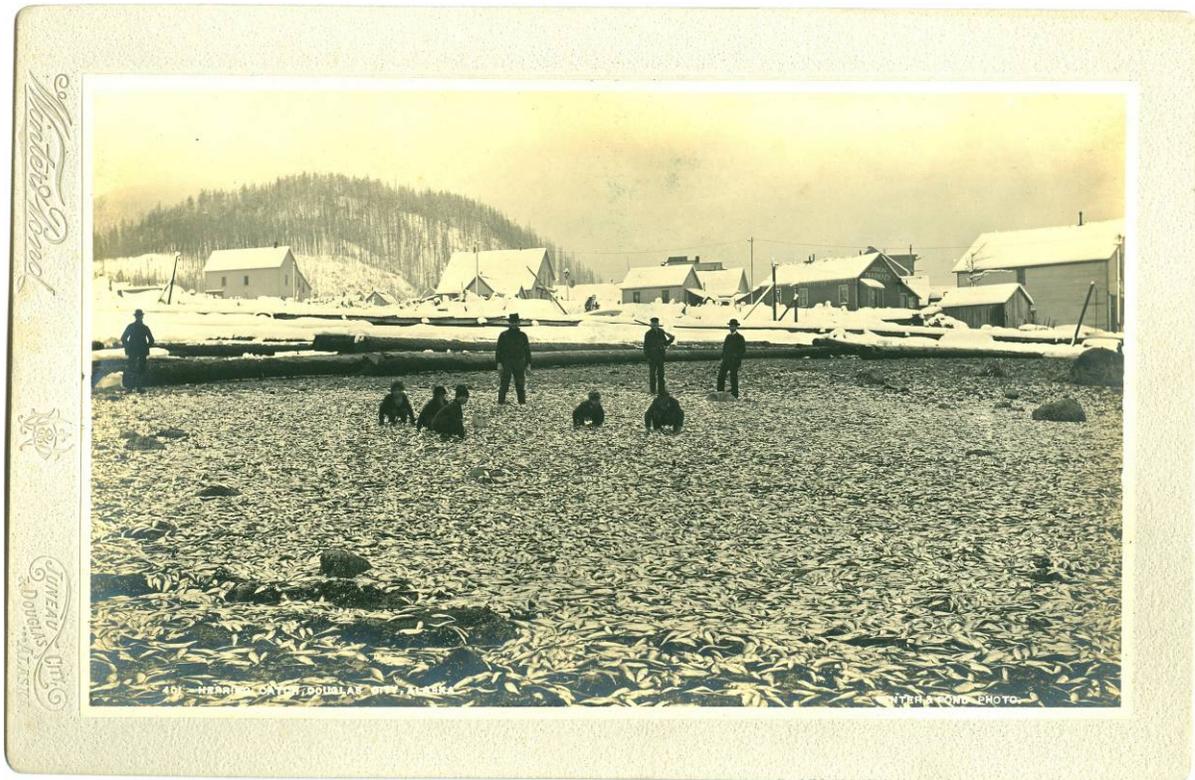


**HERRING SYNTHESIS: DOCUMENTING AND MODELING HERRING  
SPAWNING AREAS WITHIN SOCIO-ECOLOGICAL SYSTEMS OVER  
TIME IN THE SOUTHEASTERN GULF OF ALASKA**



*Tlingit children with herring catch at Douglas Island beach, 1895 (Winter and Pond postcard courtesy of Sealaska Heritage Institute archives)*

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**June 2010  
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**Final Report to the North Pacific Research Board, Project # 728**



*Steve Demmert holds up a hemlock branch covered in herring eggs Monday (April 7, 2008) at Eliason Harbor. Demmert and Lars Magnuson, facing away from camera collected the eggs from the Kasiana Islands, where they had placed the branches, and brought them to the dock to share with the public. Demmert was in town from his home in Seattle to work in the commercial herring fishery as a tender. He plans to head south after giving away the estimated 1,000 pounds of eggs on the deck of his new seiner, Julia Kae.  
(Sentinel Photo by James Poulson Web Site Accessed April 9, 2008)*

*[I]t's mind boggling to think how herring survive. From the time they spawn, the crows, the ravens, the seagulls, the eagles, sculpins, the trout, you know. You name it, they're all feeding on it. And when they hatch then the ducks and everything else are-- you know it's surprising how any can come back at all. They're just so important to the total food chain ... every animal ... in the sea. They feed everything. They feed everything. They're important to everything. ... [W]e didn't like the idea of commercial fishermen coming in and taking them on a large scale because they're very important to our salmon and especially king salmon, you know. And they feed our seals and stuff like that. Things that we're depending on.*

*-Harold Martin*

## **ABSTRACT**

Pacific herring (*Clupea pallasii*) are a foundation and bellwether species for North Pacific marine ecosystems. Alaska Natives for millennia have fished herring as part of their seasonal rounds of subsistence. More recently, the species has been subject to intense commercial fishing practices beginning in the late 1800s. Communities with local and traditional knowledge (LTK) of herring fisheries claim that historical stocks were larger and spawning areas more numerous in the past. Despite the biological, cultural and economic importance of Pacific herring, productive areas and times of year for spawning in Southeast Alaska are limited and historical population dynamics and ecology of the species are not well understood.

In order to address the gaps in the long-term historical and cultural ecological knowledge of Southeast Alaska herring, the authors synthesize existing archaeological, ethnological, historical and biological records with original data collected from interviews (86 individuals were consulted as part of this project as were 117 unpublished interviews) with herring fishers with significant long-term observations and local and traditional knowledge (LTK) of herring populations. The authors synthesize this data to build a historical and spatial database and model that: 1) identifies the extent of historic and prehistoric herring spawning and massing areas; 2) links changes in herring spawn extent and intensity to environmental and human factors in the socio-ecological system; and 3) identifies sensitive areas for protection and potential restoration of herring spawning.

The results of the study suggest that present herring stocks, even in highly productive areas such as Sitka Sound, are essentially being managed in a “depleted status,” representing a fraction of their historical abundance and distribution; that significant long-term impacts to Southeast herring stocks distribution and abundance

have been anthropogenic in nature; that human dependence on herring as a food resource evolved through interactions with key spawning areas with abundant substrates for egg deposition (such as macrocystis kelp, rockweed, and eelgrass); and that maintenance of diverse spawning locations in Southeast Alaska is critical to conserving intra-specific biodiversity and regional marine food webs.

The findings of this study illustrate the potential for LTK, in combination with archaeological, historical, and biological data, to contribute to a broader understanding of herring ecology, especially given the shallow time depth and gaps in scientific studies of the species. By linking cultural, historical and spatial models of herring ecology, it is hoped that a more robust picture of the role herring in the regional socioecological system will emerge, leading to better management and sustainable yields for both human and non-human species that rely on this foundation and cultural keystone species.

Key Words: Pacific herring (*Clupea pallasii*), Local and Traditional Knowledge (LTK), Ethnoecology, Historical ecology, Life cycle ecology, Modeling, Spawning behavior, Commercial fishing, Fisheries management, Coastal management, Restoration, Geographic Information Systems (GIS), Subsistence fishing, Herring eggs, Herring roe, Zooarchaeology, Tlingit Indians, Haida Indians, Tsimshian Indians, Marine mammals, Foundation fish, Keystone species, Trade.

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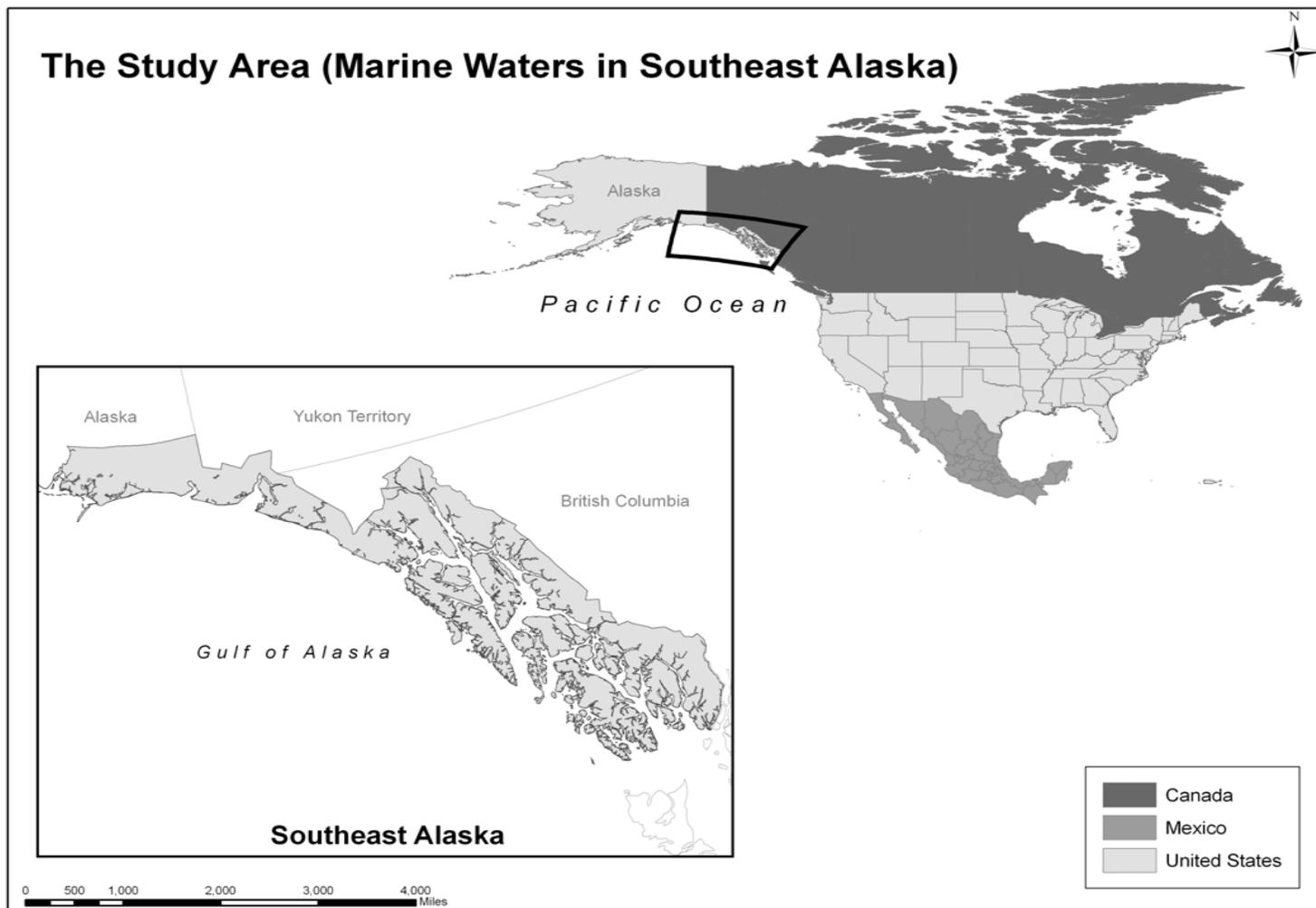
The principal investigator is especially grateful to members of the Sitka Tribe of Alaska who stimulated his interest in this topic through their tireless efforts to promote the value of Local and Traditional Knowledge in fisheries management. In addition to providing intellectual stimulation, we thank STA (especially Robi Craig, Heather Woody, and Harvey Kitka) for providing critical research support, including use of office space for conducting interviews and consultations, as well as transportation to the herring grounds. Herman Kitka, Sr., Charlie Skultka Jr., and Mike Baines also provided logistical support. Similarly, Angoon Community Association, Hoonah Indian Association (Mary Beth Moss), Craig Community Association (Lisa Trimmer), Klawock Cooperative Association, Ketchikan Indian Corporation (Irene Dundas), the Organized Village of Saxman (Lee Wallace), the Organized Village of Kake (Mike Jackson), Douglas Island Indian Association, Metlatkatla Indian Community, and the Alaska Native Brotherhood Grand Camp all provided vital support for this project. Similarly, we were assisted with logistics and in finding historical information and interview sources by the Herring Coalition (especially Andy Rauwolf and Steve Schrum) in Ketchikan, the Sitka Herring Association (Kathy Hansen) in Juneau and Sitka, as well as the Alaska Department of Fish and Game, Division of Subsistence (Elizabeth Andrews, Mike Turek) and Commercial Fisheries Division (especially Marc Pritchett and Sheri Dressel), the Southeast Intertribal Fish & Wildlife Commission (Don Bremner and Matthew Kookesh), the Juneau chapter of the Sierra Club, the NOAA fisheries lab at Auke Bay and Lena Point (especially Mark Carls). We would also like to thank the North Pacific Research Board staff, especially Clarence Pautzke, Carrie Eischens, Carolyn Rosner, and Francis Wiese. At Portland State we thank Connie Cash, Anh Ly, Bill Helsley, and Josh Reed. We are grateful to Kate Savage (NOAA) and Evelyn Brown (Fly Fishing Ltd) for their review and suggestions for the study. Last but certainly not least we are indebted to all the consultants who were interviewed (see Appendix A), who contributed their time, knowledge, and expertise to this endeavor. We hope it bears fruit in ways that improve herring management for all concerned.

## I. INTRODUCTION<sup>1</sup>

This report synthesizes information on Pacific herring (*Clupea pallasii*) in Southeast Alaska, focusing especially on historical spawning and massing areas and changes in these locales over time. It discusses: the place of herring in the marine ecosystem, the cultural significance of herring to Southeast Alaska Natives and local communities, local and traditional knowledge of the life-cycle and ecology of herring in relation to scientific data, the archaeological record of herring in relation to other faunal remains, and the impacts of historical fisheries on herring stocks in the region. The data reported were gathered as part of larger study on herring in the North Pacific, which is envisioned to begin in Southeast Alaska and move to other regions in the bioregion. An extensive literature review was conducted, as well as dozens of interviews and consultations, and several focus groups. In addition, local and traditional knowledge observations of spawning and massing areas were compiled into a geographic information system (GIS) database in order to be mapped and analyzed. The research findings are intended to be used by local communities and resource managers to assess the significance and health of their herring stocks within a broad historical ecological context that has not generally been available to date. It is expected that the results will identify problem areas where herring stocks appear to have shifted, or become depleted or vulnerable, and discuss the critical factors involved in these changes, as well as how specific herring spawning areas might be restored.

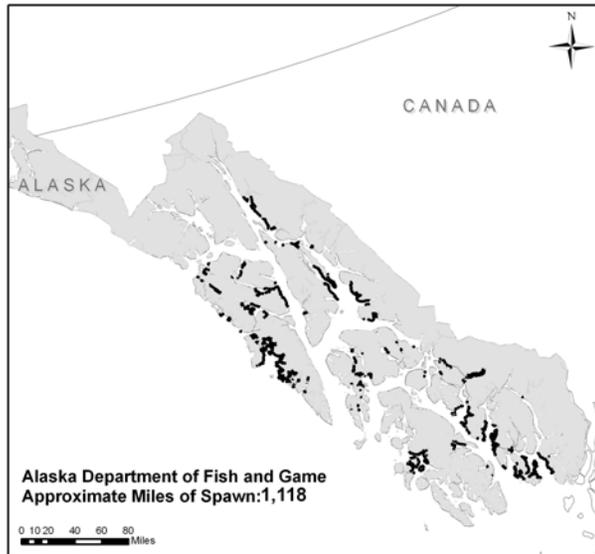
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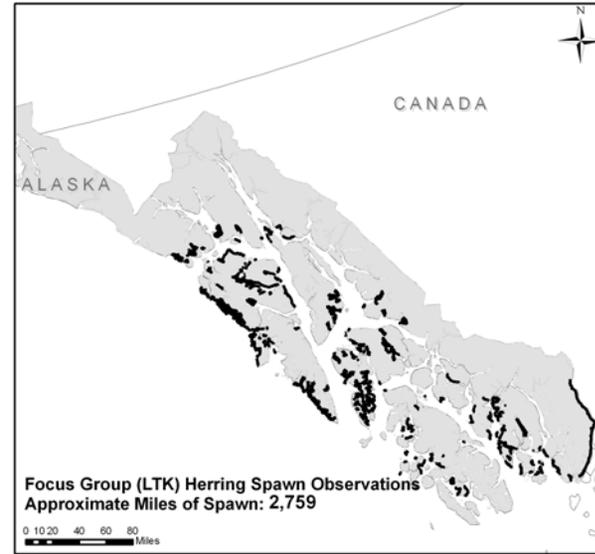


MAP 1. The Study Area (Marine Waters in Southeast Alaska)

**Miles of Spawn Identified by Alaska Department of Fish and Game (c.1970 - 2007)  
Compared to LTK\* Data (c.1915 - present)**



Linear miles of spawn identified by Alaska Department of Fish and Game (c.1970 - 2007). The data was presented as an image of aggregate data without a specific time span. Using this image, spawning locations were georeferenced using GIS software. The linear miles of spawn was calculated using a function of this software that sums the total miles of coastline identified as spawning locations. Note that some spawning areas are more frequented than others from year to year according to local conditions. For example, Middle Island, in Sitka Sound, has supported significant spawn nearly every year documented, while other areas have supported spawn irregularly or become barren.



Linear miles of spawn identified by consultants who participated in the Herring Synthesis Project (c. 1915 - present). At every focus group and individual interview, maps were provided and consultants were encouraged to identify, and mark herring spawning areas. This data was transferred into a GIS database and miles of linear spawn were calculated using a function of this software. According to these observations, herring spawning areas have covered extensive areas historically and greatly exceed those monitored by the Alaska Department of Fish and Game.

\*LTK data do not include Yakutat, Haines, Klukwan, Hydaburg or Metlakatla; limited data were collected from Wrangell

**MAP 2. Herring Spawning Areas in Southeast Alaska (Overview Map)**

### **Project Funding**

This project was funded by the North Pacific Research Board over two years beginning in July of 2007, as part of its Local and Traditional Knowledge (LTK) initiative. The project was administered through Portland State University, where the Principal Investigator holds a position in the Department of Anthropology.

### **Project Personnel**

Thomas Thornton, a sociocultural anthropologist with 18 years of research experience in Southeast Alaska, served as principal investigator and is professor of anthropology at Portland State University. Virginia Butler, co-principal investigator, is an archaeologist and professor of anthropology at Portland State University with a specialization in zooarchaeology. Madonna Moss, co-principal investigator, is an archaeologist and professor at University of Oregon, who has worked in Southeast Alaska for more than 30 years. Fritz Funk, an independent researcher, is a biologist formerly with the Alaska Department of Fish and Game with over 20 years experience researching Pacific herring. Jamie Hebert is a graduate student in sociocultural anthropology at Portland State University, and Tait Elder is a graduate student in archaeology, also at Portland State. A special appendix to the report (Appendix D) was prepared by Robi Craig of the Sitka Tribe of Alaska concerning the tribe's historical involvement in herring fishing and management issues. Finally, Shingo Hamada, a post-graduate student at Portland State, and Adela Maciejewski Scheer, a post-graduate student at University of Oxford, assisted with aspects of the literature review.

### **Background: Why the Need for a Herring Synthesis Project?**

Pacific herring (*Clupea pallasii*) are a foundation and bellwether species for North Pacific marine ecosystems, but productive areas and times of year for spawning in Southeast Alaska are limited and historical population dynamics and ecology of the species are not well understood. Salmon, halibut, cod, seals, sea lions, whales, and sea birds all rely on herring for a critical mass of their diet. Similarly, Alaska Natives for millennia have fished herring as part of their seasonal rounds of subsistence, cooking and smoking the meat, rendering oil from the flesh, and harvesting eggs after spring spawning. More recently, herring has been heavily exploited by non-Natives in Southeast Alaska beginning with the opening of the first herring reduction plant--a converted whaling station--at Killisnoo, near Angoon in 1882. This intense commercial harvest of herring to produce oil and fertilizer continued until the mid 1960s. The peak reduction harvest of 78,749 tons came in 1929 and was shared by 18 reduction plants in the region. By the late 1930s the Southeast herring reduction fisheries were in decline, and the last reduction plant, at Washington Bay on Kuiu Island, closed in 1966. Scientific studies during this period, prior to development of the state's Department of Fish and Game, were limited.

Communities with local and traditional knowledge (LTK) of herring fisheries claim that historical stocks were larger and spawning areas more numerous earlier in their lifetimes. While shifts in stocks and spawning have been documented since the 1960s, no synthesis of the deeper archaeological, historical, and ethno-ecological records on herring spawning areas has been carried out. This study aims to fill gaps and bridge divides in the current literature and data on the historical ecology of Pacific herring.

The lack of historical depth of knowledge in fisheries management is an issue of growing concern. As marine biologist Callum Roberts puts it in his recent book, *The*

*Unnatural History of the Sea* (2007:xiv-xv): “A collective amnesia surrounds changes that happened more than a few decades ago, as hardly anyone reads old books or reports.” This in turn can lead to a problem of “shifting baseline syndrome” (Pauly 1995) in management approaches in which,

we come to accept the degraded condition of the sea as normal. Those charged with looking after the oceans set themselves un-ambitious management targets that simply attempt to arrest declines, rather than rebuild to the richer and more productive states that existed in the past. If we are to break out of this spiral of diminishing returns and diminished expectations of the sea, then it is vital that we gain a clearer picture of how things have changed and what has been lost.

A paradigmatic case of shifting baselines is the Atlantic cod. Long-term studies, including archaeological surveys from the Maine coast reveal that the average length of cod consumed by people was over three feet until the past century, when it dropped sharply. Most cod landed today are less than one foot in length. Yet, rather than curtail fishing so stocks could rebound, managers instead shifted their idea of what constituted a healthy cod population. As one scientist put it “We found 15,000 cod in the South Bay, and everyone said the cod are back. Hold on! Ten years ago, the biomass, the population, was 1.2 million” (Kurlansky 1997:195).

Determining if there has been a shifting baseline in the case of herring management first requires an assessment of how large herring stocks were in the past as compared to the present and then evaluating to what extent managers’ perceptions of “healthy” herring populations may have shifted (Papworth, et al. 2009). The interdisciplinary approach we have adopted provides the tools to determine if shifting baselines have affected herring management.



Figure 1.0. Herring catch, Douglas City, Alaska. 1895. Four men with five children on fish covered beach. Photograph on file at the Alaska State Library (ASL-P87-1473).

Even if fisheries managers have been aware of shifting baselines, the present situation could be considered tenable or untenable for other reasons. The steep declines in herring returns at once-abundant spawning grounds like Kah Shakes Cove and Auke Bay in recent years raise concerns about present management models, especially for the intensive herring sac-roe fisheries. However, in each case there are other potential causal factors at work beyond commercial harvest levels. A recent biological review of herring management asserts that “management of herring stocks based on a great expenditure of research has not been very successful” (Cushing 1985, quoted in Lassuy 1989:14). A 1995 article in the Juneau Empire, “Mystery of the Missing Herring,” lamenting the decline of herring in Auke Bay asserts as much: “Scientists have plenty of theories but no real answer to what has become of the herring” (see Figure 1.1).

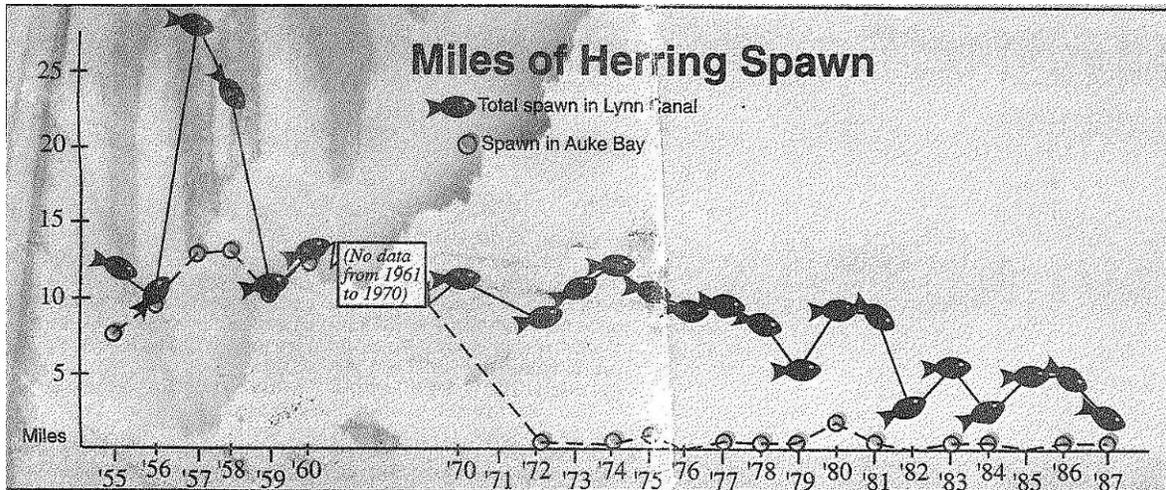


Figure 1.1 Miles of herring spawn in Auke Bay and Lynn Canal reflecting declines since 1955 (*Juneau Empire* 12/10/95:D3)

Clearly more research needs to be done to understand the range of factors that are affecting herring populations over time throughout Southeast Alaska. Local and Traditional Knowledge collected for this study speaks to these issues, including the prospects for restoration of depleted stocks through transplantation and other means, which have a foundation in Tlingit and Haida cultural knowledge and practice.

### **Aims and Objectives**

Our objective is to synthesize existing archaeological, ethnological, historical and biological records with data from interviews (86 individuals were consulted as part of this project as were 117 unpublished interviews) with herring fishers with significant long-term observations and local and traditional knowledge (LTK) of herring populations to build a historical and spatial database to: 1) identify the extent of historic and prehistoric herring spawning and massing areas; 2) link changes in herring spawn extent and intensity to environmental and human factors in the socio-ecological system;

and 3) identify sensitive areas for protection and potential restoration of herring spawning.

Key hypotheses for the project include:

1. Present herring stocks, even in highly productive areas such as Sitka Sound, are essentially being managed in a “depleted status,” representing a fraction of their historical abundance and distribution.
2. Significant long-term impacts to Southeast herring stocks distribution and abundance have been anthropogenic (a result of human activity), in particular over-exploitation of the species by commercial herring fisheries in the last century (e.g., for herring reduction plants), but also disturbance, contamination, and degradation of critical spawning habitats;
3. Human dependence on herring as a food resource evolved through interactions with key spawning areas with abundant substrates for egg deposition (such as macrocystis kelp, rockweed, and eelgrass), with which many aboriginal settlements are associated, and was later enhanced through the development of engineered marinescapes (e.g., placement of hemlock boughs in intertidal areas), techniques for conserving herring stocks by regulating human harvests and disturbances to critical spawning habitat, and by the development of new technologies (such as the herring rake) for capturing whole herring in quantity.
4. Maintenance of diverse spawning locations in Southeast Alaska is critical to conserving intra-specific biodiversity.

An additional aim of this project, as with all North Pacific Research Board projects, is education and outreach. We have provided outreach and education primarily by creating a project website, (<http://herringsynthesis.research.pdx.edu/research/index.html>). Jamie Hebert has updated this webpage to include project summaries, updates, maps,

results (including a pdf version of this report), educational materials (including a pdf version of the outreach poster), and numerous other links to relevant herring information found elsewhere on the internet. Collaborating organizations have also assisted in this effort. For example, Sitka Tribe has scanned relevant herring photos from its archives for inclusion on the website, with captions. In addition, the researchers have presented project findings in academic journals, conferences, and other public forums. As an example, Thomas Thornton chaired a special session on herring at the Gathering of Tribes and Clans Conference in Juneau in March, 2009 to disseminate preliminary results of the project to a large segment of the Southeast Native community, as well as scholars and other interested parties; this session also included Fritz Funk presenting historical commercial fisheries data, Madonna Moss, on behalf of herself, Virginia Butler, and Tait Elder, presenting archaeological results, Shingo Hamada, presenting comparative Japanese and Ainu perspectives on herring, and Harold Martin, Ethel Makinen, and Roby Littlefield, presenting Tlingit perspectives on herring. Thornton also provided preliminary results and testimony to the Alaska State Legislature, Fisheries Committee, at a special session on herring held 10 February 2009 and to an open council meeting of Sitka Tribe of Alaska in March 2010. A number of related peer reviewed articles are being developed for academic journals.

### **Research Methods**

Three primary research methods were employed in this study. First, a comprehensive review was carried out of the anthropological, historical, and biological literature on herring and herring fishing. This review incorporated both published and unpublished documentary records, and culminated in an annotated bibliography, which is reproduced in Appendix H and also housed on line in downloadable pdf form

(<http://herringsynthesis.research.pdx.edu/research/index.html>). Thomas Thornton and Jamie Hebert led the review of the ethnological and historical literature on herring, while Madonna Moss, Virginia Butler and Tait Elder reviewed the relevant archaeological studies and unpublished reports for evidence of herring in the faunal record. Fritz Funk, reviewed the relevant historical fisheries records for site specific data on the impact of herring reduction plant fishing. Robi Craig of the Sitka Tribe of Alaska reviewed STA's own substantial archive of information concerning local herring fisheries and chronicles the Tribe's efforts to achieve a stronger role in managing herring, as concerns over Sitka area stocks have developed (see Appendix D). Adela Maciejewski Scheer, a post-graduate student at University of Oxford (now pursuing a law degree at McGill University), added contributions on the use of marine LTK in non-Alaskan settings, and Shingo Hamada, a post-graduate student at Portland State University (now pursuing a PhD at Indiana University) provided context on Japan's herring fisheries.

Second, semi-structured, qualitative interviews were carried out following a basic set of topics and questions. These topics and questions were closely tied to project objectives of documenting Local and Traditional Knowledge of herring ecology particularly changes in local patterns of massing, spawning, and human and environmental factors that may relate to these changes. Copies of the project consent forms and interview schedule are attached to this report as Appendix B and Appendix C. A virtue of semi-structured interviews, as opposed to formal surveys or questionnaires, is that they enable consultants to express perspectives in their own words, with the opportunity to expand on and clarify their response through follow-up dialogue with the interviewer. Given the complexities of herring ecology, we found this approach especially useful. Another advantage of the conversational quality of the interaction is that it allows for probing consultants' memories about historical events about which they might otherwise not voluntarily recall spontaneously in response to a simple question or

structured questionnaire. In some cases follow-up questions were required , and even return trips, in order to verify information or probe topics that arose in other interviews.

Most of the 86 interviews were conducted individually. However, we also conducted small group interviews and larger focus group style interviews. Small group interviews were generally conducted at the request or convenience of the consultants. Focus groups were undertaken in larger communities, including Juneau and Ketchikan, and also in the village of Kake. A focus group is a structured discussion in which a moderator, in this case the PI, leads a small group of participants, typically 5-12 people, through a set of queries on a topic. A good focus group may function very much like an academic seminar or meeting for learning, where participants' collective input, dialog, and interpretations exceed the sum of the individual participants. At the same time, focus groups have potential drawbacks. For example, participants may feel limited by conflicting or hidden agendas or dominance hierarchies that constrain the proceedings and may, in turn, skew results. Focus groups were preferred in the larger communities because it was otherwise not possible for the researchers to recruit and interview a significant sample of the population with Local and Traditional Knowledge of herring. However, if particular individuals not present were identified by focus group participants as worthy of interviewing, or expressed reservations about participating in a focus group due to the constraints of that medium, we attempted to meet them individually for separate, semi-structured interviews.

Criteria for selection of consultants was based on the researchers' own knowledge of these fishing communities as well as input from local tribes, elders, representatives of local Fish and Game Advisory Committees, and various non-governmental organizations involved with herring management. Where public focus groups were held, general invitations were issued through local organizations and their media. During the interviews, some consultants also identified persons in the community that they thought

we should interview, and in one case, the PI was contacted by a subject wanting to be interviewed. Interviewees were offered an incentive of \$20 for their participation, though not as a means of recruitment. The incentive payment was introduced as part of the informed consent process, as detailed in the individual and focus group consent forms (Appendix B).

The bulk of the interviews were carried out by PI Thornton during three major periods of field work in March 2008, September 2008, and March and April of 2009. Jamie Hebert assisted with interviewing in March 2008 and Fritz Funk participated in the March 2008 Focus Groups and selected interviews held in Juneau, where he resides. Jamie Hebert also conducted seven separate interviews in Ketchikan and by phone, and Sitka Tribe of Alaska made available the results of their own recent interviews (Sitka Tribe of Alaska 2008a). Consultants interviewed for this study are cited by name within the text, unless they requested anonymity, in which case they are cited by number. These names or numbers correspond to interviews and transcripts carried out for this study (see Appendix A for a list of consultants and interview dates).

Finally, the PI carried out participant observation in conjunction with the spring herring spawning in Sitka during 2008 and 2009. This fieldwork involved observation of both the commercial sac roe and subsistence roe fisheries and interaction with participants. It also included observations of herring events, such as the annual STA “herring dinner” normally held just prior to the opening of the fisheries to celebrate the return of the herring and express news and concerns about conservation and management. Participant observation proved valuable in assessing statements in interviews and probing further topics. It revealed important details about how LTK is acquired, transmitted, and maintained, and operationalized in the context of practical interactions with herring in particular environmental and social contexts.

## **Interview Transcripts, Maps, and Field Notes**

Jamie Hebert transcribed the audio-recorded interviews, generating electronic files consisting of over 1000 pages of double-spaced text. Those parts of the interviews Hebert had difficulty interpreting, such as Tlingit language names and phrases, were marked and checked against the original recording by Thornton, who reviewed and edited the entire set of transcripts for errors and omissions. These edited transcripts were then sent to the consultants for review, and they were invited to make corrections, additions, or other changes to them either in writing or through phone or face-to-face consultation with project personnel. Consultants were given up to 30 days to make corrections and the revisions were incorporated into a final set of interview documents which constitute the basis for analysis. AtlasTi, a qualitative database, was used to analyze and code selected transcripts for important themes related to location, and the database information was transferred to MS Excel. Electronic and hard copies of original transcripts and electronic versions of the Excel database are on file at the Department of Anthropology, Portland State University.

Consultants were asked to identify herring spawning locations, massing areas, and other impact events (such as contamination, predation, historical fishing incidents, etc.) on maps or charts. These maps were then aggregated by Hebert into a geographic information system (GIS) database and a set of seven maps, organized by appropriate biocultural regions, known as *kwáan* in Tlingit, which attempt to situate herring observations in both space and time. Limited review of the maps was conducted on follow-up research visits to communities; however, this review was not comprehensive due to the complexity of the task and time and funding constraints, and therefore the maps should be considered works in progress. The GIS database also attempts to correlate LTK of herring ecology with selected other environmental datasets, such as bathymetry, marine ecoregions, seal, sea lion and shorebird populations. The synthesis

of these data should provide rich opportunities for further analysis of the LTK in relation to scientific results that can be displayed at similar spatial scales. The GIS database and hard copies of area maps are housed at Department of Anthropology, Portland State University.

Notes were made by individual researchers during the course of their interviews and fieldwork. These notes serve as a supplement to the transcripts and maps and inform relevant portions of the analysis in this report. These notes remain in the personal possession of each of the researchers.

### **Limitations of the Data**

Although this project relies on a variety of methods and sources to ascertain patterns of herring ecology over time, each source has its limitations. To begin, although the literature on herring is significant, the focus is uneven. For example, in the archaeological literature, many studies fail to record the existence of herring remains, because they were carried out with mesh screens too large (coarse) to capture fine herring bones. Such a methodological choice can lead to bias in the archaeological record towards larger fauna, as discussed in detail in the archaeology section. Similarly, despite their foundational importance in the marine food chain and human fisheries, herring have not necessarily been considered as “charismatic,” captivating, or valuable as other species, such as salmon or halibut, and therefore they have not garnered the same amount of attention or inquiry among scientists and chroniclers. Indeed this project is aimed squarely at filling the gaps in these literatures.

Qualitative interviews, based on referral or snowball sampling, also have their limitations. First, it may be difficult to generalize mathematically from the sample to the community at large. As a consequence, these data may not be comprehensive so much as

describing well-known trends or events among a community. This limitation is mitigated to an extent in the case of herring by the fact that they are a pelagic, schooling fish. They travel en masse, and thus when a large ball of herring is present or consistently utilizing an area for massing, feeding, or spawning, it tends to be widely noticed and reported among human groups with an interest in the species. At the same time, herring may also disperse into smaller schools at certain times of the year and minor spawns occur in many places without drawing significant attention. This is evidenced in our results by the fact that many observations of minor spawns often were cited by only 1-2 individuals, whereas major consistent spawning areas were widely known among herring fishers in communities. Thus, reasoned interpretations and general conclusions can be drawn from synthesizing these data. As well, they may lead to appropriate hypotheses and paths for further investigation, perhaps involving statistical models.

Other potential limitations to interviews include bias and validity. We minimized interviewer bias through extensive review and discussion of questions among the research team and collaborating organizations, and also by employing multiple interviewers in the project, often working together, so as to minimize individual bias. Validity issues were minimized by 1) defining a large sample of consultants from a variety of geographic, ethnic and occupational backgrounds, including herring fishers and managers from the sac roe, reduction, and bait fisheries as well as the rake, jig, oil, and egg-on-substrate fisheries; 2) ensuring that interviewers and interviewees understood the research questions; 3) consulting with managers, collaborating organizations and fellow researchers about their understandings of research questions and potential; 4) utilizing the semi-structured protocol to ensure that key concepts and language were used and understood consistently; and 5) reviewing interview transcripts for accuracy and validity issues and discussing substantive issues that arose; as noted

above, most transcripts were read by at least 2-3 people, including the PI and the interviewee, who was given the opportunity to correct and clarify potential errors contributing to validity problems.

As with our comprehensive, multidisciplinary literature review, the interview protocol and large, diverse sample of interviewees helped to “triangulate” critical issues, events, and points of convergence and divergence in the historical ecological record of Pacific herring in the Southeastern Gulf of Alaska. Thus, the researchers are confident that this methodology, despite certain limitations, represents the most efficacious means to synthesize the historical ecological knowledge of herring.

### **Conceptual Approaches and Issues Related to Local and Traditional Knowledge**

#### Historical Ecology

The basic approach of investigation for this study is historical ecology. Historical ecology is a relatively new field or research program developed by anthropologists and other scientists. It draws from a wide range of analytical tools and perspectives. As William Balée and Clark L. Erickson (2006) observe in their book *Time and Complexity in Historical Ecology*, authors have used the phrase to emphasize such things as “climate change, geomorphological processes, environmental history, value of historical documents, and human ecology.” But it is not simply landscape ecology or environmental history. A pioneer in the field, archaeologist Carole Crumley (1994:9) characterizes historical ecology as tracing “the ongoing dialectical relations between human acts and acts of nature, made manifest in the landscape.” From this perspective historical ecology seeks to liberate studies of human-environmental interactions from the classic dichotomies of man/nature and cultural determinism/environmental determinism in favor of a more dynamic, relational approach which recognizes the

complexity and mutual interdependence of these interactions across multiple temporal and spatial scales.

Balée (1998) identifies four “premises and postulates” that separate historical ecology from earlier research programs in culture and environment. These are:

1. Humans have had an effect on nearly all environments on earth
2. Humans are seen as morally neutral: they are not inherently bad and programmed to destroy the land and biodiversity in their environments nor are they inherently good
3. Different types of societies influence their landscapes in different ways
4. The relationship between people and the landscape can be comprehended holistically.

In their book *Time and Complexity in Historical Ecology*, Balée and Erickson (2006:5), seeking to codify the emerging field of historical ecology, posit:

What historical ecology harbors as an explicit proposal is that the human species is itself a principal mechanism of change in the natural world, a mechanism qualitatively as significant as natural selection. In addition, the human species is not just a product of natural selection (though it is partly that) because it too makes histories and specific landscapes that bear its inscriptions. The cumulative effects of these undertakings influence the development and form of the exact cultural qualities of contemporary landscapes and are manifested in them.

By emphasizing a dynamic, non-equilibrium ecology, traceable through specific landscapes over time, historical ecologists do not privilege or negate human intentionality in manipulating the environment. Similarly, historical ecologists do not necessarily assume a pristine or primitive environment upon which human activities are inherently “degrading,” or a pristine or primitive state of culture that was inherently

harmonious and non-transformative of existing habitats. Rather landscapes and human societies are historically-contingent processes of mutual construction. It is only through such a framework that we can understand “the heterogeneity of landscapes across world regions, and. ... assess the historical relationship among cultural, linguistic, and biological diversity” (Maffi, quoted in Balee and Erickson 2006:7). In the case of herring this means understanding how aboriginal human interactions with herring affected particular marinescapes.

A historical ecological synthesis should not be limited to historical sources, which are shallow by the standards of ecological timescales. Especially in a new “frontier” like Alaska, environmental data from documentary sources may be limited to the last few decades or centuries. Archaeological sources can help fill in the gaps (Crumley 1994). Similarly, local and traditional knowledge, passed down from generation to generation, provides a third axis of inquiry for understanding patterns of human-environmental interactions over time. All of these axes of reference are used in this project.

Applying such a perspective to marine environments, or marinescapes, presents special challenges. Marine ecosystems are vast, varied, fluid, and largely invisible to human perception. Even more than conventional landscapes, marinescapes may vary by season, weather, ocean flows, as well as local microclimatic conditions. What is more, these environments have only recently lent themselves to significant archaeological investigation. Thus, our understanding of marinescapes is fractional in comparison to terrestrial ones.

### Local and Traditional Knowledge

Local and Traditional Knowledge is the phrase used by the North Pacific Research Board to define ecological information which may be produced, transmitted,

and maintained through social networks that are not conventionally consulted by scientists. As such, it is considered a relatively “untapped” source of knowledge which may potentially complement and extend scientific data sets, if not the theoretical paradigms that drive them. The terms Traditional Ecological Knowledge (TEK), Local Knowledge, and Indigenous Knowledge (IK) are often used synonymously, but Local and Traditional Knowledge is perhaps the broadest term. Berkes (2008:7) defines TEK as:

*a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment (2008:7)*

He and others prefer TEK to “local knowledge,” the later often viewed as both a more general and less problematical term (Ruddle 1994:161), because TEK better captures the historical, relational, and situatedness of ecological knowledge (Berkes 2008:8; see also Raffles 2002). Tim Ingold and Terhi Kurttila (2000) defined traditional knowledge as that “generated in the practices of locality,” emphasizing its phenomenal embeddedness in particular interactional contexts, or what Ingold has termed “taskscape” (see also Pálsson 1998). Adding “traditional” to “local knowledge” to make LTK helps remedy some of the definitional weaknesses TEK, while not confining knowledge to tradition. In this study we use the LTK to embrace what Berkes defines as TEK as well as other local knowledge possessed by humans interacting with herring that may not have been passed down through intergenerational transmission.

### Local and Traditional Knowledge (LTK) and Marine Research<sup>2</sup>

The potential contribution of local and traditional knowledge to marine research and management has been increasingly considered in the academic literature over the

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<sup>2</sup> Additional author: Adela Maciejewski Scheer, University of Oxford

past several decades. A number of diverse disciplinary and interdisciplinary studies have been carried out under the auspices of LTK research. However, to date, there are few instances of work bringing together the literature across these fields in the marine context (see Johannes and Neis 2007 for the one broad review).

This brief review reveals that marine LTK encompasses a broad range of topics from indigenous knowledge of herring spawning areas to salmon spawning grounds to the multiple Inuit terms for sea ice to commercial fishers knowledge of bait to catch ratios. The term 'marine' encompasses LTK relating from the deep sea to the coastal realm. Inland waters are generally excluded except where they relate to species which travel inland from the ocean to spawn (e.g., salmon).

Three key questions may be used to assess the literature: 1) what kind of LTK has been collected? 2) under what auspices and with what success has LTK been applied in research and contemporary management? 3) to what extent are insights from LTK and 'Western' science comparable such that they may be productively combined or synergized?

#### *What kind of LTK has been collected?*

A review of the literature reveals that LTK has been collected about many facets of marine environments. The majority of articles in the bibliography are species-specific studies which examine species location and abundance, ecology and behavior. Work examining the abundance and spatial distribution of certain species includes studies on the bumphead parrotfish (Dulvy and Polunin 2004; Aswani and Hamilton 2004), the ivory gull (Mallory et al. 2003), cod stocks (Murray et al. 2008), and bowhead whales (Noongwook et al. 2007). Moreover, LTK has allowed insight into historical stock numbers, through the collection of oral history (Jones 2007; Sadovy and Cheung 2003) and examination of archives (Lajus et al. 2007). LTK has been collected on the

migratory and seasonal movements of various species, such as that of Brazilian coastal fishes (Silvano et al. 2006), multiple fish species in an African artisanal fishery (Poizat and Baran 1997), Mekong Basin river fishes (Valbo-Jorgensen and Poulsen 2000), the bowhead whale (Noongwook et al. 2007), the beluga whale (Huntingdon et al. 1999; Mymrin et al. 1999) and *Pomatomus saltatrix* (Pomatomidae) (Silvano and Begossi 2005). Key habitats for cod (Ames 2001) and gadoid fishes (Bergmann et al. 2004) have been studied, as has knowledge about tropical coastal habitat connectivity and the composition of species assemblages by underwater habitats (Garcia-Quijano 2007). In the case of herring, an LTK study by Jones (2007) of the Haida Gwaii herring stocks in the Canadian Pacific Northwest suggests long term changes in both abundance (declines) and structure (smaller and fewer mature fish) of these fish, though causes and long term trends are not easy to pinpoint.

A number of studies have focused on species' behavior, though what behavior has been studied is diverse. General studies have documented what LTK exists on the behavior of the Carangidae fishes (Hamilton and Walter 1999) and polar bears (Keith et al. 2005), the latter through sources such as oral history, vocabulary and cultural traditions of the Inuit. Reproduction-related studies have been prominent; these studies encompass fish spawning habits (Hamilton 2005), calving in beluga whales (Huntingdon et al. 1999; Mymrin et al. 1999) reproduction of *Pomatomus saltatrix* (Pomatomidae) (Silvano and Begossi 2005) and nesting site fidelity in sea turtles (see Johannes and Neis 2007). Feeding behavior of beluga whales (Huntingdon et al. 1999; Mymrin et al. 1999), *Pomatomus saltatrix* (Pomatomidae) (Silvano and Begossi 2005), and fourteen fish species in the Negro River (Silvano et al. 2008) have also been examined. In addition, the effect of the physical environment, such as that of lunar periodicity on fish (Aswani and Hamilton 2004), the reaction of eiders to shifting ice pack (Gilchrist and Robertson 2000) and the breeding behavior of geese in relation to storm surges (Fienup-Riordan

1999) and other impacts has been documented (see also, Zavaleta 1999). Finally, the behavior of tuna (Moreno et al. 2007) and seals (Moore 2003) with respect to fishing nets has been of interest, though knowledge of the influence of humans on animal behavior has only been studied in the case of polar bears (Keith et al. 2005).

Shifting from documentation of knowledge, other work has examined the resource management practices of communities, largely in artisanal fisheries (Amos 1993; Hickey 2007; Johannes 1978, 1981; Johannes and Yeeting 2000; Ramos and Mason 2004; Morrill 1967; Thornton 2008). Basic fisheries assessments have integrated LTK in one case (Arce-Ibarra and Charles 2008). A number of studies describe specific fish harvesting techniques and technologies (Langdon 2006; Anuchiracheeva et al. 2003; Nsiku 2007; Linkous Brown 2006), including for Pacific herring (Stewart, 1977; Schroeder and Kookesh 1990; Victor-Howe 2008). A sole study describes seaweed harvesting methods (Turner and Clifton 2006). Studies probing the life cycle of fish using fisher knowledge have described local size classifications of the bumphead parrotfish (Aswani and Hamilton 2004) and the life history of Goliath grouper (Cavaleri Gerhardinger et al. 2006). Schafer and Reis (2008) identified artisanal fishing areas in a Brazilian estuary using the knowledge of local fishermen. In commercial fisheries, knowledge of bait to catch ratios in the lobster fishery have been examined (Harnish and Willison 2008), and Moreno et al. (2007) recently carried out a comparative study of the LTK of Spanish and French tuna fishing fleets. LTK has also been used to assess the effectiveness of conservation measures, such as traditional management practices (McClanahan et al. 1997) and village-managed fish conservation zones (Baird and Flaherty 2005). Similarly, indigenous knowledge has been applied in the design of marine protected areas (Aswani et al. 2007; Aswani and Hamilton 2004). A marine protected area emphasizing subsistence-only use of herring recently has been proposed

for Sitka Sound based on a study of US federal waters in the vicinity of Makhnati Island (Sitka Tribe of Alaska 2008a).

LTK about the physical marine environment comprises another important facet of the literature. For example, Tobisson et al. (1998) note knowledge about tidal cycles, semidiurnal, diurnal and fortnightly, seasonal changes in winds and precipitation and seabed morphology. LTK has also helped describe the nature of currents and island wakes (Johannes 1981). Work in the Solomon Islands has also used local knowledge to interpret satellite images (Lauer and Aswani 2008) and aerial photos (Aswani and Lauer 2006) in order to better map both shallow water and seabed environments. Moreover, a number of recent studies probe human communities' knowledge of sea ice conditions, freeze/thaw processes, and the influences of winds and currents on ice conditions (Laidler and Elee 2008; Laidler and Ikummaq 2008), and observations about glacier advances, retreats, and surges (Cruikshank 2001, 2005). A few studies also describe the ways in which communities live in sea-ice environments (George et al. 2004; Riewe 1991). In particular, navigation in these environments has been of interest (Bradley 2002; Aporta 2004), with some work using local knowledge to plot GPS points in order to map trails (Aporta 2003).

LTK often has been used in assessments of environmental change. For example, Kovacs (2000) used LTK for the identification and evaluation of factors inducing disturbances in mangrove forests. LTK has also figured in climate change research. Indeed, Riedlinger (2001) argues that local, land-based expertise and community-based assessments can provide observations, predictions and explanations of climate change at scales and in contexts currently underrepresented in climate change research. Under this rubric, changes in sea ice have been documented using LTK (Gearheard et al. 2006). Laidler (2006) examined Inuit perspectives of the relationship between sea ice and climate change while Krupnik and Carleton Ray (2007) note perspectives on the

changing climate–walrus–human relationship. Rather than comparing knowledge from both LTK and science, work on climate change in the Arctic in particular has sought to improve our understanding of climate change by examining both scientific and Inuit perspectives (Laidler 2006; Riedlinger 2001). Certainly “scale and context are key components in maintaining the validity and integrity of TEK” in relation to science (Duerden and Kuhn, 1998:37).

Ethnoecologists and linguists have been active in documenting local names for fish (Ambali et al. 2001; Ankei 1989), words for hydrological features (Burenhult 2008), landscape and seascape terms (Cablitiz 2008; Levinson 2008; O’Conner and Kroefges 2008; Senft 2008), coastal proverbs (Kurien 1998) and terms for sea ice conditions (Krupnik 2002; Norton 2002; Laidler and Elee 2008; Laidler and Ikummaq 2008), as well as constructing broader, integrated conceptualizations of marine ecosystems from indigenous perspectives (Krupnik and Jolly 2002).

Finally, a growing number of studies have branched away from simply documenting LTK to examining its application into six main areas of study. First, how LTK is communicated and transmitted has been examined (Akyeampong 2007; Alessa et al. 2008; Aporta and Higgs 2005; Berkes and Turner 2006; Bonny and Berkes 2008; Crona and Bodin 2006; Foale 2006; Palmer and Wadley 2007; Poepoe et al. 2007; Reyes-Garcia et al. 2007) as has the way in which knowledge is distributed within a community (Crona 2006; Ruddle 1994; Felt 1994; Olsson and Folke 2001; Knudsen 2008). Second, some work analyzes the role of LTK in national and international policy (Agarwal 2002; Berkes et al. 2001; Ellis 2005; Mauro and Hardison 2000; Memom et al. 2003; Satria 2007). For example, Satria (2007) analyzes why traditional fisheries practices ceased and then were reinstated in Indonesia. Third, a literature is also developing on methods (Neis et al. 1999; Vayda et al. 2006; Watson and Huntingdon 2008) and ethics in LTK research (Maurstad 2002; Silver and Campbell 2005; Wenzel

1999). Fourth, some work has sought to compare LTK and data gathered by Western scientific methods. Daw (2008), for instance, compares fishers' reports of catch rates with official landings data and underwater visual census (UVC) in Seychelles and finds that contemporary reported catch rates and landings were consistent though fishers' knowledge, landings, and UVC perceived different trends over time. Finally, some work has probed the relationship between scientific and indigenous epistemologies in the context of collaborative projects (Fienup-Riordan 1999; Gearheard et al. 2006; Leduc 2007; Krupnik and Jolly 2002; Murray et al. 2008). A more detailed discussion of the perspectives on the integration of LTK and science follows in Section 2.3 below.

Geographically, of the 129 articles sampled with specific case studies, approximately 40% of research took place in North America (with studies in Arctic Canada and Alaska accounting for nearly 60% of those articles), 20% in Oceania, with the rest of the world's regions (split into Africa, Asia, Europe, South America, and Central America and Caribbean) each accounting for 4-9% of articles each. The greater proportion of articles from North America can be attributed to the rising degree of education, sovereignty, and funding favoring collaborative involvement of aboriginal peoples in LTK and cooperative LTK-Western scientific studies.

Based on this review of LTK studies, a few key general observations can be made regarding its uses and limitations:

- 1) The scale at which LTK and Western science operate can be different. Berkes et al. (2007) note that local observations and traditional knowledge generally are not attuned to processes that occur at chemical/biochemical/cellular levels (though toxins can sometimes be tasted). Higher trophic levels of the marine ecosystem, those that are most readily apprehended by the human senses, tend to yield the most LTK.

- 2) LTK focuses on the parts of the life cycle of species which are of interest to those that utilize them, such as fishers and subsistence users. This pattern has been observed early and often in the literature, For example, Morrill (1967) observed that “much of the Cha-Cha ethnoichthyology derived from particular fishing methods used and the observations which they require or permit.” Foale (1998:200) argues that most TEK “possessed by subsistence, artisanal and commercial fishers is focused on how to locate individuals of a target species in space and time, and, once located, how to capture them”; Foale (2002) argues that one of the commonest ‘empirical gaps’ in LTK is knowledge about parts of the life cycle that are unseen by fishers.
- 3) Changes in stocks or local population segments of fish are often the first ecological changes to be recognized. This is especially true of fishing communities where there is intergeneration knowledge of specific massing, spawning, or feeding areas.

We found similar patterns in our investigation of LTK of Pacific herring. We gathered few observations that specifically identified chemical/biochemical/cellular level processes, although some toxins were detected via proxies, such as unusual visual symptoms (disease) or (abnormal) behavioral patterns. The bulk of our interviewees focused on higher trophic levels of the marine food chain and their interactions with herring, especially those species that feed on herring, such as king salmon (*Oncorhynchus tshawytscha*), marine mammals, sea birds, and humans. At the same time, like Morrill, we found that much of the LTK we gathered was generated in the context of how people locate and fish for herring (or their eggs) or their predators (salmon and seals, especially) in particular places and times. Like Foale, we also found evidence of empirical gaps in LTK concerning parts of the life cycle that are not readily observed by fishers, including offshore and deep sea behaviors such as massing or

'balling', though some of this has become more observable with the evolution of sophisticated fathometers and "fish finder" instruments. Relative population abundance and scarcity in particular areas also were commonly observed as trends over time. These observations were often phrased as sharp contrasts, wherein herring in a particular historical period were sensed as superabundant—"so thick you could walk on them" or "so loud they'd wake you up at night"- versus a later period when they were comparatively scarce or absent all together.

*Under what auspices has this LTK been collected?*

The literature compiled in the bibliography spans a large number of academic disciplines, including anthropology, biology, geography, history, linguistics, sociology, and political science. This breadth of disciplines highlights that developing an understanding of LTK is almost necessarily an interdisciplinary project. The literature can be roughly segmented into work which has focused on documenting LTK in order to fill in gaps in scientific understanding, and that which applies LTK in the context of conservation and resource management.

Academic researchers have used LTK in multiple ways. In some cases, LTK has been collected primarily to add to our existing knowledge base with studies which could be termed "documentation" studies. Rather than have an explicit management aim, this work is fairly descriptive. A number of other studies use LTK to serve as the groundwork for new studies in "data-sparse" situations, such as providing initial assessments of both Mayan fisheries (Arce-Ibarra and Charles 2008) and Guinean fisheries (Poizat and Baran 1997). LTK may yield useful information about the abundance and behavior of historical fish stocks (Lajus et al. 2007; Saenz-Arroyo et al. 2005; Sadovy and Cheung 2003). Another grouping of studies is those which have used LTK to inform research

design (Moreno et al. 2007; Bart 2006, Hamilton and Walter 1999). Bart (2006) used information from salt hay farmers about an invasive reed to design manipulative experiments the results of which shed light on the causal mechanisms underlying the invasive phenomena described by locals. He found that “local accounts may provide rich narrative histories that can both refine research questions and suggest multiple plausible scenarios” (2006:546).

The bulk of LTK research has been conducted to enhance resource management objectives. Foremost, LTK can improve management simply through increasing the knowledge base about a given species (Silvano et al. 2006; Silvano et al. 2008; Valbo-Jorgensen and Poulsen 2000), such as through more precise stock numbers (Jones 2007; Saenz-Arroyo 2005; Foale 1998). Second, LTK may be used to improve management practices in commercial fisheries, such as to reduce by-catch (Price and Rulifson 2003), to examine bait to catch ratios (Harnish and Willison 2008), to understand seal interference with nets (Moore 2003) and even to compare the fishing practices of different fleets, e.g., Spanish and French tuna fishing fleets (Moreno et al. 2007), according to management criteria. Third, in a number of cases, LTK has brought to light potentially useful traditional practices which could be incorporated into ‘contemporary’ resource management (Baines and Hviding 1993; Johannes 1998, 2002; Linkous-Brown 2006; Menzies and Butler 2007; McClanahan et al. 1997; Ashaletha and Immanuel 2008; Mathooko 2005). For example, LTK has been used to resolve management disputes between stakeholders in marine contexts (Davis et al. 2004; Hunn et al. 2003).

LTK has been employed to develop and assess novel techniques for resource management. Protocols for incorporating GIS with LTK have been proposed (Calamia 1999; Close and Hall 2006) and used to map local fishing locales and practices (Anuchiracheeva et al. 2003). Fishermen’s knowledge has been used to supervise the

classification of remote sensing imagery (Lauer and Aswani 2008). LTK has also been used in the development of expert-system models which can inform an understanding of how fishermen make decisions about when, where and how to fish (Grant and Berkes 2007; Mackinson 2001). In one case, LTK was used to develop indicators for fisheries management (Wilson et al. 2006). Finally, most of the literature noted above studying the distribution and communication of LTK within a community has been conducted with the aim of understanding social relations so as to better structure management interventions, though it is worth noting that a number of studies have contributed to the knowledge base without referring explicitly to resource management (e.g., Aporta and Higgs 2005, studying GPS and Inuit wayfinding).

LTK has also been prominent in work on conservation. It has been used to identify essential habitats (Bergmann et al. 2004), to assess the effectiveness of conservation zones (Baird and Flaherty 2005), and to examine the conservation status of species such as the bumphead parrotfish (Dulvy and Polunin 2004). Scientific studies have been designed to improve conservation practice either through the collection of data (Cavaleri Gerhardinger et al. 2006; Richmond et al. 2007) or through studies of fisher perception of conservation efforts (Rosa et al. 2005). Increasingly, LTK is being used in the creation and evaluation of marine protected areas (MPAs) (Aquilar-Perera et al. 2006; Aswani and Lauer 2006; Aswani and Vaccaro 2008; Aswani et al. 2007; Aswani and Hamilton 2004; Klubnikin et al. 2000; Mallory et al. 2006; Mow et al. 2007; Scholz et al. 2004).

A number of studies have also been conducted in order to better understand the dynamics of collaborative research and management projects and how they can be improved. Several of these describe collaborative research projects, such as that of the Alaska Beluga Whale Committee (Fernandez-Giminez 2006) and others (Huntingdon et al. 2004; Krupnik and Ray 2007; Wyllie-Echeverria et al. 2002, Obura et al. 2002).

Other work has focused on the challenges and opportunities present in co-management efforts (Metcalf and Robards 2008; Moller et al. 2004; Peters 2003; Warner 1997). Researchers also have endeavored to make locals' knowledge legible to science for management purposes. For example, Puerto Rican small-scale fishers' knowledge about tropical coastal habitat connectivity has been systematically documented to improve coastal management and planning (Garcia-Quijano 2007). And fishers' knowledge has been gathered in order to "promote or enhance dialogue among farmers, scientists and managers" (Silvano et al. 2008:241).

In sum, the auspices under which LTK research has taken place have most often been those relating to building the scientific knowledge base about various species where gaps exist, or as part of specific attempt to improve resource management.

### *Can Science and Local and Traditional Knowledge Be Compared?*

While a large proportion of the literature treats local and traditional knowledge as a straightforward empirical input into academic research or scientific management, there is debate as to whether LTK as a system of knowledge and the Western scientific paradigm are commensurate, i.e., whether the information from both can be treated in the same way. For example, Agarwal (2002) argues that databases of traditional ecological knowledge result in a fragmentation and "scientisation" of traditional knowledge. Indeed, LTK is by its very nature embedded in a local context and worldview and taking this knowledge simply as data can strip it of explanation and depth (Hensel and Morrow 1998; Cruikshank 2001). Moreover, despite an explicit attempt on the part of some researchers to bring together LTK and science as complementary sources from different knowledge systems, it can be a difficult task to incorporate them in a meaningful way (Mackinson and Nøttestad 1998 in Mackinson 2001). LTK is often

considered to be a more holistic approach to understanding the environment, which means that scientists may need to develop ways of coming to understand the context that will allow them to better understand LTK (Hamilton and Walter 1999). LTK and science are both products of epistemologies that are rooted not only in the human senses, but in particular land and seascapes and the cultural and political economies that inform them. This realization has led some to conclude that LTK must be defined and managed by indigenous and local people themselves; otherwise it is likely to be “colonized” or distorted by the more powerful Western knowledge system in self-serving ways (Nadasdy 2005; Heckler 2009).

Others are more optimistic about prospects of collaboration. As a starting point, it has been noted that LTK and science are in fact most often quite similar in their observations of environmental phenomena. However, their explanations of causality can be very different (Fienup-Riordan 1999) or limited in the case of LTK (Bart 2006). Such differing explanations—for example whether declines in a fishery are due to overharvesting or improper ritual engagement—can have a significant impact on the management of marine resources (Fazey et al. 2006). LTK and science can also vary in perspective and emphasis (Gearheard et al. 2006) as well as in the rate at which knowledge develops and changes. Krupnik and Ray (2007) argue that in the case of the Arctic, the knowledge of subsistence hunters is potentially changing faster than scientists’ knowledge. Moreover, as the socio-ecological network in which fishers are embedded has changed, the way in which LTK interacts with other knowledge systems also changes. In the case of environmental change, Norton (2002) argues that it is possible that Inupiat knowledge of sea-ice is less applicable today because of environmental change. Cultural changes in the Arctic, such as the introduction of various technologies also may be affecting LTK. At the same time, Norton emphasizes that “unless research in the North becomes consistently careless and discredited,

collaboration with scientists seems to pose little threat to corrupting TEK. Rather, I suspect that technologies will continue to prove more contagious and addictive than will scientists' 'unnatural' patterns of thinking'" (2002:152). This observation applies to Pacific herring in Southeast Alaska as well, where new technologies, such as sonar and aircraft, have been used extend the perceptual basis upon which to build LTK without necessarily altering its paradigmatic assumptions.

Another important theme in the literature which discusses the commensurability of science and LTK is that LTK research should emphasize process and collaboration (Brook and McLachlan 2005; Krupnik and Ray 2007; McGoodwin 2006; Kaplan and McKay 2004; Berkes in Krupnik and Jolly 2002; Turnbull 1997; Begossi 2008; Krupnik 2002) and greater involvement in the early, strategic decision-making phases of co-management projects (Houde 2007). Indeed, Wilson et al. (2006:800) argue that in the case of management, an extractive approach to LTK is "absurd" and "using simple indicators for management does not substitute for ongoing interactions between scientists, fishers and managers where management goals are set and refined." Precisely because observations may be similar but perspectives and contexts different, collaboration between scientists and holders of local traditional knowledge is essential in research and management. Laidler (2006) posits that conceptual bridges need to be built through defining common interests and a reconsideration of how expertise is delineated.

While collaboration may be an overarching goal, it is not without its challenges. Successful collaboration depends a great deal on trust as a foundation for engagement (Davis et al. 2004). Indeed, Turnbull (1997:551) affirms that "in order to ensure the continued existence of the diversity of knowledge traditions rather than have them absorbed into the great imperialist archive we need to enable disparate knowledge traditions to work together through the creation of a third space in which the social

organization of trust can be negotiated.” Science can be perceived as a tool of state control, and examples of successful collaboration have accordingly emphasized power sharing through both formal channels and informal interactions (Fernandez-Geminez et al. 2006). In an examination of seven case studies of the use of LTK in policy, Wilson (2003) found that institutional factors, such as agency turnover, rather than differences in understanding were crucial to the success of an initiative. For this reason, Soto (2006) argues that the institutional structures supporting science and the integration of LTK need to be examined by stakeholders and redesigned accordingly. Correlatively, Wenzel (1999) suggests that LTK demands closer ethical treatment than science given its embeddedness in a culture and local context without pretense to a universalist perspective or ethics, as is the case with science.

In terms of future research, examples of successful collaboration can help to point the way forward for fruitful research and management (for more detailed references, refer to section 2.1 above). Novel approaches in academia may be necessary. Watson and Huntingdon (2008), for example, demonstrate how a traditional academic paper can be re-structured to better represent different accounts of reality. Given the urgent need for improved understanding of both ecosystems and social systems in the context of resource management and environmental change, coupled with increasing devolution of resource management to local stakeholders, such collaborative research does indeed appear to provide a potentially fruitful avenue for further work.

To date LTK has largely been absent from studies of Pacific herring. An important contribution by Brown et al. (2002) concerns the ecology of herring and other forage fish in Prince William Sound (PWS) and the Outer Kenai Peninsula before and after the 1989 Exxon Valdez oil spill, which decimated parts of the Sound. Key informants in five area communities were interviewed and their observations recorded on topics such as: life history stages, fish behavior and schooling characteristics,

predation, seasonal distributions in space, and decadal shifts observed. Significantly, in addition to local fishermen, almost half of the interviewees were pilots, affording a unique perspective on herring movements and schooling, which can often be seen more clearly from the air. The study also documented spawning and massing areas not previously reported by the Alaska Department of Fish and Game, and “decadal shifts in the reported extent of juvenile herring distribution matched decadal trends in catches of the PWS adult herring population indicating that traditional ecological knowledge is a potentially valuable source of information for indicators of recruitment and populations trends” (2002:1).

Russ Jones’ (2007) recent study of Haida LTK of herring is another important contribution which highlights the potential utility of this knowledge to management. Haida LTK indicates there was a greater abundance of herring in many areas around Haida Gwaii (Queen Charlotte Islands, British Columbia) prior to the advent of commercial reduction fisheries in the twentieth century. Because Pacific herring have been critical to their economy and culture for generations, Haida fishers are cognizant of changes in herring stocks over extended time scales. Jones (2007:103) points out that “In the past decade, stocks have been depleted because of low recruitment and excessive exploitation by commercial fisheries.” Unfortunately, “The present harvest policy, established in the mid-1980s does not take account of Haida traditional knowledge.” Jones argues that such knowledge may “contribute to reassessing reference points for the management of herring in Haida Territory.” He and other members of Haida Gwaii First Nation have encouraged the incorporation of Haida LTK and ethics in management and restoration of herring and other fisheries (Jones and Williams-Davidson 2000). A recent discussion paper, published by the First Nation (Haida Gwaii 2007), “Guided by the Haida Marine Vision and Haida Ethics and Values,” goes further, calling for the establishment of an oceans data centre and resource library on Haida Gwaii, that

includes scientific, traditional and local knowledge, and specific conservation actions to “Protect and rebuild marine species and habitats around Haida Gwaii that are of known conservation concern, including herring, rockfish, wild salmon, northern abalone, and Pacific cod populations.” The Canadian government, charged with managing fisheries through its Department of Fisheries and Oceans, has yet to sign on as a full partner in this endeavor, however. Co-governance remains the goal, however, and from the Haida perspective “collaborative marine planning is expected to result in improved protection of Haida Gwaii waters for future generations, great Haida participation in management decisions, and increasing emphasis on sustainability of both local fisheries and communities” (Jones, et al 2010:10).

Similar partnerships have been sought by Tlingit tribes of Southeast Alaska, especially the Sitka Tribe of Alaska, which signed a Memorandum of Agreement (MOA) with the State of Alaska in 2002. While no explicit mention is made of LTK, the MOA recognizes:

that the Tribe, in managing Tribal affairs within the Sheet'ka Kwáan. ... [Sitka Tribe Traditional Territory], has information, resources, and responsibilities beneficial to ADF&G. ADF&G, in managing natural resources within the State, has information and resources beneficial to the Tribe. Thus, the Tribe and ADF&G will consult and cooperate in the management of all commercial fisheries, hereinafter referred to as "commercial herring fisheries," occurring within the greater Sitka Sound area. ...

To date, however, this has been largely a consultative process rather than a true co-management or equitable integration of Tlingit LTK or fisheries ethics with Western scientific knowledge and management practices.

## **II. ETHNOGRAPHIC SYNTHESIS: CULTURAL SIGNIFICANCE AND MANAGEMENT OF HERRING<sup>1</sup>**

### **Introduction: Oral History**

The earliest knowledge and practices associated with Pacific herring in Southeast Alaska come to us through Alaska Natives. Southeast Alaska Native space and time were to a significant extent coordinated by herring. In addition to being among the first “fruits” of the spring, thus marking the change of season and the coming of the summer fishing season, herring massing and spawning areas were also widely distributed throughout the Southeast region. Indeed, every one of the 13 contemporary Tlingit and Haida community spaces, or *k̄wáan*, historically possessed one or more significant spawning areas for herring (see Figure 1.1 Approximate Locations of Southeast Alaska *K̄wáan* Territories). The presence of herring, in turn, attracted other key species, including halibut, salmon, and seals, which Natives harvested in quantity. There is even evidence from elsewhere on the central Northwest Coast (Monks 1987) that herring were used as live “bait,” for example through confinement in pens or stone traps, in order to attract other species (see archaeology section). Although we found no direct evidence for this in our interviews, the archaeological synthesis suggests that herring may have been trapped for food, if not bait in pre-contact times. Overall, we found strong evidence that “herring were among the important schooling fish. In fact, it is certain that herring was more important than present [scientific] evidence suggests” (Ames and Maschner 117:1999). Native peoples distributed themselves among dense and predictable patches of herring according to the timing of their presence, just as they did with prize salmon streams, halibut banks, and berry patches. In doing so, they also took advantage of the

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rich supplies of other prey attracted to this foundational food source, such as birds, salmon, halibut, cod, and marine mammals. Overall, Pacific herring can be considered “cultural keystone species” among Southeast Natives, according to criteria outlined by Garibaldi and Turner (2004), including its: 1) intensity, cultivation, and multiplicity of use, 2) rich linguistic and 3) cultural associations, 4) persistence in memory and use despite cultural change, 5) unique and irreplaceable role in socioecological system, and 6) value in providing opportunities for resource acquisition beyond the home territory (e.g., through exchange).

Oral migration histories suggest that Southeast Alaska Natives have often moved to find better resource patches, or when local supplies became compromised due to environmental change or other factors. Anne-Marie Victor-Howe (2008:15), summarizing motives for the Alaskan Haidas move north from Queen Charlotte Islands, reports:

Blackman (1977) and Brink (1974) attribute the emigration of the Langara Island Haida to a shortage of subsistence resources on the northern part of the Queen Charlotte Islands, specifically the absence of salmon streams and herring spawning areas. Langdon (1977) also identified, as further motivation for this emigration, the scarcity of food, especially the lack of sockeye salmon (*Oncorhynchus nerka*) streams on the Queen Charlotte Islands, and the availability of those resources just across Dixon Entrance on the Alexander Archipelago.

Steve Langdon (1977:110-111) notes:

G.M. Kelly, a prominent Masset Haida, comments that the presence and relative abundance of certain resources in the Prince of Wales Archipelago—resources that were either absent or scant in the northern Queen Charlottes, especially

“herring spawning areas” and “wild meat source”—was more than enough to have attracted the Kaigani [to Alaska].

Herring were also a factor in the founding of Sitka (see discussion of Herring Rock, below), Klawock, Juneau, and Wrangell. Juneau area Tlingits, or Áak’w K̄wáan (from the Tlingit name for Auke Lake, meaning “Little Lake”) trace their origins from Wrangell where herring spawn had been plentiful (an island at the mouth of the Stikine, for example, carries the name *Xídlaa* [X’áat’í] or “Herring Rake [Island]”). As the late Áak’w K̄wáan clan leader Philip Joseph tells it, about 500 years ago:

The people started off [from Stikine area] towards the North. This was a rough trip for some people with women and children. It took them weeks. They finally came to Stephens Passage. They explored every island and bay. The only place they didn’t explore was the Taku Inlet and Gastineau Channel. They went outside Douglas Island, then they came to Youngs Bay.

Here they discovered lots of seal. They came inside a big hole just above the high water mark. It had a small entrance at the high tide through which the seal comes into the inlet. The seal go after fish in the creek. Then the natives go out to the entrance in small canoes. They line up their canoes across the entrance and use paddles for plungers until the tide goes out. After the tide goes out behind the flats then the seals come down to get out to sea. That is when they use clubs to kill all the seals they need.

The people wanted to stay there but the Chief refused and told them to go on. He told them if they didn’t find another place to suit them, they can always go back. When they left some of the people. They came by Outer Point and came to Auk [sic] Bay. The Chief then told his people where they would make their new settlement.

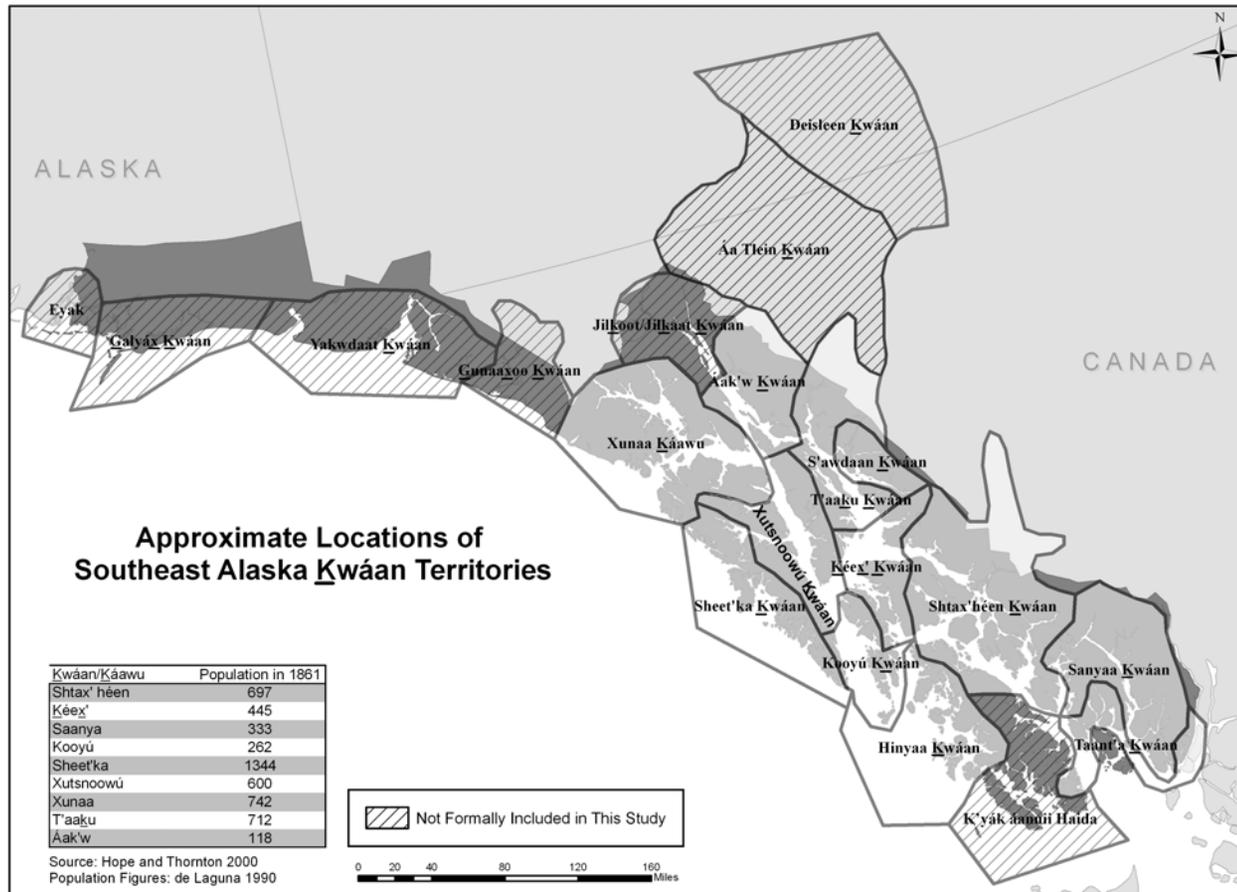


Figure 2.1 Approximate Locations of Southeast Alaska Kwáan Territories

They landed in Fairhaven [Indian Cove, just north of Auke Bay] and started building. They put up big houses, huts, and smokehouses. At the same time most of the people explored the whole bay. They soon find Auk [sic] Lake. And they find out the creek [that] runs from the lake is a good sockeye creek. They also f[i]nd out the herring spawns in the spring. There were all kinds of berries, game, and shellfish food.

Indian Cove was a stable source of herring and a premier site for spawning. The settlement grew, and consequently may have posed a “development” disturbance to spawning herring. Oral history suggests that this was one motive in the decision to move the village north to what is today Auke Recreation area. They named their new town site, which was still proximal to the herring but not right on top of the critical spawning grounds at Indian Cove and Auke Bay, *Anchgaltsoow*, or “Town that Moved” (Thornton 1997:16ff). This history suggests that concern for sustainable supplies of herring has been a priority for Tlingit and Haida communities since pre-contact times, and that they were willing to adapt their living patterns to maintain local herring habitat and populations. Aak’w Kwáan Tlingits have continued to defend their right to the herring grounds to the present era, including seeking protection of herring fishing rights and federal recognition of Auke Cape as a Traditional Cultural Property (Goldschmidt and Haas 1998; Thornton 1997, 2009). The importance of traditional cultural property such as Auke Cape was also stressed by our interviewees. Al Wilson recalls throughout the 1940s, long after Natives had moved their village out of Auke Bay, about 20 Natives would come from the downtown village (about 10 miles southeast of Auke Bay) to camp at Indian Cove, putting up tents, harvesting and processing herring, and jigging and drying halibut. He adds, “I spent a lot of time on that point [Indian Point]. ... There’s a lot of evidence: holes dug where houses were because there’s graves there also. It’s a beautiful, absolutely beautiful place.” Fred Hopkins of Juneau put up herring eggs there

with his grandparents, Sam and Sally Hopkins, until the 1950s, often camping at Indian Island, just outside Indian Cove.

Population estimates from major villages of the early historic era combined with known historical spawning areas show a basic spatial correlation. Those villages that lacked major herring runs and spawning areas, such as Haines and Klukwan, typically possessed an abundance of a comparable resource—eulachon—which offered similar nutritional benefits (though more oil than eggs) and spring runs. Some communities, like Wrangell, had plentiful supplies of both herring and eulachon, as well as five species of Pacific salmon and river access to the interior, which helped support among the highest population densities of any *k̄wáan*.

### **Learning to Harvest and Cultivate Herring**

Herring have been harvested for roe, oil, meat, and bait from the earliest recorded histories of the Northwest Coast. Oral historical records emphasize that herring eggs were highly valued and sought after as a food. Herring were particularly prized because they were present throughout the year in select places, unlike the more migratory salmon, and also because they returned to near shore spawning areas in late winter and early spring at precisely the time when winter food stores were running low and fresh sources of meat, oil, and protein were at a premium. As several sources point out (e.g., Herman Kitka for Sitka and O. M. Salisbury for Klawock), as much as two to three months before spawning in late March or early April, herring might be present in spawning bays in vast quantities, where they could be raked, jigged, netted, or trapped to be eaten fresh, smoked, or rendered into oil. Salmon, with few exceptions, can make no such claims.

Many tribes along the Northwest Coast focused on herring during their spawning season which unfolded in winter and spring in a south to north direction. The Lummi of Washington State and Koskimo Kwakiutl (Kwakwaka'wakw) at the north end of Vancouver Island harvested herring using rakes and collected roe from December to January during the spawning run, when the fish milled about the surface. "At times these masses were dense enough to permit their being scooped up in ordinary baskets. The roe, collected on submerged branches, was removed and dried, as was the common Northwest Coast practice" (Hewes 1952:144). In February, the Nootka (Nuuchahnulth) harvested herring using rakes and nets, and herring spawn was collected from various substrates submerged at high tide. Haida on the Queen Charlotte Islands and on the southernmost islands of the Alexander Archipelago harvested herring using similar techniques. And of the Tlingit, "Holmberg, probably referring only to the Sitka Tlingit, stated that herring were of more importance than salmon in the native economy" (Hewes 1952:154). While the importance of herring is sometimes underemphasized vis-à-vis salmon, obviously both were vitally important to the Native economy. Further, as nearly all of our Tlingit informants stress, the productivity of salmon stocks, particularly king and coho, is dependent on herring.

The primacy of herring versus salmon features in oral history of the Natives of the Northwest Coast. The Tlingit story of the Salmon Boy, versions of which are told up and down the Pacific Coast, tells of how herring migrating out to sea in their post-spawning phase are insulted by incoming salmon returning to their natal streams to spawn (probably in June):

[Migrating up into Sitka Sound] The salmon tribe came against the herring tribe. In the canoes of the salmon tribe one stood up. He said to them, "When did your cheek-flesh ever fill a man?" The others stood by one another. The herring tribe said in reply, "We fed them before you. Our eggs are our cheek-

flesh. When will the space around your backbone not be dirty?" The salmon tribe started off for the outside coasts of these islands [of Sitka Sound]. (Swanton 1909:304)

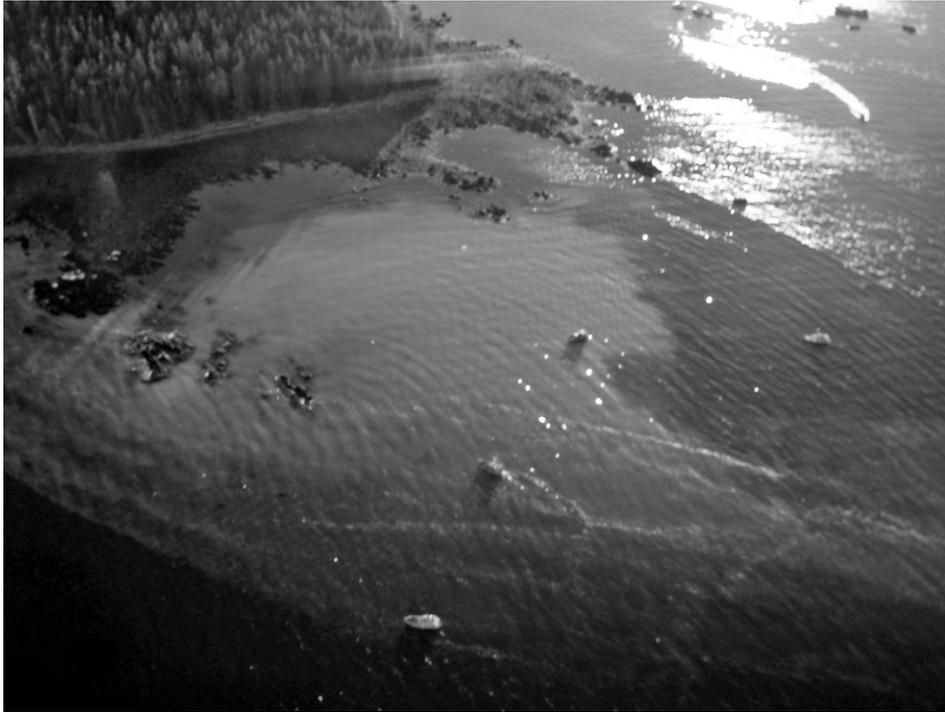


Figure 2.2. Herring spawn, Metlakatla 2008

The story suggests that herring are of particular importance because they feed the people before the salmon arrive, and also because their bones may be “cleaner.” A similar emphasis on herring is found in other Alaska Native communities, such as Yup’ik villages on Nelson Island, which are highly dependent on herring due to the comparative lack of salmon, and dry them for use throughout the year (Pete 1994).

In Haida oral history, there is also character known as “Moldy Forehead,” who also insults the salmon. He is captured by the dog salmon people and taken to an undersea world.

One day, after he had been there for some time, people came dancing on their canoes. Then they landed and began to dance in a house, and the one who was half rock said to him: "Now go behind the town. Then break off a young- hemlock bough. Shove it into the corner of the house over there where they are dancing. Do not look in after it." Then he did so, and when he felt strange (curious) about it, he looked in. His head got stuck there. He barely could pull it away. His face was half covered with eggs. He scraped them off with his fingers. And he pulled out the hemlock bough. The eggs were thick on it. Then he went to the end of the town and ate them at the creek.

Then the Herring people started off. Sometime after that the Salmon people also began to move. (Swanton 1905a:9-10)

In a Karta Bay version of this story (Keithahn 1945), the salmon boy, known as Shin-quo-klah, becomes very hungry in the Salmon People's village, as

He didn't know how to get food. He was told to go to the Herring People's house. There, they would be dancing but what looked like feathers flying in the air was not feathers, they said. He was instructed to take a hemlock bough and hold it inside the doorway, keeping his eyes closed. When it got heavy he was to withdraw it and he'd find something good to eat. Following these instructions, the boy found that the "feathers" were really herring eggs, of which he ate his fill. That is why Indians still spread hemlock boughs to catch the herring eggs when they spawn.

This story, in addition to noting the massing and spawning (dancing) behavior of herring, suggests that herring eggs were discovered by Natives partly in response to the stress of hunger and inability to obtain other foods.

In another version of the discovery-of-eggs story, the trickster-demiurge Raven finds the best technology for acquiring herring eggs as part of his epic and insatiable quest for food.

After he had traveled thence for a while he came to a house in which the Herring people were dancing. The air (weather or sky) even shook above them. And when he looked in the Herring people spawned upon his mustache. Then he ate the fish eggs. They tasted bad, and he threw away his mustache. Then, having pushed in a young hemlock he had broken off, he drew it out. The fish eggs were thick upon it, and he ate them. They tasted good. He started the use [of these limbs]. (Swanton 1905a:135)

According to Nancy Turner (pers. comm. 10 Nov. 2009) Raven's mustache "was probably a dark brown seaweed occasionally used to collect herring eggs, but not preferred for this purpose, called *xuyaa sGyuuGa* ... ('Raven's mustache seaweed') (Becky Pearson), which John Enrico notes is almost certainly *Desmarestia intermedia*." (Swanton's footnote says only: "a seaweed from which fish eggs were sometimes gathered, but it did not serve as well as hemlock boughs"), a common spawning substrate generally considered inedible due to its bitter taste. In a separate incident, traveling by canoe, Raven "came to where herring had been spawning. He then filled the canoe with herring, dipped them out of the place where the bilge water settles and threw them toward the shore. 'Future people will not see the place where you are'" (Swanton 1905a:128), he said, implying that some schools of herring remain hidden, and perhaps were transplanted (see below).

In Tlingit country Raven finds herring inside a whale, and later tricks seagull into capturing herring for him:

By and by Raven came to a sea gull standing at the mouth of a creek and said to it, "What are you sitting in this way for? How do you call your new month?"

"YAdāq!o'l," replied the seagull. Raven was questioning him in this way because he saw many herring out at sea. So he said, "I don't believe at all what you say. Fly out and see if you can bring in a herring." This is why, until the present time, people have differed in their opinions concerning the months and have disputed with one another.

After they had quarreled over it for a long time, the gull became angry, flew out to sea, and brought back a big herring. He lighted near Raven and laid the herring beside him, but, when Raven tried to get it, he gulped it down.

(Swanton 1909:13-14)

Eventually Raven gets the best of gull by enlisting heron to kick him in the stomach, thus bringing up the herring, which Raven devours for himself. Swanton notes that the name seagull gives to the month "does not occur in the list [of months] given by the same man" (Swanton 1908:426), but the first syllable is close to the sound that seagulls make when herring are present, *yaaw*, which has become the Tlingit name for herring. The month in which herring return to spawn is usually termed *Héen Táanáx Kayaaní Dísi* (Plants Grow Underwater Moon) by Tlingits (Thornton 2008:121). Gulls may mark time differently but they clearly do so in ways that interest the Tlingit, who respond when the birds herald the arrival of spawning herring.

Lily White of Hoonah tells of how herring eggs were first "discovered" as a food by Hoonah Tlingits, who were facing hunger and privation.

When our people came down from Glacier Bay, after that ice age, they started settling over here on Chichagof Island. And after the ice age, they had two winters [perhaps in the early 1800s when a volcanic eruption in Indonesia darkened skies]. And starvation came among the people. And that's when they saw this spawning of herrings up Neka Bay. They said they didn't know what it was. It just looked milky. And they put stuff in there like a branch, when they take

it out it just thick. They recognized herring eggs because when they opened herrings it'd be in there. That's when they first tried eating it because of starvation. And there's a lot of things that they sampled to eat. My mom said some of the things they sampled to eat killed some people because starvation was awful. After the two winters they had nothing to eat. They ate everything that they could possibly get their hands on and that's when they got introduced to eating herring eggs. They didn't know which way to do it. They cut branches and got them together with roots and they just hold it in there a little while. Now they keep it overnight. They pull it up--it is just thick with that herring eggs. And they start using it for food. And they started drying it also. Drying it and eat it like one would dry salmon, and they found that it was very, very delicious. And they started going up there; they found out that it spawns in the spring. So that's how our people got introduced to the herring eggs.

At Sitka there are several stories about the origins of herring fishing at Herring Rock. As John Nielsen recounts:

And [the stories] about the Herring Rock are very true. Many, many, many moons ago. We've known them for thousands of years. The Herring Maiden, she'd go down there when the tide would be coming up. She had real long hair. About that time the herring would start coming in. They'd mill around her hair and they'd start spawning in her hair. Then they found out after that, "Hey there's some food value in that." So they start gathering, what you call it... on the hair kelp. And then we start setting branches too.

Eventually, Herring Rock (*Yaaw Teiyí*) was taken as a crest by the Kiks.ádi clan, and a name was given to commemorate the woman, *Yaaw Sháa* ("Herring Woman," or "Herring Maiden," sometimes collectively applied as *Yaaw Sháawu*, "Herring Women") or *Kaxátjaa Sháa* ("Flipping Girl"), which is still carried today as a female Kiks.ádi

name.<sup>1</sup> Donald “Duck” Didrickson adds further details about this sacred site, which was literally blown-up (dynamited) to make room for a breakwater and pier by what is now the Totem Square Hotel in downtown Sitka.

It had three names you know; it’s Didrickson Rock, after my Grandmother, Chris Didrickson. That’s who owned the Herring House. That’s why it’s called the Herring House [*Yaaw Hít* or *Kaxátjaa Hít* in Tlingit]. The reason they call it Didrickson Rock-- everybody give up [on it]. They couldn’t get any herring spawn [there]. We set branches down there on the beach and all the herring come in. I figure it had the power to bring in the—see it had something to do with my people settling this area. ... But Herring Rock ... had the power to draw everything in, everything we wanted, you know. The *guwakaan* and the *xóots* you know--deer and the bear, it’s all there; in the rivers, our fish. Down here we had Herring Rock to draw everything in. Draw the herring and everything else: the salmon, the halibut, the seaweed, gumboots, everything. That was our—in the old days, that was our calendar. Herring spawned down there, you know, spring is sprung, you know. There’s a lot of history to it you know. And one of these days, I’m going have to tell you the story and you can record it before it’s lost you know. I’m the only one alive that knows the story. ...

Yeah, Herring Rock been there over 10,000 years, you know. And they always figured it had the power to attract the herring.

Mr. Didrickson’s observations on the Rock’s power “to bring in herring” could be read as suggesting that certain habitats, such as that traditionally found around Herring Rock, are important in attracting herring. When altered significantly, herring may cease to

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<sup>1</sup> See also Jacobs, Harold. n.d. “*Gaax’w*, Herring Eggs: A Traditional Resource in Decline,” (undated). Accessed on 10 June 2009 at <http://www.ccthita.org/pdf/Articles/Wanton%20Waste%20Herring.pdf>.

return to these places or decline in their returning numbers, a suggestion that is supported by the scientific literature (see Life Cycle chapter for more on this).

There is also a further, spiritual layer of significance of Herring Rock, and Mr. Didrickson notes that this is why he insisted on saving a portion of it to be displayed in front of the Sitka Tribe's community house, where it is blessed each spring at herring time.

Oh yeah, she—[when] they couldn't get any herring, she [grandmother] went down to the Herring Rock. She just had that dream, you know. All our people, a lot of things we do come to us through our dreams, you know. Like my people, everything has a spirit. We come from the trees. The trees have a spirit. Everything we do, we do through our dreams. That's why she went down there for that dream, you know. And she got herring, you know. And they named it Didrickson Rock. And then they named it Kiks.ádi Rock. Then they named it Herring Rock. Then she named our house Herring House. But when they had the rock down there, I told them, and I spent 34, 37 years protecting that rock. I saved it for my people. It's part of us, part of our tradition, our culture. That's why it's got to be blessed, blessed with salt water. I go to different areas to get water, salt water for the blessing. That's what we use this salt water to bless, that is I get a gallon of salt water, blessing you know. And that rock itself, that story's always told that part of the reason that brought my people to the shores here which the old-timers said they called this 'God Country.' ...

I ought to have brought my staff. I had a staff special made for me, I didn't even know about it. That was Bob Sam, my brother and Reg Peterson, made that. Called the Herring Rock Staff. It's quite expensive. It was designed and carved by Reggie Peterson. He's a well-known artist here. He says it's worth about twelve

thousand dollars now. When he passes away, he said it'd be worth three hundred thousand, you know.

After herring production began around Herring Rock, many people began to gather eggs there, and it became necessary to impose prescriptions and prohibitions on the harvest and distribution of the catch. The story of the "Woman Who Turned into an Owl" is illustrative:

When this town (Sitka) was first discovered the KîksA'dî [Kiks.ádi] were here, and we stayed on this (the north) side. This town (at the northern end) was named Mossy-town [S'ix'qaa Aani?]. There four men grew up, two of whom were named Łq!ayâ'k! and KAck!A'Lk!. They married. Łq!ayâ'k!'s mother was named KAck!A'Lk!'s-mother. Łq!ayâ'k!'s wife refused to give her mother-in-law herring to eat. After she had refused her twice she put hot milt into her hand. She told [her son], "She put hot milt from a male herring into my hand." It burned her hand. For this reason her son carried down the canoe. He filled it with herring by means of a herring rake. When [the canoe] was filled, he brought them in. The Herring Rock [Yaaw Teiyî] is over yonder this side of Big-fort [Noow Tlein]. He brought them in the evening. He said to his wife, "Go down to it," and she went down empty handed.

Then she shouted up, "Bring down the basket," but her husband said, "Don't listen to her." Night came on. Toward morning the woman began to change her cries. "This way with the basket (kât [*kaat*, a long, flat loosely woven basket for pressing out herring oil])," she said toward morning. Later still she began to say, "Hû, hû, hû, û." Her husband said to her, "You can become an owl from this time on." So she started to fly off. She became an owl. She flew first among the trees. She was heard saying, "Sit in your holes," after which he (her husband) went outside. He said to her, "You put milt into my mother's hand. For

that you can become an owl. Way back there for you is Owl's-rock-slide" [*Tsísk'w Kaadi*]. This is why it is so. This is why we can always understand it (the owl). It always predicts bad weather. It always tells what is going to happen in other towns. (Swanton 1909: 299-300, bracketed orthography and notes added)

Herman Kitka suggests the story “was invented so people would quit [harvesting eggs] when the sun goes down. A lot of people from all over Southeast would come here, and on account of the story, fear [if they] fish all night long they’re going to turn into an owl. Everybody quit at sundown.” He notes that with perhaps 20,000 people coming to Sitka to participate in the herring roe harvest (a figure drawn from Father Duncan’s records, which may be inflated according to Schroeder and Kookesh 1990:6), regulations on demand were necessary. With a smaller, dispersed population such regulations would not be required, in part because there is a natural window within which eggs can be harvested. As Duck Didrickson observes, after the eggs begin to develop they start “turning yellow [or brown] ... that’s when we quit taking the herring for their eggs, the roe, you know. ... Then they turn too soft, too soft to cook.”

Related to the notion of limiting demand to avoid overharvest is the metaphysical belief that herring may withdraw their consent to be harvested if they are not treated with respect. As the Northwest Coast ethnographer Charles Hill-Tout writes (see Turner 2000:1279)

Nothing that the Indian of this region eats is regarded by him as mere food and nothing more. Not a single plant, animal, or fish, or other object upon which he feeds, is looked upon in this light, or as something he secured for himself by his own wit and skill. He regards it rather as something which has been voluntarily and compassionately placed in his hands by the goodwill and consent of the “spirit” of the object itself, or by the intercession and magic of his culture-heroes; to be retained and used by him only upon the fulfillment of certain conditions ...

respect and reverence in the killing and plucking of the animal or plant and proper treatment of the parts he has no use for.

In short, herring had to be respected and cultivated as non-human persons, not merely as foodstuffs. John Nielsen puts it this way:

Well, you know, the one thing our ancestors, our grandparents would say, “Do not destroy the fish. Have a little respect. They’ll feed you along the years and take care of you. Take care of them, they’ll take care of you.” That’s our customary tradition way of, even in a salmon stream. You take care of the fish. They’ll take care of you. Indian ecology they call it. We never take more than we can handle. Just what we can use and that’s it.

This behavioral perspective has been called, alternatively, *collaborative reciprocity* (Fienup- Riordan 1994) or *relational sustainability* among the Tlingit (Langdon 2007). But Tlingits most commonly refer to it simply as “respect,” as in the axiomatic phrase: *Ldakát át a yáa ayaduwané*, “Toward all things show respect.” The principle of respect (*at yáa awuné*) governs all relations among beings in the cosmos. For Tlingits, respect is not maintained by “managing resources” from outside nature’s “house,” but by “sustaining relationships” within it through proper cultivation, interaction, and stewardship. To go “against nature” is the Tlingit definition of “taboo” (*ligáas*). Tlingit conservation practices, thus, flow from this premise of respect. And, like other peoples who have successfully adapted to their habitats over long periods of time, Tlingit conservation practices emerge as the products of ecological knowledge and relationships developed in dynamic *kwáan* (habitats, dwelling places, or ecosystems) over time. It is typified throughout the Northwest Coast culture area by stories such as that of the Salmon Boy and rites such as the first salmon ceremony, but the concept was also extended to herring. As Drucker (1955:154-55) makes clear:

A set of beliefs relating to the immortality of certain animal species was universal throughout the Northwest Coast. . .

The general belief was that the salmon were a race of supernatural beings who dwelt in a great house under the sea. There they went about in human form, feasting and dancing like people. When the time came for the “run,” The Salmon-people dressed in garments of salmon flesh, that is, assumed the form of fish to sacrifice themselves. Once dead, the spirit of each fish returned to the house beneath the sea. If the bones returned to the water, the being resumed his (human-like) form with no discomfort, and could repeat the trip next season. Since the Salmon-people’s migration was considered to be voluntarily undertaken, it followed that it behooved human beings to take pains not to offend their benefactors. To return all the salmon bones to the water was one of the procedures believed to be essential. ... All the Northwest Coast groups had long lists of regulations and prohibitions ... in order to maintain good relations with these important beings.

This concept was extended to many other species. Herring and olachen [eulachon], also seasonal species were widely believed to have their own house under the sea (or to share the Salmon-people’s house) and to behave the same way.

As benefactors herring were cultivated and thanked for their largess during feasts marking their return. They were also respected by Tlingits taking only what they needed of the herring supply, an ethos that remains strong today, as evidenced in the following statements:

[T]he traditional rule [was] that we only take what we need. That’s it. ...  
[We o]nly took what we need. We use them for trolling bait. Just take enough for that one day. (Harold Martin, Juneau)

Yeah, they did respect it, like you know, don't go down and catch a fish and demolish it and play with it. They said always leave it alone. You know, if you're going to catch fish, just get enough to take home and eat but don't waste it you know, fool with it. But they said that way they get what they need every year, by you know respecting the food, the animals and the fish. (Harold Dick, Hoonah)

After the people got what they wanted so they opened up the net and let them all go again. ... And then they didn't go out there and make a set in the same spot again the next time they went out there and did a little bit of bait fishing again they did it down by the cannery which is another location where the herring used to spawn. (Thomas Mills, Hoonah)

Even with modern harvesting, storage, and transportation techniques, the principle of “take only what you need” endures, according to Ralph Guthrie:

Well, you know, for years our people just took what they needed. But there was more of our people around. I think generally, taking what you need is still, you know, still basically the [case] ... but what took the place of 20,000 Indians that came here to harvest herring eggs, [we] started the use of the airplane and the ferry system [to ship eggs]. ... I send anywhere from 19 to 27 boxes to my relatives. So, I represent that much just in my family.

John Martin explains how respect is even shown to the hemlock trees before their boughs are cut.

When we first moved to—while we were—when my wife and I moved to Juneau, Carol [his wife] and I and Al and Margaret [Martin], we got these branches and we set it out at Amalga Harbor. . . And we did our little ritual at this: *xadaxkuntz*; in others words to talk to the spirits, *xadaxkuntz* (Tlingit). *Xadaxkuntz* (Tlingit). In other words we're going after our food. That's what they call *xadaxkuntz*

(repeats Tlingit phrase). And the reason why I brought Doug [Chilton, a carver] up is he does that—we received from the earth especially the trees and such, the roots. So before we cut the timber or even the branches we say our Tlingit acknowledgement by saying, “Be kind to us. We don’t mean to hurt you. What we’re doing is for our food.” So then we cut the branches. And I think Doug does the same thing when you fell a tree for his work for totem pole and canoe? [Doug Chilton affirms.]

Herring also were honored in dances in which herring rake style staffs were used, their nails being replaced with herring simulacrum artistically rendered from copper or (later) tin (cut from coffee cans); the manufactured herring would shake and shimmer like dancing schools of fish (Mike Jackson, Kake).

Finally, herring might be cultivated by a proper “invitation” to their spawning grounds, again showing respect. Clara Peratrovich explains this concept:

[there was] a traditional way of inviting the herring to come in ... when they’re setting ... their branches, their boatloads of branches. And the folks would come in and they’ll come at an angle and they’ll pick up their branches ... facing the south: branches are all facing the south. And ... the traditional way of putting your branches in the water-- say I’m sitting here in the boat and picking up the branches-and instead of just picking it up and throwing it, you got to pick it up and call in the [herring], it’s just like wishing the herring to come in: the wealth to come in. And [you] put it in the water and after [that] you tie it. You can’t just go and pick it up and throw it.

You have to lay it [the herring branches] a certain way ... you’re respecting nature doing it the right way. And in Tlingit ... You’re motioning it into a spawning area. And so that’s showing respect. Anything you eat ... you respect.

It was considered disrespectful to disturb spawning grounds before spawning began, and risky to move branches excessively during the spawn. Again, Clara Peratrovich explains,

They never brought branches to the spawning ground, never put branches in the water until it starts spawning. If you put branches in the water before it starts getting milky, you'll never get the herring to spawn before they're ready. They like the fresh, clean branches when they're starting to spawn, when it's getting milky. That's when you put your branches in. But before that starts, they'll never spawn on it. Never spawn on it. I've seen that before. ...

It must, somehow, whatever is in the water has something to do with it. I don't know. Maybe they get firm, you know, when they put them in water and it stays in there for some time, I guess ... The young generations want to move [branches]—and that's another thing. [If] You move [the branches] when it's not, when there's very little [eggs] on the branches and you want it to get thick, you don't pick it up and put it in a place where it's sparse. Starting to spawn again, they'll never spawn on it. I don't know if it's because of the milky. It's already been spawned on, or ... You just have to put a fresh one there. But never transplant your old one that's not thick to a place where it's spawning to make it thick.

If these protocols were not followed relations with herring could be compromised and, as a consequence, the quantity and quality of spawn might be compromised as well.

“Watchmen” were employed to regulate interactions with herring in some particularly sensitive areas, such as spawning grounds near Klawock at Fish Egg Island, named in Tlingit for its white, milky appearance during the spring herring spawn (*Sháan Dàa*, “White Around”). The concept of the watchman seems to have been an extension or an analogous concept to the *héen s'áati* (“stream master” or “riverkeeper”), who was considered a kind of caretaker of a watershed and thus given authority to “manage”

peoples' interactions with it (Thornton 2008). But as Byron Skinna notes, The Watchman could also regulate interactions with herring:

The reason ... nobody allowed outboards around Fish Egg Island is because we didn't want the herring disturbed. You had to row.

[One figure that enforced this] was The Watchman. And he told you where you could go and when. And you didn't dare go there without his permission. When it was time to go to different areas, he would come into town and he'd tell the elders, 'Ok, this is where we can go.' They all have names. Every place has a name and we all knew the name. . . .

And when it was time, he came and told the elders here, 'You can start fishing this area.' This area or that area, but not before he gave permission. ...

Oh man! It was strict! It wasn't just a regulation. It was really strict. ...

If you were acting up, he just grabbed you by your hair, jerk you off your skiff and hold you down until there's no more bubbles. Then he'd push you down. Then he'd row away.

Other enforcement and monitoring techniques are discussed in more detail in the section on resource management below.

In addition to gathering herring on natural (kelp and seaweed) and "planted" (e.g., hemlock boughs) substrates, oral history and anthropological studies suggest that Northwest Coast Natives were fishing for herring with nets, hooks, rakes, and traps (see archaeology section) prior to contact (Drucker 1995:35). Swanton (1905a:235), for example, references a Haida story about herring fishing in a village called Pebble-town, near present day Skidegate, where "at times the town people fished for herring with nets."

Oral history also alludes to the transplanting of herring as a cultivation technique. Several consultants described an elaborate process for transplanting herring

that involved an eagle claw and other prescriptions. Al Martin, a Juneau resident originally of Hoonah, elaborates on the method.

You take the live herring and have an eagle [claw] transport them to the area where you want them to spawn and then you release the herring, in an eagle's grip. And I guarantee that that transplant works. It's a known fact and that's how our Tlingit people transplanted most of the spawning areas. It's not by accident we got the herring chosen to spawn. They done this for subsistence use. They done it because it was for easy access: that was the thought behind it, our Tlingit people.

In modern times the practice of transplantation has continued based on lessons learned from observing the herring life cycle and changing patterns of spawn. Harvey Kitka of Sitka explains,

We don't see herring [in places we used to]. I've been trying to repopulate it. I take some of the branches up there and, some of the thinner ones I get, and put it up there.

They claim that the herring will survive out of water for almost three days. As long as you get them back in the water they'll, within three days, they'll swim away.

Not all fish were transplanted, but salmon (Thornton 2008) and herring were, apparently in numerous regions throughout the Northwest Coast. In paper on the British Columbia Coast Salish, anthropologist Dorothy Kennedy (2000 n.d.) documents:

A Homalco man raised the issue of transplanting fish. ... They had the ability, he explained, to move both sockeye and herring. This could be done by tying a piece of twine about the neck of a male and female fish and leading them live to the

stream or bay where the fishermen desired a new run. The twine holding the fish would be anchored in place so that the fish would become acquainted with the stream. Although my friend had not seen this done, he had heard of a man on Cortez Island who used this method to start herring spawning in a bay where there had never before been herring. A new run of chum salmon was established in Hot Springs Cove, on the west side of Vancouver Island, as well. In that case, a male and female salmon were captured and released in the stream where the new run was desired.

Such cultivation techniques are further evidenced by the anthropological and historical records, and our own interviews, as will be seen.

### **Early Non-Native Accounts of Herring Fishing**

Early visitors to Southeast Alaska and ethnographers of the Tlingit describe herring spawning in detail. These accounts are summarized in Schroeder and Kookesh (1990) and other sources. Many of the earliest accounts of herring fishing are centered in Sitka. An example is Marchard, who visited as part of his 1790-92 voyage (Fleurieu, 1969), and wrote “The principle food of the natives of Tchinkitanay [Sitka Tlingit] is fish, fresh or smoked, the dried spawn of fish, of which they make a sort of cakes, and the flesh of the animals that they kill.”

In Sitka, egg drying was done in special “herring trees” that featured branches extending parallel to the ground (trimmed to maintain their shape) and exposure to breezes. The dried eggs could be pressed into cakes, but were more commonly packed away in containers for future use. The eggs could be preserved for months and reconstituted by soaking them in saltwater and then blanching them in steaming water.

An excellent, detailed account of herring production in the late 19<sup>th</sup> and early twentieth century is provided by George Emmons (Emmons and de Laguna 1991:117-119). He describes the basic harvesting methods and substrates used. Interestingly, though well aware of Sitka's famous herring spawn, Emmons also identifies other important herring areas, such as Angoon's Kootznoowoo Inlet.

The Alaska herring, *yow, yar* [yaaw], though a small fish, is extremely rich in oil and was greatly valued by the natives on this account, as well as for its spawn. Its distribution is limited, and it cannot be depended on from year to year except in a few localities, of which the chain of lagoons penetrating the western shore of Admiralty Island at Kootznahoo Inlet was the most favored. Vancouver's surveying party [Vancouver 1801, 5:422] mentioned the great abundance of this fish found here in July 1894, and this abundance has continued to this day.

In April, vast schools enter the bays and inlets among the islands to spawn, and they deposit their eggs, *khok* [gáax'w], in countless millions on every growth of sea plant and on the rocks in comparatively shallow water. Taking advantage of this, the natives cut hemlock boughs which they placed on the shore at low water, and weighted down with boulders. Or, still better, the branches were anchored with a rock tied to the butt ends, so that in standing up they would present more surface for the deposit of the eggs which adhered in great clusters. A broad-leafed seaweed, *dow* [daaw, macrocystis kelp], "feather" and a long black skeleton moss [or sea grass], *nh* [né, "hair in the water"] seemed equally desirable to the fish to spawn upon, and for the natives to gather when so covered. These were fished for from the canoe with a long spruce pole with a small crosspiece seized at the end, called "sea moss catcher," *nh heetar* [né xit'aa, "sea-hair broom"]. This was entangled in the moss, with a sudden twist the root was detached, and it was brought to the surface and deposited in the canoe. ...

After spawning, the herring disappear into deep water, and about September, following their food, a tiny crustacean, they again school in myriads in the inland waters, but not necessarily on their spawning grounds from year to year, but always about Kootznahoo Roads. For this reason the resident natives of Angoon are the herring fishermen of the coast. At this season and extending through the fall, the fish are very fat and are valued most highly as oil producers, although also enjoyed as fresh food. They were sun dried in limited quantities.

Fishing was done in small canoes. The steersman in the stern paddles to where he saw the fish jump or the seabirds gather, since birds, larger fish, and men were all equally alive to the abundance that nature offered them. The bowman used a rake, *heet lar* [*xídlaa* or *xítlaa*]. This was a spruce staff about twelve feet long, oval at the handle and flattened at the other end to a thickness of two or more inches. Along one edge [of the flattened end], for a distance of three feet, were inserted sharpened nails, an inch or so apart. Iron has taken the place of older bone teeth. This implement was driven down into the water with a long paddle stroke and brought up with its teeth up. With a quick turn and jerk over the canoe, the impaled fish were shaken off.

[Sitka was also a center for catching herring and for obtaining herring eggs. Thus Lütke (1835:111-12), who was at Sitka in 1827, reported that in spring, during the herring season, the natives used to gather near the fortress of New Archangel up to a thousand strong, and an equal number were on the nearby islands. In summer, there were often five to six hundred natives. At first no native was permitted to camp near the fort, but Governor Mouraviev (1821-27) finally changed this policy, thinking it more advantageous to have the natives and their families under the guns of the fort. From that time on, the Tlingit became more peaceful. Tikhmenev ([1861-63] 1978:368, 422), reporting on conditions of about

1860, mentioned that the herring fishery at New Archangel was very good, and that in February and March, when most herring were taken, the water became milky from the spawn and milt, and that it was easy to catch the fish with a rake. They were also caught sometimes in the fall.] (Note: bracketed Tlingit spellings have been standardized to the popular coastal orthography)

This detailed account is noteworthy in that it highlights Sitka as a dominant locale for egg production and Angoon for oil production. Emmons' account also lists the dominant subsistence methods and means of processing. He does not discuss the use of herring for bait, however, which has been a major use of the species since pre-contact times.

Additional details of herring processing and consumption are provided by Emmons:

Eulachon and herring were the only other fish [besides salmon and halibut] that were cured for winter use, but only in limited quantities, for their importance as oil producers was paramount, and only the surplus was preserved for winter food. Both were also eaten fresh.

[It will be remembered that the herring which were caught in the fall were fat and so were used for their oil.] This trying out of herring oil, both for home consumption and for trade, was carried on only by the Hootzah-tar Qwaan [Xootsnoowu Kwáan] who built very substantial houses along the shores of the lagoons of Kootznahoo Inlet where they spent the fall. The fish were tried out in canoes with heated stones. ... But since this was more of a commercial industry, several special implements were used. Thus, a long-handled wooden straining spoon with slits and holes in the bow was used to remove the mass of fish from the canoe. This was emptied into a long, open-weave, spruce root bag. When half filled, the bag was folded over and laid on a slat frame over a large box half filled with water. On top of the bag a heavy slab of wood, two feet square and two

inches thick, with a handle at one end or corner, was placed and pressed down. The oil was skimmed off the water in the box with a wooden ladle, often finely carved, and was put in boxes about one foot square and eighteen inches high, as yellow grease. It was eaten with all dried foods: fish spawn, berries (except for the soapberry), potatoes, and seaweed—in fact with every kind of food, and if it were rancid, this added rather than detracted from its quality. It was largely used in trade and had a fixed value. With the establishment of the Killisnoo Oil Company [probably the Alaska Oil and Guano Company that had acquired the old whaling station at Killisnoo in January 1887, and was processing herring oil], the natives gave up its manufacture, since they could procure a better product [from the company] with a minimum cost of time and labor.

A limited amount of herring was cured for home consumption. The woman preparing the fish held it in her left hand just below the head, belly up and head to the left, and with a knife cut the fish from the gills along the stomach. With the thumb of the right hand she pushed out the entrails and this was all the cleaning done. The fish were strung on a small alder stick or line, passed through one gill and the mouth, alternate fish being strung through the right and through the left gill, so that the fish stood out from each other when the string was placed over a rod, and thus had a better opportunity to dry. After being sun dried for a day or two, they were hung under and about the smokehole of the house, and so cured. Or, they might be strung together with lines, fastened alternatively around the head and small of the tail and crossing between each fish; or the fish might be opened lengthwise and strung through the head. Like all other dried fish, they were dipped in oil when eaten.

Herring eggs [procured in the spring] were considered a luxury rather than a regular article of the diet. When eaten fresh, they were dropped into

boiling water for an instant. [To cure the eggs], the moss, seaweed, or boughs to which the eggs adhered were hung on the fish racks, or on lines, trees, and bushes, and sun dried. They were temporarily put in bags or boxes, as the [spring] season when the spawn is very short, and the cleaning process was not attempted until later. ... To prepare the eggs for winter use, they were put in a box of water, together with the material to which they were attached, and when the eggs swelled, they were stripped from the broad leaves of the seaweed or from the moss. Spawn on sea moss was often packed away as gathered, since the moss does not decay and is tasteless. The eggs on hemlock branches had to be stripped very soon, before becoming impregnated by the pungency of the needles. This was done by breaking the twigs, rubbing them together, and dropping them in water, where the eggs separated and sank, while the needles and woody particles floated to the surface and were easily removed. After the eggs had been separated and cleaned, they were sun dried on boards, canoe covers, or so forth, and then packed away in boxes for winter

Cured eggs were allowed to boil in a little water for a few minutes, and were generally eaten with oil or grease. Herring spawn constituted an article of trade, and in 1882 were worth \$3 for the amount contained in a hardtack box (Emmons and de Laguna 1991:145-148).

Although Emmons considered herring eggs to be a “luxury,” this is because they were seemingly available for such a limited period. Herring eggs were preserved for use long beyond the spring harvest time and bolstered Native food needs throughout the year, especially when other fish and resources were less accessible. In Sitka, herring eggs were (and remain) a staple and iconic food at winter ceremonials, such as potlatches (*ku.éex'*), where large quantities are consumed. Tlingits also recognize the critical role of herring as feed for other resources upon which they depend. For example, at Angoon, it was

understood that spring herring returns would attract king salmon, which could be caught in the bays and inlets around Angoon in springtime, well before their migration into freshwater streams for spawning (George and Bosworth 1988:53). Similarly, Klawock Tlingits told Salisbury (1962:151), succinctly, “Herring come-whale come-sea lion-seal-king salmon—everything eat herring, come-big time!” Harold Martin put it more eloquently: “[Herring are] important to everything. ... [W]e didn’t like the idea of commercial fishermen coming in and taking them on a large scale because they’re very important to our salmon and especially king salmon, you know. And they feed our seals and stuff like that--things that we’re depending on.” Thus, Tlingits recognized their mutual dependency on herring with other species, such as king salmon and sea mammals.

Variations on traditional harvesting and processing techniques are further described by Lisianski (1814:239) and others (see Schroeder and Kookesh 1990) for Sitka, George and Bosworth (1988) for Angoon, de Laguna for Angoon and Yakutat, (1960, 1972), Newton and Moss (2005) for Angoon, Kake, and Hoonah, Thornton (1997) for Juneau, Ellanna and Sherrod (1986) and Salisbury (1962:151-162) for Klawock, Victor-Howe (2008) for Hydaburg, Oberg (1973:69) for Klukwan and Haines, and Firman and Bosworth (1990) for Kake, and Cohen (1989) for Wrangell. These studies reveal important local and regional differences in Native production, such as the Hydaburg-Craig-Klawock preference for roe on kelp, the Sitka preference for roe on branches, and the association of Angoon with herring oil production. Modern studies, such as those by the Alaska Department of Fish & Game, Division of Subsistence, also highlight changes to herring schools and subsistence patterns, such as the advent of preserving eggs through freezing, and of shipping eggs in large quantities on private vessels or via transport companies, such as Alaska Airlines (Schroeder and Kookesh 1990).

## **Other Patterns of Production and Use of Herring**

The production of fresh herring in fall and wintertime for meat, bait, and oil underscores the fact that herring were important year round. For those places that enjoyed year round schools, herring could be taken almost any time. Again patterns varied by area. In Sitka, herring oil was rendered in fall and in February and early March when herring moved into Sitka Sound for spawning (Herman Kitka). In Juneau and Klawock, oil was produced from late fall through spring (before spawning). Oil rendering is more productive in the fall because the fat content of herring is higher (Cobb 1906:21). As George Jim of Angoon states, "In September, October, and November, it is the time of contentment and happiness among the Tlingit people, for it is harvest time. Deer, goat, sheep, bear, king salmon, herrings, every species of salmon is fat, ready to be harvested, and plentiful" (Newton and Moss 2005: 2).

Seagulls (especially Glaucous-winged gulls) and marine mammals, including seals, sea lions, and whales, signaled the arrival of the herring each spring. The gulls are said to have named herring by their spring call, *yaaw*, distinctive for its change in response to the arrival of the spawning schools (Herman Kitka, Clara Peratrovich; see also Life Cycle chapter). Of Klawock in the 1920s, Salisbury (1962:151-152) reports:

Early in December one dark afternoon I saw the school children in a flutter over something and excitedly looking at the water of the inlet below the schoolhouse, so I looked too . . . "Those must be sea lions," I thought, "that means the herring are here." They were, for a while I watched, the surface of the water broke into a rippling, splashing disturbance and flashing fish struggled to get away from terror that pursued them from beneath. I have come to recognize that splashing and boiling of the surface the water as indicating the presence of the herring horde and that their enemies are raiding them from below. . . .

I wish I might have had a better opportunity to observe them, but the sea lions are not popular with the natives because of their pursuit of the herring and men across the bay began to shoot at them. They quickly became wary and kept beneath the surface when in the bay. Big brutes as they are, the Indians say they are as hard to hit as a hell-diver, for they are always alert and a puff of smoke will cause them to dive before a bullet can reach them. If mortally wounded they sink in the water and are lost to the hunter, so the only chance to get them is to kill them with a shot in the head.

This account suggests that Tlingits occasionally engaged in predator control, at least against sea lions which were both a competitor for herring and a food source for Natives. However, some eighty years later, a Klawock fisher (Consultant #13) observes, “You know another big thing I’ve noticed would be another factor is, back in the day, you know, the locals probably kept it, the herring, guarded against other wildlife. Like now, if you glare at a sea lion, they want to throw you in jail.”

Salisbury (1962:153) goes on to report the mechanics of the subsistence herring harvest in the 1920s, including the use of herring rakes and dipnets.

The first day of their appearance everything that could float was out on the bay and the fish that were raked aboard within the next few hours made many a stuffed Thlinget that night. Canoes and rowboats were out with some one to row or paddle, and another someone at the forward end with a dip net, or more often, with a long pole in the lower end of which wire nails had been driven so that the sharpened points projected an inch, an inch and half, or two inches. The boat would be worked over the moving stream of fish and the brailer would plunge the pole down and with a sweeping motion, bring it up through a mass and shake off in the boat the fish impaled on the nails. It may sound like slow

work, but there would be from four to a dozen fish at a sweep, so the boats filled rapidly and would come in loaded deep in the water.

With this harvest commenced a prolonged herring feast.

The natives, however, never tire of them. They eat them fresh—they dress them and string them on long sticks to dry in the sunshine or beside smoking fires—they shovel them into tubs, or even into holes in the ground to ripen, and cook the oil out for future use. They soak themselves in the fishy atmosphere of their cabins and saturate themselves with oil and gorge with the dried fish until their very bodies exude herring savor. ...

Salisbury (1962:152) adds that “it is claimed [presumably by Klawock fishermen] that while the herring are running for the two or three months prior to spawning, they do not feed.” He surmises, “That seems probable, for while they are running they move in solidly packed streams of fish that flow ceaselessly, much of the time five to ten feet below the surface, and it would seem impossible for such a horde, so closely packed, to find food enough for the multitude” (ibid). As a consequence of ceasing to feed and of the stress of reproducing, herring oil content was low during this time. Thus, Clara Peratrovich, who was active processing herring around the time of Salisbury’s presence in Klawock, notes of her family, “They went and dried some. They salted some for bait. Dry salted for bait because there was not refrigeration for bait. So dry salting for bait was the only thing that they did. They rendered the herring for the oil [only] for personal use.”

In contrast, large quantities of herring oil traditionally were produced at Angoon in the fall time, particularly at Favorite Bay, which lay just inside the village of Angoon and was well known as a herring massing area, though less so for spawning. As noted in the archaeology section, many Tlingits were encamped there in late October, 1882, when the U.S. Navy bombarded Angoon (de Laguna 1960:42, 168, 170). An eyewitness to these

events, Deisheetaan elder Billy Jones, described how Angoon residents were putting up the fall run of herring and rendering the oil at the time the gunboats came to Angoon and “left us homeless on the beach” (de Laguna 1960; Reckley 1982:11). Another Angoon elder, Jimmy Johnson, noted that he also “fished herring in the area between Point Wilson and Point Gardner. We had camps for herring oil preparations along the coast. All the people who are from Angoon get herring there,” usually in fall time (Goldschmidt and Haas 1998:148). Herring oil produced in the fall was critical to the Native winter food supply. Even after the Angoon bombardment, people from as far as away as Hoonah and Sitka came to put up herring oil in Mitchell Bay and Favorite Bay, inside Angoon. George Davis of Hoonah notes that herring rakes were employed for this process in the early days. Expanding on Emmons’ description, he explains:

Herring rakes (iron spikes) were used, before that, bird bone points, about one inch long on a rake 40 inches long [though some were apparently much longer]. First the bone was tempered in fire; it is heated with a tong, then it is cooled in grease and heated up again. Then you grind the point until it is really sharp, then it becomes hard. The pitch of old-growing spruce is used to bind points onto the rake; it’s really stronger than glue, like cement. (Newton and Moss 2005:15)

The chapter on the historical reduction fisheries, and our interview with Walter Soboleff, who was born in Angoon in 1908 and worked in the Killisnoo herring reduction plant in the 1920s, suggests that Kootznoohoo Inlet was affected by the heavy commercial fishing that took place there beginning in the late 19<sup>th</sup> century. Gabriel George notes that herring, though in decline compared to pre-reduction fishing days, were still abundant in Angoon up until the 1960s; however, by the end of the decade, there were “hardly any” left. He attributes the change to the “immense amount of herring fishing going on in

Chatham Straits,” at that time. And the population has not rebounded, he notes, “The herring hasn’t recovered.”

The byproduct of oil production, herring mash, was also used for fertilizer and food. Henry Katasse of Kake remembers:

We were small kids when the family moved to Union Bay. I distinctly remember raking herrings into a canoe until it was loaded down. They were rendered down over an open fire with everyone working. ... We kids were running around the canoe with herring in it. Late in the afternoon, we were each given a cracker, pilot bread as some people call it, and we put some herring on it. After it was rendered down, it was so crisp and tasty—after we had been playing all day. We had a great big pot of herring mash; it was hot and good tasting—all you could eat. Later in the fall, they did some trading of herring oil for smiling berries [saskatoons]. (Newton and Moss 2005:15).

While oil, eggs, and sometimes smoked meat were traded, herring waste and offal were retained as fertilizer for family gardens, an important post-contact development in the food economies of Northwest Coast Natives. Sandy, loose, or spoiled eggs and dead herring (i.e., those mortally exhausted or wounded by predators during spawning) might be exploited for fertilizer. This is still the case in Sitka, as Roby Littlefield explains:

Traditional use, modern use, right here by Halibut Point Rec[reation Area], the town-ward side of it is a very nice stone beach ... and after the herring spawn--we get big spawn during a storm, a lot of the eggs don't, aren't able to attach to anything so that's when I like to go down there with a wheelbarrow. I go down there with my boat and just beach it on the white beach and just fill up buckets and buckets of herring eggs that didn't attach and there's just like sand dunes or egg dunes of it. Yeah. Those are really good for fertilizer.

Fresh herring are taken seasonally and eaten fresh. Dick Stokes of Wrangell recalls:

Well, [we took them] whenever we could get them. It'd be year-round. We used to be able to get them year-round right in Wrangell. I remember as a little boy, growing up, at the head of the bay before they dredged it and it was all tide flats. And I'd just take a bucket and just [scoop them up].

Similarly, Al Wilson (now of Sitka, but raised in Juneau) recalls that "having a fishing pole in those days [1940s]," was only the luxury of "a rich man." Hence he scooped up herring by hand in Auke Bay "when they get caught in the tidal flat."

While oil was rendered prior to spawning, as noted above, it was not the peak time in the life cycle for oil production. After spawning herring could be smoked or dried, but was of little or no value for oil. Clarence Jackson of Kake remarks, "The people used to dry herring; they smoked it and dried it. It tasted absolutely like eulachon. I don't know why they think eulachon is the only one that's good. I like smoked herring too." Herring might also be salted and barreled for bait, as Clara Peratrovich recalls:

Just recently that pickled herring came along. But they smoked it mostly, you know; they fillet them. Take the backbone off and string them you know they're fillet, you put your stick through it and put about five or six or ten at least ten filleted all the way down to the tail. Cut it right down the backbone and then string it up with the head. Put a stick through it and then put it across the long sticks. You're crossing it. And dry it.

When Scandinavians arrived, they brought additional methods for preserving herring. Nels Otness of Petersburg remembers, ". ... right here in Petersburg. There was just a few guys were doing it, but I'll never forget the one guy: he wore a suit all the time and here he was working with this herring, pickling it. Yeah! And he pickled a lot of herring and sold it." Nels' wife, Dorothy, produced for us a Petersburg PTA Cook Book (n.d.) of some vintage, which contained several Norwegian recipes for herring, including

*sildbald* (herring balls) and *sildeslat* (herring salad). *Sildbald* are still made for Christmas holiday occasions, according to the book's recipe as follows:

8 salted herring  
8 medium potatoes  
1 medium large onion  
¼ teaspoon pepper  
3 cups of flour

If herring is very salty, soak in water overnight. Clean, removing bone and skin. Peel potatoes and onions. Put all this through food grinder. Add pepper and flour and stir the mixture by hand. Place a small piece of bacon or salt pork in the center of each ball. Make the balls the size of a small orange. Dip hands in cold water each time. Put the balls in a kettle of boiling water and cook 45 minutes. Serve with fried bacon or salt pork. If some are left they can be fried in bacon fat the next day. (Mrs. Chris Wick).

Fagan Skaflestead of Hoonah explained that pickling herring is an ongoing tradition in Hoonah, especially among those of Norwegian descent:

I preserve it [herring] for my fisheries. For commercial trolling, I salt it and fillet them and work them up that way. And then we make pickled salmon and pickled herring and stuff like that. ... There's a few, probably 15 people [that still do it]. ... Once you get it pickled—once you get it cleaned and ready and salted and put in the pickling spice, within—you can start eating within two days. . . . There are different recipes, you know. That's what we use. Herring is a very—you know it's a food that salmon eat. We go king salmon fishing. We look for certain type of herring, you know, and actually it's your, to me, herring is your backbone of your big fish.

We have needlefish, we have eulachon, we have you know different candlefish [eulachon] and stuff like that but they're not like, they're not plentiful like herring . . .

Al Wilson recalls his family salting, drying and kippering herring from Indian Cove near Auke Bay,

Every spring they'd set out a herring pot [also known as a herring pound] in a place called Indian Cove which is across [from our place] ... around the pot is where we set our branches. We processed them. My folks dried them. They salted them. In those days [there was a] lack of refrigeration and electricity out there at that time. We salted them and I guess they call them 25 gallon drums or barrels. And then ... there was a large tide flat below as part of the beach as the tide went out when the herring were spawning, there'd be left a lot of live herring bouncing around and some of them caught in the pools. We'd go down there with buckets and collect them up. Mother would fry them. We'd smoke them and kipper them in hot smoke. Put them up in cans and had kippered herring. We also took some of the—we'd hire/rent a transfer truck haul branches into Juneau, Juneau village and sold herring eggs there.

Khlebnikov, who spent considerable time in Sitka as a manager for the Russian America Company from 1817 through 1832, identifies yet another (apparently extinct) technique for harvesting eggs with a basket, and comments on the important culinary combination of herring eggs and raspberries.

The Kolosh [Tlingit] of Sitka begin preparing food in February when the herring come in. They do not preserve this fish because it molds and spoils easily; but they do preserve the roe. The Kolosh know when the herring spawn, and prepare a wicker container, tie it, and submerge it with stones in the water near the shore. The released roe settle on the wicker, which is then taken from the water and

dried in sun or just in the air. When the roe is dry, they remove it from the wicker and keep it to use. ... In addition to fish, raspberries are preserved and eaten with herring roe, thus making a *tolkuska*. (Klebnikov 1976, orig. 1861, quoted in Schroeder and Kookesh 1990:5).

We learned nothing of the wicker basket method of harvest. Perhaps there were other local technologies developed to harvest herring which have not been documented.

### **Local and Traditional Knowledge and Adaptive Management**

The variety of techniques Natives developed to harvest herring and their year-round use of the species suggests that it was a staple resource, rather than a luxury, and also focal point of cultural development. Along with salmon, it has been said that “Herring are the ‘staff of life’ for them” (Salisbury 1962:155). Critical fishing technologies, knowledge, and skills were built up through interactions with herring and efforts to enhance supply and regulate demand at various scales suitable to the particular locality. This knowledge, innovation, and social learning (Berkes 2008) allowed Native peoples of Southeast Alaska to harvest herring sustainably from pre-contact times to the present. This process of “strategic learning-by-doing or quasi experimental approach to the management of natural resources encouraged by institutional flexibility” is termed by Armitage et al. (2007:328) as *adaptive management*.

It should be noted that just as humans have adapted to herring populations, so have herring adapted to human populations, and not merely through avoidance. This is discussed more fully in the Life Cycle section, but a single example may be introduced here. Herring have long been associated with fish processing and storage facilities, where fish waste is discharged. If conditions are not otherwise unsuitable, herring will move into these areas to feed on fish remains discarded by processors. However, as

regulations on waste have tightened, and facilities have become less productive, the patches of herring associated with the gurry discharge have correspondingly dispersed (see Management Chapter for specific comments). As schooling fish, herring seem to possess a “swarm intelligence” that governs their movements and patterns of behavior in unique and powerful ways. But few investigations have been carried out to see how certain mass responses may be related to human and environmental factors.

Native and non-Native fishermen alike have had to do the best they can to understand, cultivate, and manage herring resources in their seasonal, patchy abundance through various techniques of capture, storage, distribution, and consumption. Although not all these techniques are strictly concerned with conservation of herring, they were designed either to help sustain the species or to make the most efficient use of it, which in turn, insured a sustainable supply.

Today, many production techniques, such as rendering herring oil and the air drying of eggs, have all but disappeared from local culture due to modern conveniences like freezers, or the availability of alternative products, such as seal oil or commercial cooking oil. While Natives appreciate the modern technology and conveniences, some have mixed feelings about the loss of traditional skills involved in herring egg production:

The ones that were dried, it was amazing how they were dried and all you had to do was soak them and then boil them, and they were almost the same as when they were fresh. Hardly anybody does that anymore because everybody has freezers. And if you have freezers, you have a freezer you don't need to dry it. But I think someone should do it anyway just so we can keep that knowledge that this is how it's always been. (Fred Hope)

Similarly, Native communities have lost managerial control of the herring fisheries, for which they had evolved a wide range of tools to conserve herring populations for sustainable use. Despite recent “co-management” developments, such as the Memorandum of Agreement between Sitka Tribe of Alaska and the State of Alaska (2002) and various participatory avenues for input to fisheries management, Natives collectively have very little effective control over the fate of herring. What is more, it is assumed that there was no effective system of controls in the past based on traditional resource management techniques, which is not the case.

Table 2.1 summarizes the key traditional resource management strategies exhibited by Southeast Alaska Natives in terms of supply and demand techniques, with examples drawn from the analysis above. Techniques to manage supply include technologies of preservation and storage, trade and exchange, habitat conservation, habitat cultivation, return of selected egg deposits, transplantation, and efficiency innovations. On the demand side, key techniques include territoriality, mobility, prescriptions and prohibitions, prey choice, substrate choice, and sabotage or sanction of high-demand harvesters or hoarders.<sup>2</sup>

It may be that most of these techniques went unrecognized because they were conducted quietly in a non-confrontational way. For example, The Watchman figure,

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<sup>2</sup> Of course most non-Native observers failed to recognize Tlingit resource management strategies and some feared that their efficient harvesting tactics might jeopardize the resource. In the case of herring an isolated example of this perspective is that of Evermann's (1913) , an early an ardent advocate for fisheries conservation, who observed,“ In this connection, citation is made of the doubtful practice of the Indians at Auk Bay and other places of putting brush in the water each spring during the spawning season for the purpose of securing herring eggs which they dry and make use of as a food delicacy. The adhesive tendency of herring eggs makes it an easy matter to thus secure large quantities with but comparatively little effort. Countless millions of eggs are in this manner destroyed by the Indians. It is doubtful whether this practice of the Indians should longer be permitted. “

Note, it is also about this time that Legislation is introduced to the territorial legislature (and perhaps Congress as I recall) to ban the reduction of herring, or harvesting other fish for non-food purposes. So there is this attitude of "non-wastefulness" at the time, which gets twisted in cultural context and comes out in rather perversely in Evermann's statement....which is clearly referring to a food use.

**Table 2.1 Tlingit Herring Resource Management Strategies**

<b>Supply Side</b>	<b>Demand Side</b>
<i>Preservation and storage</i> (drying, freezing, etc to temporally redistribute supply)	<i>Territoriality</i> (to prevent damage to spawning stocks and their habitats)
<i>Trade and exchange</i> (e.g., herring eggs for eulachon oil to spatially redistribute supply)	<i>Mobility</i> (e.g., redistribute people in relation to resources threatened with overexploitation)
<i>Habitat conservation</i> (e.g., of spawning grounds to insure sustained reproduction)	<i>Prescriptions and taboos</i> (quieting the spawning area, inviting the herring in, not harvesting eggs after dark, “The Watchman,” etc.)
<i>Habitat cultivation</i> (e.g., placing branches or other substrate to increase spawning in certain areas)	<i>Predator control</i> (e.g., of sea lions preying on spawning herring)
<i>Return of viable egg deposits</i> (e.g., placing thinner egg deposits back in the productive “band” of intertidal area for hatching)	<i>Prey choice</i> (e.g., switching to seal oil when herring become too sparse to harvest; or choosing not to harvest an egg deposition)
<i>Transplantation</i> (of eggs to new areas or to restore old areas)	<i>Substrate choice</i> (switching from kelp to another substrate if kelp beds are stressed)
<i>Efficiency innovation</i> (consumption of “mash,” etc.)	<i>Sabotage/sanction of hoarders</i> (e.g., freeing herring from overcrowded pounds that wastefully destroy fish)

discussed above, was usually obeyed among his own group, based on his accepted expertise, authority, and wisdom concerning how a particular watershed or spawning ground should be regulated to benefit the group as a whole. Thus, only rarely did he have to resort to more physical tactics to limit fishing or other activities that might be detrimental to the herring supply. But this is not always the case, particularly when there was competition or conflicting demand between groups. In Klawock there are clear cases of territorial behavior. Outsiders that disturbed or fished too close to the spawning grounds would be sanctioned. Clara Peratrovich remembers an incident from the mid twentieth century:

Years ago, right in the main spawning ground there was only one boat that used to bait fish, seine, and they called him Big Andy. He was a big guy. Well,

when the herring hit the main spawning ground over in Fish Egg Island, the outer bay, you know, that's the main spawning ground. Well he went in there and he seined all around the whole spawning area.

And the men-folks had all the rifles on the beach pointing at him and he was just laughing at them. This one guy said, "I'm going out there, you folks keep the rifles on them." He says "I'm going to cut the seine so it'll be cut in half and the herring will be released." And so that's what he did. He [Andy] got a rifle and he was pointing at him when he was pulling the seine up, all the way up to the lead line. And he had a sharp knife. He [Andy] says, "If you cut that," he says, "I'm going to shoot you."

Everybody on the beach went and put their rifles up and shot in the air-- he would be dead too. So he put his rifle down and that guy that came out there put his knife on the lead line and let the weight of it cut right through the net, through the cork line and let the herring go. And he had to pull it in and he went and backed out of there. They told him just back out silently, go quietly, not at a high rate of speed--you'll scare the herring.

Significantly, this territoriality was based on conservation rather than an attempt to monopolize herring supplies, and thus can be considered an example of resource management.

A similar case occurred near Kake when Kake Natives attempted to prevent Petersburg bait fishermen from herring fishing for fear they would deplete local stocks.

Nels Otness, a Petersburg herring fishermen, recalls:

Anytime we fished around a village, well, we were outcasts is what we were. ... Oh, they didn't like us fishing around there...

Well, I had friends you know that—I was born and raised practically with guys from Kake. They used to come in here all the time and we played basketball

against each other and all that kind of stuff. And it just—they all knew me and knew I fished herring. And herring to a Native is ah—they troll, hand-trolled, and they used herring for bait. And some of my friends, I tried to tell them, ‘Hey, we’ve got more sense than to go into a place and wipe it out. That makes no sense. We’re living here. This is how we make our living. We clean out these places, we got nothing to fish for: we’re out of it.’ You know. Stupid. And I don’t know where the enforcement was through the years of the reduction fishermen because some of my friends in Sitka told me they came right into Sitka Sound and took every herring--wiped her clean.

Kake people, however, viewed the Port Camden herring bait fishery as a conservation issue rather than mere protectionism. Marvin Kadake notes:

[T]he price of herring got so expensive for food that Petersburg started to come over here. And anyway, I knew all the managers and everybody was running PFI [the local fish processor] at that time. And we were totally against it because it was affecting our spawn. And there’s no problem going up here and get all the eggs we want, you know. And when we first started doing that, it was Gilbert, the old people was telling us how we should do it, you know. And anyway, I heard Gilbert Williams hollering timber and he dropped a fairly young tree, but it must have been 30 feet. And he towed it out there and put a rock on it and it sank. That tree was so tall, it was still sticking out of the water (laughs). But anyway, the next day when we went back to check, no kidding we couldn’t lift it. The spawn was so thick on it. All we could do was get a little bit at a time from the top and we just left the rest there. We had more than enough. I don’t know how many trips we came into town giving it away, you know. And I was using just Kadake’s rowboat at that time. And anyway, it was just a lot of fun. And it was fun doing it. And on that winter fishery, I was part of the—in fact the whole town was against it. And I

called PFI, I told them, “Don’t. Quit this.” I told them we were going to go up there and we were going to cut the corks. If you let this \_\_\_\_. If there’s anybody up there, tell them we’re running up there now. It was Gilbert, myself and I don’t know how many of us. We ran up—they saw us coming. They’d already got their—I’d told them, . . . that anybody that’s got their net aboard, I told him we were going to cut it. I told him, “If you guys can lock us up. Do whatever you want, but we’re coming up —against this issue, you know, winter fishery.” And Bob called them and boy, they were pulling their seines back full-bore, they were running up. And one guy had his net about halfway in, just going full-bore. Didn’t even purse up. They just let everything go. And no kidding, we had our knives pretty well sharpened and some hacksaws. And we got up there and there were just barreling out of here. And surprisingly, Fish and Game didn’t bother us. Nobody bothered us. So we just waited. The whole fleet was running out. And that was the last we saw of Petersburg’s fishers. So I called them and I told him we meant our threat, you know. I told them, this is our livelihood. And they apologized for that, you know.

In other cases, however, territoriality perhaps was less an indication of conservation than protectionism. For example, Leonard Skeek, a Tlingit from Kake, remembers being chased out of Ketchikan by local herring fishermen.

Well, there used to be herring around Ketchikan area too. Handy for the fishermen. They ... fished outside, wait for the herring to come out from underneath the piling. Just like stealing candy from a baby. [Local] Fisherman finally got smart and boy they shot at us. ... They weren’t shooting right at us, but they let us know, boy.

Related to territorial regulations on demand were sanctions taken against outsiders who took too much. In a small scale homogenous community, conservation by prescription or

taboo often functioned well enough without additional sanction. But in heterogeneous or rapidly changing communities, such internal sanctions often lost their force and had to be supplemented with more forceful intervention. Natives often appealed to territorial or state law enforcement for help. For example Salisbury (1962:154-156) relates an incident from the 1920s in Klawock:

A boat I was told was from Prince Rupert and not supposed to be in American waters, loaded and overloaded till its deck was almost awash before pulling out. A little later one of the natives told me that the boat had not reached its destination and it was thought it may have foundered in a storm that developed soon after it departed, but we learned still later that it eventually reached port, but a large part of its cargo had either been washed overboard or jettisoned.

Another day the “Confidence” came in from Ketchikan and from one haul of her purse seine loaded 300 barrels of herring and in three hours time after her entrance had left the inlet after dumping the surplus haul of her seine which she could not brail out for lack of capacity, to float out on the tide, dead.

The herring is a delicate fish and quickly succumbs to the crowding and rough handling in the seines, so when they are dumped the mass will float, white bellies up, on the surface of the water and then begin to sink until the bottom twenty or thirty feet down will gleam white with the dead fish—tons of them. I stood on the dock one day watching them settle to the bottom, when a native beside me said, “Bimeby all come up—float on top water—make smell—make bad smell—make much bad smell.”

The Natives say the run of fish is small compared with other years and it troubles them greatly to have the power boats from Ketchikan and elsewhere, come into their dooryard and raid the herring flood to the extent of thousands of

barrels; and in their greed and recklessness, leave other thousands dead behind them because they hauled more in their nets than they could possibly carry away. Herring are the “staff of life” for them and the spawn is another source of sustenance. What affects one, affects the other.

The seined herring are taken to Ketchikan where they are frozen in the cold storage plants for bait for the halibut and salmon fishing later in the season. The Indians realize the importance of having bait, but the needless and terrible waste of the seiners, whose only consideration is that of loading as quickly as possible and returning for more, alarms them for the safety of their source of food supply, and they became much wrought up over it. The whites, knowing they were ruthless, were cowardly in their greed and complained to the United States Marshal that they were threatened with violence by the Indians, and asked for protection. The marshal came over to see for himself, which gratified the Indians, because it gave him a chance to see what was going on. He came to me and I told him the situation, which fitted in with his own judgment. I advised the men to present their complaint both to the United States Bureau of Fisheries and to the Territorial Legislature, then in session, through their capable representative William Paul, an educated Thlinget; and prepared letters for them which were signed by the village officials. To further clinch the matter, I took photographs of the Pirate and the Radio, two large gas boats from Ketchikan which were working close to the Commercial Company dock. The evidence was conclusive. It was too late to stay the waste for this season but Klawock inlet, inside the red light at the mouth of the bay, has been barred to seines in the future.

. ... The Pirate drew the seine so full that the water was boiling with fish even before the seine was closed, and when the Radio drew in on the other side of the pond, as the closed purse-seine is called, to brail out the herring, the net was

opened to let out a portion of the excess of the haul and the dead fish poured forth in such numbers between the bows of the two boats, that the water was solid with their white bellies. I was in a rowboat with my camera and a solid white current flowed by me on either side like drifting snow and ice, until the dead fish began to settle to the bottom, which they did almost immediately.



Figure 2.3. Dumping a brail of herring, Craig, Alaska, early 20<sup>th</sup> century. Crewman operating a capstan on the vessel *Hedgeland*. Photograph on file at the Alaska State Library (ASL-Craig-3, ASL-PO1-0952)

The *Pirate* and *Radio* were boats well known to Martin Perez, a 92-year old fishermen from Ketchikan interviewed for this project. However, they were “small potatoes” compared to the 90 foot “sardine seiners” that eventually came north to fish for the reduction plants.

Well, we had a lot of—used to be a lot of seine boats come up here, great big ones come from Lower 48, you know, in the summer and catch them herring when they’re vulnerable, let’s put it that way. I know, I remember when those big seine boats used to come in and lay at New England fish dock there, you know.

Our local boats like the Pirate and the Radio and a few of them others were just for the local fishery. Mostly for cold storage you know: bait purposes. But not compared to them great big ones that come from below with 80-footers you know, 90-foot boats. Anywhere from 60-foot on up: big herring seiners. What they were, they were the sardine seiners from California that come up here. That's when the herring started to be depleted.

Similar protests to those of the Klawock Tlingits were lodged against herring reduction plant seine fishing too close to villages and spawning grounds in Sitka (for Sitka Sound in the 1930s) and Auke Bay (see commercial fishing chapter), as Natives and non-Native locals alike felt the impacts of the commercial take on their community fisheries.

If law enforcement was ineffective or powerless to intervene, Natives would take matters into their own hands. Martin Perez describes one small measure of sabotage or ecological justice taken by local Natives against herring pounds that were not properly managed:

Well, there was ... that one man. I won't mention no names, but the fishermen used to go in there where they had the big pot [also known as a herring pound] and they put so much herring in there that when the tide went out it naturally shallowed up. And they start smothering. And then they die. And the guys used to go and push the nets down and make as many escape as they could. But they did have them herring pots down [the coast]. There was one at Ham Island and where was the other one? There was several others on the Prince of Wales Island on the inside.

Similarly, if fisherman tried to privatize herring zones with their pounds, the Tlingit would object and defy them. Goldschmidt and Haas (1998: 117) recorded:

At Fairhaven, between Auke Bay and Tee Harbor, there is a place that the government has set aside for the fishing people. The government has put up a sign saying that this place is for the fishermen, both white and Native, and has protected this place against homesteading. Now, however, there is a herring pot [also known as a herring pound] on this place which was put up by John Willis, a white man, and he is trying to prevent the fishermen from going in there.

To the Tlingit, territoriality is seldom exclusive unless there was a conservation threat to the resource. Otherwise, boundaries remained strategically permeable, especially through social networks. The important thing was to *ask permission* to access resource patches which you could not lay direct claim to through matrilineal corporate ownership (Thornton 2008, de Laguna 1972, Olson 1967).

For large, superabundant spawning grounds like Sitka Sound (and perhaps Auke Bay and Klawock's Egg Island in their heyday), asking permission was not necessary, except perhaps for outsiders. However, there was still monitoring and enforcement of respect for property and herring sets, as well as local prescriptions and taboos, such as those highlighted in the "The Woman Who Turned into an Owl." This ethic seems to have broken down somewhat as Sitka has grown into a small city of 8,000 and plays host to the herring sac roe and other fisheries which bring large numbers of boats from out of town during herring spawning. Theft of branches has increased, such that local Natives have adopted strategies of either boldly marking (with named buoys) or camouflaging (by removing buoys and submerging) their sets so that they will not be stolen (Schroeder and Kookesh 1990). In addition, representatives of the Sitka Tribe Herring Committee have begun to engage in monitoring activities of the most popular herring egg harvesting sites during the 2009 fishery, such as Crow Pass, both to monitor the quality of the spawn and to discourage theft. Similarly, the Tribe has for many years been monitoring

the sac-roe fishery to insure it is carried out in ways that minimize potential impacts on spawning.

### **Using LTK and Historical Ecology to Assess Healthy Spawning Areas**

In every community we visited we listened to people describe how herring had declined in the days of the reduction plants and failed to fully recover. Martin Perez sums up the situation for southern Southeast Alaska,

Well, the herring population now is just a drop compared to what it used to be. We had herring all through here, all through the—so far south, we went through herring: schools and schools of herring in my young days. Even as far down as—I fished down, way down, all the way down to Washington, Oregon. But the herring up in this country all the way down into Hecate Straits—that's Canadian waters--all the way up to above Juneau and all over. I remember when there was schools and schools of herring. Now we don't see that any more.

Like many elders Mr. Perez takes a long view in his assessment of the herring stocks, going back at least since the 1920s. This was just on the cusp of the largest catches of the herring reduction fisheries (1929 being the largest recorded). At the same time, other critical events in the marine ecosystem, such as the widespread implementation of commercial floating fish traps and the recovery of some marine mammal populations, were beginning to have impacts. Herring have come back to some extent in places, as will be seen in the area chapters that follow, but typically not to the historic levels which elderly fishermen remember first hand, and certainly not to the levels described in the early ethnographic literature, where visitors remark on going through herring schools for hours at a time, or viewing them across straits and channels for as far as the eye could

see, observations echoed by elders we interviewed. More analysis of the early commercial fishing period is presented in Chapter V.

In his assessment of the potential for “Integrating Fishers’ Knowledge into Fisheries Science and Management,” McGoodwin (2006:180), following Pinkerton (1994:319), cautions,

Fishers’ knowledge is more amenable for incorporation into contemporary fisheries science and management when the historical record shows that the group having this knowledge responded constructively to resource depletions in the past. Evidence of constructive responses might include, for example, willingness to participate in self-enforcement and self-monitoring, as well as willingness to work cooperatively with regulatory authorities.

The fact that these elements are present in the Southeast Alaska Native case leads one toward optimism, but there are important obstacles that remain to successful linking of these paradigms.

The first obstacle is that Tlingit resource management practices for herring and other fisheries have been largely unrecognized to date. Particularly in the case of herring, these fish have been treated as a superabundant resource, which Natives had no practical means of depleting and thus no incentive to manage. Indeed this was also the non-Native perspective in the early days of the commercial fishing, when supplies of herring in the North Pacific seemed endless.

A second obstacle is the fact that many of the principles of sociopolitical organization and spiritual life of Southeast Native groups, such as the Tlingit, which underlay the management system of herring, have been undermined by the state, their authority usurped or even thwarted by competing economic interests, world views, and state authority. A full treatment of this issue is beyond the scope of this study but is taken up in others (e.g., Thornton 2008; Langdon 1989).

A third obstacle to successful integration is that Natives and small-scale fishermen do not necessarily have the same objectives as to *what* ends and for *whom* herring should be managed. These are questions of political ecology that affect managerial priorities and views. Fish and Game management biologists are under political pressure to manage fish stocks as commodities to produce a *maximum sustained yield* for commercial exploitation. Their job is to develop a model that will allow commercial fishermen to take as much biomass as possible without compromising overall supply of herring. Considerations for human subsistence and for other species in the ecosystems, either their needs or their impacts, are minimal. In the case of the sac-rope fishery, the overarching objective is to put 51 commercial fishing permit holders onto sufficient quantities of “ripe” herring—i.e., with mature roe sacs which bring maximum valuable on the Asian markets—to make commercial harvest efficient and economically beneficial. The fact that sac roe harvests destroy the herring, while subsistence egg harvests do not, is immaterial, so long as yields can be sustained. Similarly the temporal constraint that sac roe harvests must *precede* subsistence harvests means that subsistence users cannot receive priority consideration (except in spatial terms, through the creation of non-commercial fishing or subsistence harvest zones, which has proven infeasible in state waters). Similarly, the notion that disturbing the spawning grounds to capture herring with mature sac roe may adversely affect the spawn is of little consequence, unless the effects can be proven scientifically to have a detrimental impact on the future biomass, which, in turn, would harm the commercial fishery. It is not a holistic or ecosystem-oriented model, but rather one of economic maximization. The models lump all non-commercial fishing mortality as “natural mortality,” which cannot be controlled. As a consequence such mortality factors as disease, predation, or even subsistence harvests are not modeled (in time or space) or fine-tuned for local conditions of predation, disease, habitat, or other variables. The lack of a fine-tuned spatial

prescription for exactly when and how the harvest should be removed in order to minimize ecosystem impacts is perhaps the greatest weakness of the present management regime (Fritz Funk, pers. comm. August, 2009). Similar constraints govern the herring bait fishery and most other fisheries in the state.

In contrast, Tlingits tend to advocate foremost for a management model that produces a high quantity and healthy quality of herring spawn to insure a proper food supply not only for local subsistence needs, but also for the needs of other species that depend on them, such as salmon and seals. This view is epitomized in the following statement by Al Wilson of Sitka.

I'd just like to stress the importance of the herring as a food supply. The herring biomass is in danger of collapsing. The Fish and Game by their own reports say that the biomass has diminished in the last two years, yet their harvest increases. They say things like while they've moved their bait fishery to Sitka from Tenakee saying that the herring are no longer available there. They don't know why. They just move. That seems to be their answer. I was raised in a place called Auke Bay and they had a tremendous herring harvest there until they opened up the area to seining, harvesting the herring for roe—sac roe. Herring biomass is completely disappeared. It's never come back. I know places like West Behm Canal. The same thing has happened. I know the areas around Hydaburg. ... near Klawock has diminished tremendously. The herring roe that comes in there is very small. Normally we used to get herring roe from that area before they had a harvest in Sitka. When we were living in Auke Bay the herring harvest would occur earlier in Sitka than where we harvested in Auke Bay—it'd follow that. The harvest of the eggs on kelp and branches—we know they're getting smaller and smaller and they keep raising their quota and going after more and saying that the herring stocks in Sitka Sound are healthy. We know otherwise. We

know all these areas of spawn that they have on their spawn map does not mark or in any way denote a healthy spawn area where you could set out branches and harvest herring eggs. You go there and just find a smattering of eggs and a lot of coloration in the water—there's miles of spawn that is, to me, meaningless. Even when you look at past spawn maps—early, like around [19]68, there substantially more miles of spawn then. It seemed to me that from that they could see that the herring biomass is getting smaller. I'm really concerned. That's my biggest concern that the herring biomass will collapse and I know that when that happens it will never come back. At least not in my lifetime.

Unless these models can be reconciled, the prospects for successful integration of LTK and into contemporary fisheries management may be limited. We return to this issue in the Conclusion and Recommendations section.

### III. THE LIFE CYCLE AND ECOLOGY OF PACIFIC HERRING<sup>1</sup>

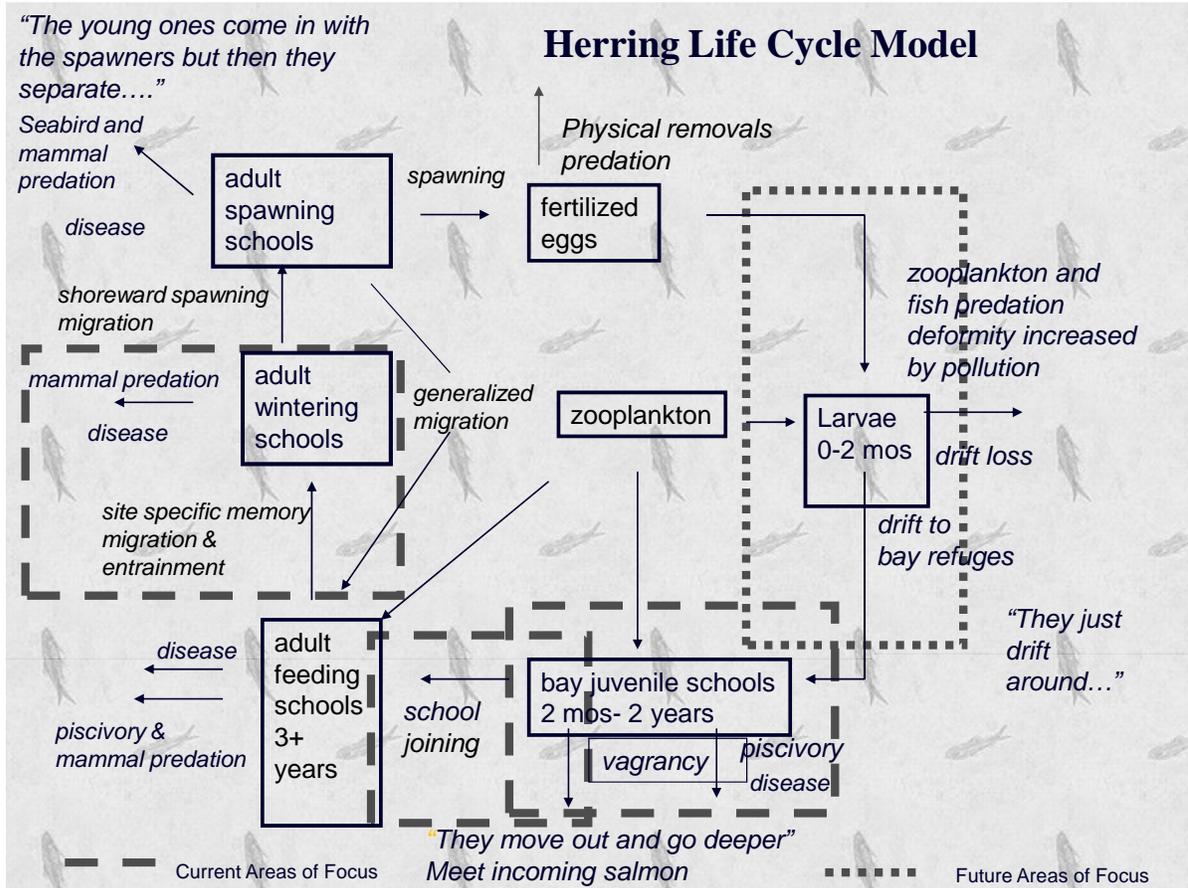


Figure 3.1. Herring Life Cycle Model (adapted from Brown, et al. 2008) with selected LTK quotes

Pacific herring are a critical foundation of the marine food web. They are pelagic fish of the Clupeidae family, characterized by their spectacular quantities and schooling behavior. Brown and Carls (1998:1) observe:

Few species are of greater combined ecological and economic importance in Prince William Sound (and in many other coastal ecosystems) than is the Pacific herring, *Clupea pallasii*. Herring of all life stages are central to a marine food web that includes humpback whales, harbor seals, a large variety of marine and shore

<sup>1</sup> Primary author: Thomas Thornton, Department of Anthropology, Portland State University and Environmental Change Institute, University of Oxford.

birds, bald eagles, jellyfish and other invertebrates, and an array of other fishes, such as pollock.

Herring eggs, meat, and oil have also been critical to human subsistence and commercial fisheries, especially eggs which arrive in spring before the major salmon fisheries begin.

Herring range from the Baja peninsula in Mexico to the Beaufort Sea on the North American Pacific coast and from Northwest China and the Korean Peninsula to Japan and Siberia on the Eurasian Pacific Coast. They have been exploited throughout their range for centuries by both subsistence and commercial interests. Pacific herring are distinct from Atlantic-Scandinavian herring (*Clupea harengus*), which inhabit the northern Atlantic and also have been exploited for centuries. One key difference between the species lies in their spawning behavior. Pacific herring spawn demersal adherent eggs on shallow subtidal or intertidal vegetation and substrates in the nearshore areas of sheltered bays, while Atlantic herring may spawn further offshore and let their eggs sink to the bottom. Herring spawning among Pacific stocks tends to be concentrated in the late winter and spring months, along a northward latitudinal cline (Lassuy 1989) sometimes referred to as the “silver wave” (Lewis et al. 2007), whereas various Atlantic herring stocks are spawning nearly every month of the year. The two species also have different diets, though both rely on endemic species of plankton and copepods, the abundance of which forms a limiting factor on populations. Healthy herring schools can number in the millions, or even billions of fish, thus contributing massively to the conversion of the lower trophic biomass. In turn, Pacific herring females carry from 7,000 to 30,000 eggs, depending on their size, approximately 90 percent of which are deposited between -5 and +2 meters mean low water (Brown and Carls 1998:2), providing rich fodder for marine, terrestrial, and avian predators at higher levels of the food chain.

Despite their importance, relatively “Little is known about the larval and juvenile biology of herring in Alaskan waters. Overwintering areas, feeding areas, migration routes and stock definition have yet to be established” (ADF&G 1985: 340). LTK has the potential to contribute to our understanding of these critical phases of the herring life cycle. Thus, our LTK interviews included questions on various stages of the herring life-cycle, the basic phases of which are highlighted in Figure 3.1. Predictably, given fishers’ interests in herring spawn and the observability and scale of spawning events, the majority of observations we collected were centered on this last phase of the life cycle. Comparatively few observations were made of the earliest (larvae) phase of the life cycle. Similarly, we recorded limited LTK of the habits of juvenile herring after they move offshore, though with the advent of winter bait fisheries and fish finding equipment, capacity to track this phase of the life cycle has increased. The following sections outline some of the key observations made by interviewees for each phase of the life-cycle. These observations also reference critical overwintering and feeding areas and migration routes, which are taken up in more detail in the area review (Chapter 6).

Consistent with project objectives, whenever possible LTK observations have been linked to specific places and time periods in the accompanying GIS database. This way, changes in herring ecology can be assessed at a regional level over time and in relation to archeological records (Chapter 4), historical patterns of commercial fishing (Chapter 5), and other socioecological factors (Chapters 5-6), such as climate change, development, and other activities.

#### *Larvae Stage (0-2 Months)*

Herring eggs, which Tlingit term *haaw*, hatch into larvae within two to three weeks of fertilization (Lasker 1985). For this reason, eggs must be gathered within a few days after spawning, before significant incubation has occurred. Because herring

typically spawn in “waves,” sometimes over a period of several weeks, not all eggs hatch at the same time. Larvae are distributed according to local current patterns, winds, and vertical migration, generally down during the day and up toward the ocean surface at night. Larvae have little capacity for propulsion in their early stages, so survival depends on their ability to ride stable currents toward relatively protected areas, such as bays and kelp patches, where they can feed and grow (Lassuy 1989). They are aided in their odyssey by a yolk-sac (McGurk 1990; Brown and Carls 1998) which provides critical nutrients and ballast during the first critical week of this vulnerable stage in the life cycle.

Tlingits refer to a special wind, the “wind of the washing of the spawn,” which typically arrives shortly after spawning and blows the fertilized eggs off the beaches and allows the herring to survive. Al Martin (Juneau), a T’akdeintaan originally from Hoonah commented:

It’s called the ‘Wind of the washing of the spawn:’ *L’uk’ eeti.oosk*. I never heard about all the biologists talking about how the herring had to be washed clean from the beach so the herring can survive, all of the herring; but the Tlingit knew for centuries.

Harvey Kitka (Sitka) notes that this wind used to be more predictable vis-à-vis spawning than it is today, a fact that may be attributable to climate change.

[I]t used to be we’d get—once the herring were through spawning—within three days after spawn, we’d get a big storm. And as the waves go, just like big circles in the water, they shake the eggs loose, and it also helps how many will hatch out ... that was nature’s way of getting more. Now we don’t get storms like that anymore. It used to be about three days after that spawn.

Those eggs stranded on the beach or laid too deep offshore do not survive to the larvae stage. Harvey Kitka observes,

And according to the old Indians--my dad and some of my uncles that talk about it--six feet above the low water line and almost three feet below, those are the only ones [herring hatchlings] that swam away. Anything deeper than that or anything shallower than that died.

Aware of this, some Tlingits targeted non-viable eggs in the zone lying more than 3 feet below the mean low water line for egg harvest, as a means of conserving the viable stock in the “survival zone.” (Setting above 6 feet is not practical given the presence of birds and other predators.) Harvey Kitka states, “ Well, that’s why when we set our branches it’s three feet below the minus tide because it didn’t bother the stock at that point.” Another strategy was to select particularly thick eggs, the innermost layers of which were considered non-viable due to the milt not penetrating more than several layers.

It was also a custom among some Tlingits to transplant eggs laid in the non-viable zones to places where they were more likely to survive, or to areas they wish to see revitalized or re-populated through “seeding.” As Harvey Kitka explains, “I believe there’s a few other people who have started to do that. ... Some people are trying to take some back in Deep Inlet and other places,” effectively to restock those areas. Transplanting was also carried out on eggs considered too thinly laid for eating. Harvey Kitka further explains, “I take some of the branches ... some of the thinner ones I get, and put it [in areas that need re—populating]. They claim that the herring will survive out of water for almost three days. As long as you get them back in the water they’ll, within three days, they’ll swim away.”

His father, Herman Kitka Sr., a Sitka elder born in 1914, adds:

It seems like the one that the tide uncovers—the one that minus tide uncovers are the ones that survive is what the old people said. And the one that

ordinary tide uncovers never survive and the one in deep water never survive. I don't know what that light [exposure to sunlight] had to do with that.

[It] seems like ... just a certain belt survive everywhere where they spawn. Herman Kitka suggests that failure to receive enough light may prevent eggs from hatching. On the other hand, too much light does not appear to be an inhibitor. He reported on a friend of his who transplanted

a whole pile of them [eggs on branches] from here [Sitka Sound]. Had it on the dock for one whole day [for distribution to people]; They didn't take them all, so he tied lines to move them [back into saltwater] and they all swam away [i.e., hatched]. So it didn't hurt to be in the light.

A related factor consultants identified as limiting the viability of herring eggs is the thickness of their layering, which too may correlate with access to light or critical nutrients. Ralph Guthrie, an elder from Sitka, observes:

We always get these stories [about how thick the spawn is at lower depths] because they [Fish & Game divers] dive on these eggs. If the herring spawn and get that thick [about 3 inches], only this much [about 1-1.5 inches]—only this much hatches, the rest of it dies. ... I think what happens, when the eggs start dying and getting rotten, it kills the rest of them. And one of the reasons I know this is because a lot of times after the season I take and haul the trees out that wasn't harvested, and the trees would be covered with eggs, but they would be black. So, if you get a big spawn where you have deep, you know, deep eggs, it doesn't mean you'll get a good return out of it. And what does help, is if they get a storm and it breaks up those eggs. It gives them a chance to get the oxygen they need.

This may be one function of the “wind of the washing of the spawn,” that Tlingit elders reference.

As noted above, many Native harvesters prefer thick spawn to thin spawn, and will select for it. In some cases it was reported that branches with thin spawn would be left in place, transplanted or otherwise positioned favorably so that the eggs would hatch successfully.

Matilda Kushnick, a Tlingit elder from Saxman raised in Klawock, notes that

Hydaburg never had any herring [herring spawns]. ... Our tradition is [that] some old person had to tow a tree all the way to Hydaburg. You know that spawn? They spawned on that. And they towed it there. And then it spawned in Hydaburg. That’s how they started getting herrings. ... I was a kid when they towed it down to Hydaburg”

Herman Kitka recounted a similar version of this transplantation story:

They done that [transplanting] at Hydaburg. They took it from Klawock area: Craig. ... As they were building up they kept getting the ones [eggs] from deep and putting them in shallow water. ...They took kelp from the deep water. ... Some of the kelp that was fastened to rocks, they picked it up and moved them. ... That’s the one Joe Demmert, telling the Haidas, they want the rock back. Joe Demmert Sr. comes from Craig. That’s where they took the herring. So that wasn’t long ago. It was after they moved. After the United States took over, they moved from Howkan into [Hydaburg]—and they used that white’s man name for a village: “Burg.”

Matilda’s Kushnick’s brother, Franklin James, also successfully transplanted eggs. He stresses that when they tow herring eggs they wait until the milt cures the egg, until “the eyes were almost forming on the egg.”

And you don't want to tow thick eggs because it's a waste of time because the milt only penetrates about four layers at the most of eggs and then it goes through it and so the rest is no good. They're not going to hatch. That's what they did there. They towed it down on the canoes. My brother, the reason I know it works, my brother Benny took some out, you know, going through Launch Pass [Near Noyes Island and St Joseph's Island]. Right where we anchor up in the little bight. My boat can barely fit past barely moving. . . and I seen the herring coming in. I wasn't there when they spawned but I can see the herring there now. Seen the small ones. I dip some there: small herring that moved in there. ... [near] St. Joseph [Island] there. ... that's what we would call Launch Pass and we transplanted some there. ... That was before our grandfathers' time I think.

Some interviewees believed that it was best to tow herring eggs in the water when transplanting, otherwise they would not hatch (Marvin Charles); however, this may apply only to the more mature herring eggs Franklin James references. Others have had success in removing eggs from the water for transplantation and merely keeping them moist, clean (of oil or debris), and perhaps partially covered from exposure (Clarence Jackson).

Perhaps more critical to herring hatching than light or constant immersion is temperature, which affects not only survivability but the length of the incubation period. The gradient of temperature from south to north determines the average length of the incubation period in the North Pacific. According to Brown and Carls (1998:2):

In PWS [Prince William Sound], eggs incubate for about 24 days compared to only 14 days in British Columbia. Egg loss due to wave action and predation can be up to 90 percent. Of those that actually hatch, it is not uncommon to observe 50% or more with morphological abnormalities.

As Tom Copeland of Ketchikan points out for Southeast Alaska:

Their whole life cycle is dependent on water temperature. The warmer the water--it'll be anywhere from 11 to 22 days to spawn to larvae stage. So the warmer it gets, the better it gets. They'll be on there—remember on this time, they're on the beach, you've got as high as 60% bird mortality. Just—so if you get on there and get off and the tide hits and these little guys are gone.

A variety of seabirds prey on the spawn and spawned out herring. Most voracious in the pre-hatch phase are the gulls, especially the Glaucous-winged gull. In Tlingit legend it was this gull that alerted people to the presence of spawning herring and named them. According to Herman Kitka Sr., “My dad says it was the seagulls that named that herring. ‘*Yaaw*’ is the noise they make when the herring’s around...that’s what the Tlingit call it: *yaaw*. “ As they spawn, the gulls eagerly feed on the eggs, especially those exposed by receding tide or washed or blown to shore. Thousands of gulls will collect near herring spawning areas and work the beaches, calling “*yaaw*.” The gulls tend to distribute themselves over space, so as not to exhaust any one area. Ravens may also work the beaches in pursuit of spawn (Kake Focus Group). Eagles, on the other hand, generally eschew the spawn in favor of the adult herring, especially those weakened or vulnerable from spawning, which may hang close to the surface and be targeted by the birds. Other seabirds, such as surf scoters, tend to raft into place offshore and feed on post hatch herring drifting about.

Another important factor in the viability of eggs is water quality. Contaminated water can prevent herring from spawning, or lead to deformed larvae. Contamination of spawning and rearing habitat was a major issue in the collapse of Prince William Sound herring stocks; researchers found it led to increases in larval deformity and non-viable larvae (Brown and Carls 1998). Pollution also has been an issue in Southeast. Floyd Peterson of Hoonah remembers in Port Frederick:

[It] was a year or two after they built the harbor the herring came in here and spawned on that creosote piling and of course all the roe turned black, you know, that fresh creosote. It all fell off. Hardly any of it probably hatched. ... Since then, no herring spawning ... the herring are in there, but they don't spawn there.

Similarly, Charles Skultka remarks on the impacts of contamination of spawning and rearing habitat at Silver Bay by the Alaska Pulp Corporation mill that operated there from 1959-1993.

I think I can say for sure, I can say the mill was detrimental. Yeah, I've lived here through the mill's being built and I watched it go away. But during the time it was here, even though people didn't admit it, we had fish kills in the eastern Sound that virtually had fish all over the beach like from Silver Bay, all the way to Baranof Point. And for what I've seen, they had a chemical outlet there. They called it a red liquor. They'd treat the red liquor and they'd dump it into the bay there right at the end of where Silver Bay Seafoods is now. Matter of fact the yellow boom is still there. And that treated stuff would lay there for years and then it would start bubbling and we'd have a fish kill. And I don't know that they've ever cleaned it up or anything, but we haven't had a fish kill in a lot of years. They shut the mill down and there was never a spawn up in Silver Bay, the whole time the mill was there, up until several years back when—ten years ago, twelve years ago. And so, the mill not being there, allowed them back in there.

Yeah, because the herring would get to the mouth of Silver Bay and they'd do a turn and go right across to the opposite shore. They wouldn't even go in there. And I say that was directly due to the pulp mill being in the mouth of the bay. Yeah.

Nels Lawson, also of Sitka, adds, "One of our favorite places [for herring spawn] was Silver Bay, but not so much now. Not since they had the pulp mill. Too much toxic

material in the water. No kelp. No shellfish or anything. Very little [herring].” Silver Bay derives its name for silvery color its waters took on when large concentrations of herring spawned and reared there (Mike Miller).

Contamination may also come from other sources, such as motor oil, fuel, sewage outflows, or degrading metals or plastics (Ebbesmeyer and Scigliano 2009). For example, the Alaska Native Science Commission (2005:17) recorded the following testimony concerning the breakdown of army waste dating to World War II.

We found out that there was a lot of lead cable laid down during World War II around these islands in anticipation of a Japanese invasion. That line is copper and steel wire wrapped with paper then wrapped with lead. It’s on the bottom, and in most instances since our bottom is so rocky it’s hard to retrieve. When they left, they left it in place so you have these columns of lead influence on the shoreline around here. It happened pretty much everywhere, so there are miles upon miles upon miles of this stuff all over this place. The cable is degrading right here at Sitka where the herring spawn takes place, and abalone, and other shell fish harvest takes place.

Hourston (1980) identifies pollution, noise and damage to substrate as causes of poor herring recruitment.

#### *Post-hatch Larvae (up to 2 months)*

The most successful hatchlings are those that can drift into sheltered bays or kelp patches. During the day, herring larvae often will move down toward the bottom of these refuge areas. George Dalton of Hoonah reports, “they hang out kind of at the bottom where the kelp is ... there’s got to be some connection there. The kelp goes like the crab and everything else. ... Yeah, you see them at the bottom.” Key food sources in these patches include invertebrate eggs, copepods, and diatoms, and larvae survival is

dependent on an adequate supply of these foods and the impact of predators (Lassuy 1989).

Predation remains the biggest threat to herring once eggs have hatched. Harold Martin, originally from Kake but now living in Juneau, observes:

It's mind boggling to think how herring survive. From the time they spawn, the crows, the ravens, the seagulls, the eagles, sculpins, the trout, you know. You name it, they're all feeding on it. And when they hatch then the ducks and everything else are--you know it's surprising how any can come back at all. They're just so important to the total food chain, on every animal you know, in the sea. They feed everything. They feed everything. They're important to everything. We always—we've always felt—we didn't like the idea of commercial fishermen coming in and taking them on a large scale because they're very important to our salmon and especially king salmon, you know. And they feed our seals and stuff like that. Things that we're depending on.

This perspective was echoed by many others, who stressed the importance of herring in the marine food chain, as “being the feed for everything.” Even invertebrates, such as jellyfish, are known to feed on herring (Brown and Carls 1998).

As noted above, once herring eggs hatch, the larvae tend to drift at the mercy of wind and current with minimal propulsion. According to Herman Kitka, they are especially visible,

just on the surface. You can see them like little flies making motion in the water. There's little eggs [sacs attached]. When you pick them up; I had a cheesecloth laid into a scoop; I picked some up when—talking to Jim Parker [Fish and Game biologist]--I told him that the salmon, it comes out of [it] the same; that's what

they feed on: the eggs, herring eggs [sacs] that are still attached to the little herring [larvae]. And yet they swim on the surface. ...

He took some salmon and examined them [gutted them] with the herring that was inside of them: those little salmons. They're only that big (finger size), the salmon when they come out of the river.

Similarly, Gordon Greenwald of Hoonah notes in spring, "sometimes you'll catch salmon and they'll—their stomach will be just full of [little herring]. Charlie Skultka adds:

They drift. I see them, like they're right up against the beach, a lot of them. And oh, geez there's umpteen different predators ... I've watched this cycle, ok. The herring come in, they spawn. Got these little babies swimming around there. And they're there. I see them every year, but the seagulls feed on them, the ducks feed on them, the Dolly Varden feed on them. After they get a little bigger, bigger fish feed on them. They run this whole gauntlet, and I've been out here picking my eggs in March and April. And that's when the humpy fry start. I've watched little schools of humpies like there might be two hundred in a bunch. They come across spawning herring and the spawning herring will eat the humpy fry. So it's a vicious circle. Yeah, but we have such a good spawn here.

Both young salmon and adult salmon will feed on herring. Harvey Kitka of Sitka, observes:

We see ... the little chums [or dog salmon, *Oncorhynchus keta*] when they come out, they come out just about the time the herring are laying their eggs and we watch them; they'll be eating the eggs as well as the herring that are between the larval stage and [the juvenile stage]—they haven't got the ability to swim yet. They just move with the wind. And you can see them. They'll feed on those. But the [salmon] are not the only ones feeding on them; you got all the other codfish, and black bass and ducks, seagulls.

Dog salmon predation on herring was also commented upon by members of the Ketchikan Focus Group, including Dennis Diamond, who points to the impact of hatcheries:

One thing that, that really tops the vine with me, is when the Neets Bay Hatchery for instance. They put all their eggs up there; there's all these dogs [salmon]. They say dogs don't eat herring well they're full of shit. They do. And they eat lots of them. Nobody ever planned on all that mass of fish [returning hatchery fish] coming back through. And I think that's got a lot to do with it too, you know, because when those fish come back, they come back in serious numbers and we never had those before.

Predation of larval herring by salmon, including hatchery salmon, was remarked upon by numerous interviewees. Jeff Trimmer of Craig notes:

When they hatch I have seen them move around. They stay, you know, right around kelp and stuff [like in Kelp Bay or out at San Fernando] ... for a little while and you always see them jumping around. You can always tell when the salmon are around because they'll boil up and stuff quite a bit ... the fish boil out of the water, [when] there's king salmon or cohos or whatnot. Mainly, that time of the year [spring] is king salmon.

Burt Cosgrove of Klawock comments:

All these things were done by Fish and Game, you know. You used to be able to walk over the salmon between Craig and Klawock. Then they put the hatchery in and there's no fish for them up there anymore. They're saving all the trouts that are eating all the herring, eat[ing] all the [herring] eggs. ...

[If] they took that hatchery out of there, we'd have a lot of fish come back. Why can't they see that?

The locating of salmon hatcheries in the vicinity of important herring spawning and rearing habitats has been a source of concern in Sitka too. Al Wilson, a Sitka elder who lives on an island not far from where salmon are raised by Medvejie Hatchery at Deep Inlet (managed by the Northern Southeast Regional Aquaculture Association, or NSRAA), remarks:

Right in Deep Inlet. All in here. And some places there's né [hair kelp] . . . High quality. ... [T]here's a place called Sandy Cove and it's in front of that; you don't want to get in the sandy areas; you stay on the rocky points. You do really well. We did really well. Again more the east of Deep Inlet there was a cove called Deer Cove it had high quality and high quantity né. Five minutes right from the house, I'd set my branches. When I harvest I would be 5 minutes from the dock. That ADF&G allowed NSRAA to put a hatchery--there are pens here in Deep Inlet and reading their application for the rearing pens and for Medveji Hatchery over in Silver Bay ... the terminal harvest area [for the hatchery fishery] was Deep Inlet and in fact what happened [is that] there was so much return that they--by emergency order they opened up the area up from Silver Point. Error Island, Emgeten Island, Cape Baranof was all open to gillnetting and seiners. There was a trolling day there but no one ever trolled it. You had better trolling out front. About three weeks after the herring spawned in this area they released the fingerlings from the rearing pen. Of course they went out and just wiped out the herring, the larvae that spawn that had hatched just a week ago previously. ... From that point on we saw it diminish, diminished return on the herring and we weren't getting any--no longer getting any eggs on branches or any né [hair kelp]. There was a herring pot [also known as a herring pound] in ... Aleutkina Bay ... And this arm that goes back in there is called Leesoffskaia Bay on the nautical charts.

Given the importance of bays like Silver Bay as refuge for larval herring and rearing habitat for juvenile schools of herring, Mr. Wilson finds it hard to “understand why they’d put a hatchery right in the middle of Silver Bay. And you argue that and they ignore you and put another one in [nearby] Sawmill Cove.” He favors dispersing the salmon hatcheries and the commercial herring fisheries away from core spawning and rearing habitats and subsistence areas:

I think like the hatcheries they could disperse them away from downtown. The fishery, the herring fishery that’s open is all of 13B, and it goes to Cape Aspid down by Necker Bay, all the way up to, all of Sitka Sound. The little subsistence area, is just a small portion for that. They could disperse away from that area and hopefully the herring would come back and we would have our harvest area back.

Along with salmon, herring hatchlings face an onslaught of seabird predators. Gulls are joined by rafts of surf scoters, which can be found following the “silver wave” north. These birds can be found “hanging out in the tidal wash, and you know that there’s larvae or something coming off the beach that they’re out there feeding [on]” (Andy Rauwolf). Beyond scoters, other noteworthy comments on seabird predators include the following:

Obviously all the birds: ravens and eagles and seagulls. Let me think what else preys on [them]—bald eagles. (Roby Littlefield)

I was amazed at the abundant wildlife in and on the ocean. Huge flocks of seabirds could be seen working on schools of herring. (Rochelle L. Rollenhagen 1993)

[W]hen I was a kid, we used to have a tremendous amount of bluebills. ... They fed on herring. They’re a bottom—they’re a diver duck. (Fagan Skafalstead)

At this stage of the life cycle, marine mammals, including whales, seals and sea lions, also continue to prey on young herring. Some local observers see a correlation between declines in the quantity and size of herring with the health of local harbor seal populations. For example, Al Wilson notes:

Yeah, we have some seal haul out rocks right in front of the dock. And they seem to have diminished in number. I'd like to get one of the harvested seals in that area. They say the fat layer on them is not as heavy as it used to be. And they think this is from the herring, the lack of herring. When the herring, when they go, small herring look for a place to be reared ... in deep bays like Silver Bay, Deep Inlet, and they go into very deep water. Seals can go after them. The seals, Herman told me that he saw a seal and his mouth was full of herring, but the herring were just small herring. And they believe the herring overall are getting smaller. The oil content isn't as high as it used to be because, it isn't as high because of that. <sup>3</sup>

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<sup>3</sup> While some of our interviewees emphasized salmon hatcheries impacts on localized herring populations, and thus the supply of oil-rich herring for local marine mammals to consume, Owen James, a Kake Native now living in Hoonah, shared his belief that the poor quality of hatchery salmon themselves also impacts on the quality of seal meat and fat:

My theory is just watching the fish hatchery fish that are coming in and how bad they are. I say, how bad they are because when you go get the—you can tell a fish hatchery fish from the fish that naturally spawned because you go to hang your fish in the smokehouse to dry it and wake up in the morning and all your fish—all your meat is laying on the floor and just the skin's hanging. That's the fish hatchery fishes, how we always tell our—and when you go to jar them, you put them in jars, the fresh ones, the ones that are naturally born looks real nice in the jar but the ones from the fish hatchery settles to the bottom. It looks like mush on the bottom of the jar. The rest of it looks like water. And I shared this with them, I said, 'You're asking me about seal hunting and why the seals are diminishing so much. To me, that's one of the reasons right there. Because of the

As they mature, herring larvae eventually shed their yolk-sacs and become dependent on other food sources, particularly invertebrate eggs and zooplankton (Brown and Carls 1998). At this stage the viability and distribution of herring schools becomes more closely tied to the bounty and distribution of critical food sources, such as krill and copepods.

Eric Jordan, a troller from Sitka, comments on the important relationship between zooplankton, krill, herring, and king salmon.

What happens, and it's just amazing how this all coincides, the herring spawn in April, late March and early April. And the spawn-outs, you know, they're weak and they drift out into the Sound and out toward the Cape and at the same time the krill hatch comes on. And so then we have all these little krill which are just ideal feed for the herring. So you've got these spawn-outs that are kind of weak in condition. The king salmon come up and into the Sound to feed on those and also to feed on the krill. So when we're targeting king salmon this time of year, the king salmon are feeding on krill and herring. They're changing from worms and an occasional herring and not eating much all winter, to they're starting to also feed on the krill and the herring. So you've got this krill hatching this time of year. You've got the spawn-out herring starting to feed on that. You've got the king salmon coming in and feeding on the herring and the krill. So we're looking for these schools of herring and schools of krill this time of year from the line at the Cape [Edgecumbe] in, all over the Sound. And wherever there's any concentration of those, we'll fish king salmon. So we're, as trollers, as salmon

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fish hatchery fish.' I said, 'How long with the fish from a fish hatchery last inside of a seal's stomach if it won't last this long.' Because I cooked some fresh fish up one time and jarred it and, like I said, inside the jars you can see it just turned to mush and all settled to the bottom. How long will that last inside of a seal? It'll just run right through.

fishermen, we're paying attention to where those herring are; every day we go out. ...

The krill are starting to bloom now and the herring will start spawning. ... It's an amazing biological thing. As the days get longer and as the sunlight penetrates and the water warms up, the zooplankton start blooming and the krill are eating the zooplankton and the herring are eating the krill and on and on.

[The krill population] seems to vary from year to year, but we don't have any quantifiable way to measure that. Some years we just notice that—and this year there's already been some krill bloom. In the last few years it seems ... like there's been really healthy krill blooms. The Sound has been alive. And I think there's a correlation between the mill closing in [19]95 and the productivity of Sitka Sound. I don't know, it just would be pure conjecture but boy, I'll tell ya, the Sound has been—it's an amazing. When you think of all the salmon and herring and stuff that's been coming out of the Sound the last few years, it's an amazingly productive place.

Herring compete for krill with whales, salmon, and other fish. The increase in humpback whales in recent years may have come at the expense of herring, according to some observers. As Andy Rauwolf notes:

There are an estimated 700 humpback whales in SE Alaska and that's probably low. In the early 60s, in '62 or in '68 there was 62. And so how many times has that population multiplied and doubled and redoubled and redoubled and our hatcheries are still pumping enormous amounts of salmon into the system and there's a huge amount of competition out there for a diminishing supply of feed. And that's what the problem is that nobody really factored in and planned on.

Consultant #23, a commercial herring fishermen from Petersburg, adds: "You know, it's more likely their numbers [are higher] right now than it was 30 years ago, but we know

there are an awful lot more. And those guys eat herring. They also eat humpies, little fry: we've been seeing them. And we're feeding them at Hidden Falls Hatchery: the chum fry."

Mike Miller of Sitka notes that humpback whales and sea lions will track herring as they return to Sitka for spawning:

Humpbacks, yeah. And the sea lions have stayed pretty constant I think. There's been some increase in them: not nearly as notable as the whales. I think it's settled into, it's not like in the 50-60 range that stay offshore here in the winter. In the late 80s there were probably 100 whales that were staying in the [Sitka] Sound. They'd over-winter up until spawning time. So, they definitely were responding to the herrings and putting you know I'd imagine a pretty big stress... The whale researchers you know estimate up to a ton [of herring consumed] per day per whale. And... anywhere in the 100 tons per day over the course of four or five months that adds up to a lot of fish.

Finally, another major factor in herring viability at this stage of the life cycle is larval drift (Brown and Carls 1998). Unfortunate storms, winds, or currents can move herring away from refuge areas and significantly diminish their chances of survival. As Mike Miller sums up, "For the first year those little fish, especially the first six months, once they hatch out are kind of powerless to swim against currents and they get swept into the bays by the prevailing currents and so these fish that end up from Middle Island, Kasiana and stuff and these big spawns they'll end up in Katlian, Nakwasina and places like that."

#### *Juvenile Phase (2 months – 2 years)*

By their third month, herring become more mobile and vagrancy increases as they begin to seek schools. Feed and protection from predators remain the critical

priorities for juvenile herring. By about 10 weeks of age, larvae begin to assume adult form, though they are not sexually mature until 2-3 years of age.

The importance of sheltered bays for herring rearing habitat is critical at this stage of development. As Mike Miller emphasizes,

The first winter they [juveniles] spend growing up protected in little balls up in these bays. ... I think it's pretty essential that they make it up into one of those protected bays. Also, I think the predation out in the--when they get split up and out, and beat up out in the open ... the survival rate is really low I guess on that. So these fish need to get up in those areas. And traditionally, I guess that, the way I understand it is that Silver Bay, the name Silver Bay comes from the young herrings that winter up there. ... That's the way it's been told to me, that they would just look like silver on the water up there. ... And it's interesting talking with Department of Fish and Game, as they've done a lot of their sampling and surveys in the winter, that there does seem to be a line. They were saying at the mouth of Silver Bay that there would be adult herring and then after that line which is right about where the mill was I guess. From up, further up they'd only catch little juveniles.

Martin Perez, a lifelong fishermen from Ketchikan, similarly observes:

Usually, there used to be certain areas where there were smaller [juvenile] herring, you know. . . [Besides Walker Cove and Boca de Quadra] They used to be over in Prince of Wales, Cholmondeley (Sound), Kasaan Bay. Any of those, you know, big bays, they used to be. There used to be a salmon fishery in them, but they're not there no more. They're all gone. No herring, no fish.

Local fishers report other small fish using these sheltered habitats, including sand lance, needlefish, capelin, and even sardines. Mike Miller relates:

And it was real rare to see them, but there's huge schools of sardines that came in the summer and they ended up over-wintering here. And they in the course of the between the summer and the winter, they didn't eat. I think they got trapped here with a warm current [El Nino?] and then it just got too cold in the winter and they didn't know what to do apparently. So I actually was catching those fish in some of these rearing areas while I was shrimping and catching these sardines and they had lesions on them and they were just barely moving. Definitely they didn't look good. I never saved any of them to bring them just to see what it is. But, definitely I was curious and worried that possibly if they got really diseased in the winter especially in these rearing areas for the juvenile fish up Silver Bay and Deep Inlet. I really hope they didn't transfer anything over to the herring at the same time. But they were just skinny, tough little fish: a lot of red lesions on them.

Small non-herring fish, even those which school, are visually distinguishable from juvenile herring because they lack the shimmering silver scales that give herring their "flashy" appearance. However, they may be mistaken for herring on technologies such as fish finders which do not capture these visual qualities.

Not all spawning habitat is suitable for wintering, in which case herring may move out of bays to find better habitat. Fagan Skafirstead of Hoonah observes that "once they get to a certain [juvenile] size," usually in late May, herring will leave Port Frederick:

They seem to shift out of here. The harbor was just loaded with them a little while ago. I thought they were fingerlings, but they weren't. I took a little scoop and I picked some up and it was baby herring about this long [1-2 inches]. ...

Matter of fact, they may still be in the harbor moving out. But I thought they were fry, but they were bigger than fry and I thought they were pretty big, so

I took a little scoop I had there and they swam, one swam and I looked, it was a baby herring.

But he also has observed that some juveniles stay in the bay during winter. “And there’s a few in the harbor too: a few herring in the harbor all winter long. But they don’t come to the surface until spring. You don’t see them ‘flipping’ in other words, until spring.”

These observations are consistent with scientific studies of this phase of the life-cycle as summarized by Lassuy (1989:4):

Juveniles may gather after their first summer and move offshore until maturation (Stocker et al. 1985) or they may remain inshore until their first spawning (Hay 1985). First-year juveniles that move offshore live mainly in water with depths of 150-200 m. Schools of immature fish (second and third year) are found in areas with depths of 100-150m (Hourston and Haegele 1980). These offshore “juvenile schools” appear to remain separated from offshore schools of adults (Haist and Stocker 1985). Age at first maturity is generally 3-5 years but increases with increasing latitude (Hay 1985) and decreases with increasing exploitation (Ware 1985).

Brown et al. (2002:81) report that local observers in Prince William Sound found that schooling juvenile herring often form tightly compact balls in contrast to adults, the schools of which may appear more like a “boomerang or ribbon.”

Predation remains a major constraint on survival during this phase. Marine mammals and fish continue to prey on juvenile herring, as do seabirds. Silver Bay, a premier wintering area named for its herring, carries the name *Kageit*, or “Loon,” a reference to the presence of these waterfowl (Herman Kitka), Loons are an important predator on juvenile herring. Dennis Diamond of Ketchikan comments:

I work at the Coast Guard base down the road here. But all winter right out in front of the Coast Guard base there’s been this flock of probably at least 300

loons. And I've worked here 20 years, I've never seen these things before. And they're out there in the channel all winter; they never left, and they'll dive. There'll be a couple of them that stay on the surface and the whole flock of them dives. And they're going down and what they're doing is they're eating on all these firecracker herring ... I know because I see them in the summer time come in along the dock there. You don't see the big herring. When I started here 20 years ago it was all big herring down there off the Coast Guard base. You don't see that anymore. It's all these little herring. You think about that flock of birds diving on those-it's not only that, there's been a whole bunch of sea lions been out there all winter too-but we got a serious predator problem.

#### *Adult Schools (3+ Years)*

Adult schools of herring are characterized by a mixed age structure, ranging from 2-17 years, though the higher age norm is typically closer to 12 years in Southeast Alaska. Adult schools tend to range more widely than juvenile schools, according to food supplies and shelter. When they are ready to spawn in near shore waters in spring, water temperature becomes a key constraint.

Because herring are migratory and disperse and mix at different times of year under different conditions, it is difficult to distinguish between stocks. Some biologists treat all of Southeast Alaska as one genetic stock (Carls, et al 2008) but other research, based on otolith sampling, which captures unique environmental chemical signatures in the bone of the inner ear, suggests that different stocks may exist even in relatively small areas such as between Sitka Sound and Salisbury Sound on the west coast of Baranof Island (Meuret-Woody and Bickford 2009). The very concept of stocks is problematic as they can be based on a number of different criteria from genetic relationships, to life histories, to management constraints. Eric Jordan comments:

We don't even know for sure—right now it's a big debate about whether the herring spawning in Salisbury are the same stock as the herring spawning in Sitka Sound. And there's some evidence that there may be multiple stocks spawning in Sitka Sound. And there's common ground amongst the herring fishermen and the tribal members and those of us that are observing is that they're, you know, the big genetic study says the herring are one big stock in southeast. Well, bullshit on that! You know, we—they may be genetically similar but there's different life-histories for multiple different stocks of herring. I mean to say that the stock spawning in Sitka Sound is the same as a stock spawning in Lynn Canal is just wrong. And so, but we don't have—there's just so much more to know. I mean, I'd love to flash forward 50 years and see how much more we know then than we know now. Hopefully we know some more, that we invest in some research and observation and the work you're doing is documented and put together so that we can use that to understand things better and to learn more. I mean, I talked to a pilot last year said there were tens of thousands of tons that they in the fishery last year, migrating around Edgecumbe. Where did those fish go? I talked to another herring fisherman and he said he thought those fish circled back and ended up spawning in the Sound. But there was no evidence of that.

Juvenile herring are recruited into adult schools at various stages, including before and after spawning. Young adult herring often hang around offshore while mature adult herring move to shore to spawn. As the spawned out herring move off shore and back out to sea, they may be joined by these young adults. As they move out toward deeper waters in late spring and early summer, herring meet the incoming salmon returning to their natal waters to spawn. The Tlingit "Salmon Boy," summarized above, describes the annual encounter between the outgoing herring and the incoming

salmon near Middle Island at Sitka. Herman Kitka suggests that herring and salmon schools migrate in similar, circular patterns, and that Sitka Sound is the main mixing area for spawning herring.

The old Tlingits say that the spawning herring comes in from outside. ... I done some study with the fur seals and seems like ... from Whale Bay up to Point Slocum, these stocks go in a circle. I don't know why they don't go clockwise, counter-clockwise along the beach and they go back out. Back down [toward Whale Bay]. ... So all the areas, and I don't know from how far south that ones that spawn that comes up all the way to Crawfish, but it's Crawfish. From West Crawfish, Sitka Sound it goes [to] Sitka Sound, [and from] Salisbury, and that's Point Slocum [it comes in from] ... and the biggest spawning area is right here, Sitka area. Because they spawn from Dorothy Narrows in here all the way. That's how come everybody from through Southeast will come here. Plus they can time how thick they want their eggs for drying.

Al Martin, originally from Hoonah makes a similar observation from the perspective of Cross Sound.

[T]he herring migrate from outside waters. And maybe the outside water's warmer out in the ocean in the winter and they come in. They come in through the—they circle area through Inian Pass and they come around [Point] Adolphus through that route. They almost take the same route as the salmon. We used to get them in our nets, even the seine nets, the big herring, the twelve-year old herring.

And I'm not against the commercial fishing per se today. ... But I think they're putting too much pressure and depleting the old herring: the twelve and the seven-year old herring run because they are mixing in Sitka. Sitka is the main area.

After spawning, herring leave the Sound as the “Salmon Boy” story suggests. Mike Miller comments on the patterns on the distinct exodus of the herring from Sitka Sound.

After spawning they take off. They disappear. It’s always interesting to watch because as soon as they’re done spawning they start breaking up immediately. And when you’re fishing you can tell on the sonar just from the return on how tight a school is if it’s spawned or hasn’t spawned. And it’s a real distinct signature the ones that have spawned. They’re really rapidly leaving the Sound whether it’s to go eat or whatever, but they’re getting out of there.

It may be that herring are seeking to avoid the schools of salmon predators that begin returning to the Sound in late spring.

Many consultants remarked on the mixed age of adult stocks. Al Martin notes, for example, that sexually immature herring will accompany older herring on spawning runs but will not spawn or will ‘spot spawn,’ thinly distributing their eggs in small areas in a way that fails to produce high quality eggs for harvest. In addition,

[T]here’s a seven-year old herring and a twelve-year old herring. And there’s also a three-year old herring. The three-year old herring—this is the legend. We know it by Tlingit story. The three-year old herring don’t spawn completely. They show the sign of spawn, but the spawn is sparse. The matured herring, only the matured herring, the seven-year old herring completely spawn and that’s the spawn they harvest in Sitka: seven-year old herring. And it’s immaterial to harvest the young herring at an early stage, they’re killing off the herring run prematurely.

The diversity of age classes within a local herring population contributes to its stability and resilience.

A number of interviewees commented on the fact that adult schools follow vertical migration patterns, both within a daily cycle, going deeper in daylight and rising to the surface in the evening. For example, Tom Mills of Hoonah remembers at Excursion Inlet in springtime, “Nighttime you could hear the water rippling with them coming to the surface. And now the only way you can see herring is set a herring net. But that’s always invaded by sea lions now.”

There also is a seasonal cycle to herring vertical movements. In winter herring often lay in deeper waters, especially troughs or depressions, before moving into the shallows during spring spawning and feeding closer to the surface during the krill blooms. Ralph Guthrie of Sitka observes,

You know, a lot of times herring will lay, you know—you understand that krill will lay, you know, there’ll be a depression and it’ll show just about straight. And that would be the krill laying on the bottom. Well, the herring would be in there feeding on that and other stuff. There’s—it seems like in the wintertime, you know the loss of the nutrients on the surface, the water gets clearer and in the summertime there seems to be more uplifting and it changes the amount of feed that’s there and the fish come up, you know.

In the wintertime, you know, they—probably the little bit of turbulence there keeps enough life going there to survive on. And you know, you see one of the indicators of, for centuries I think, is the squid. Their lifecycle kind of is over in the wintertime, you know. And I think it’s because of the lack of feed. So, you know, the next batch of squid starts showing up later on in you know, in April when you start getting little tiny squids and pretty soon you got big ones.

Herman Kitka observes:

A lot of herrings still hang around at the 50 fathom edge. I think they feed on that krill that comes to the surface from down there. And when we studied the fur seal too, we followed the herring going this way. And when they're migrating, the fur seal hit this school: they scatter. And that's where the biologists came up with the little ones have a hard time catching the scattered herring. That's how come they were starving.

From that study I got interested in if the sea lion follow the herring. They seem to follow the area herring only. They never go out of the herring when they're trolling outside, following the 50 fathom edge all the way up.

Harvey Kitka adds:

So many places had their own big bodies of herring. Crawfish Bay was one of the places that had a-that's a very deep trough; some of these bays-and Crawfish was notably one of the other places where they stayed all the time. It was one of the wintering places for the fur seal, but when they were migrating by they'd stop and feed there along with Silver Bay. One year they seined down in that area [for the commercial sac roe fishery] and there hasn't been anything that way in a long time.

At times schools of herring can mass large and virtually spread out across the ocean surface, especially in spring and summer. Harold Martin (H) and George Davis (G) of Kake recall,

HM: the herring used to go from Cape Bendel all the way out to Turnabout Island from there all the way, I think, right around Eliza Harbor.

G: Yes.

H: On down toward Point Gardner. ...

H: ... I was just a kid and very impressed when the[re] came about a nice day, calm day, you know, and just as far as you can see it's nothing but herring. Loud! Like a waterfall [they sounded as they surfaced]

Interviewer: What brings them to the surface do you think? Is it just feeding?

H: Just feeding on krill. There's a lot of krill in the springtime ... in Port Camden, you used to hear them at night. They would come up at night. During the day, you couldn't see them. They were down deep.

G: Yeah, it was when the tide was flood. When the tide was flood. You know, on the incoming tide, it brings up the, those feeds. The herring comes up with it.

Evidently another place herring will feed is off the fish waste ground up and discharged by canneries and processors. Consultant #23 of Petersburg notes,

Well, they used to be under the cannery here all the time when they were dumping fish right there. Now, everything has to be ground and piped out to the middle of the Narrows. It's not a good deal. I mean—of course they can still feed on that, but they're not where you can see them there. ... I was on the Advisory Board here for a while and I remember one troller or sportfish guy was just ragging on us about how there was no herring left here because he didn't see them under the cannery. I said, well geez, they quit baiting them. What do you expect? You know, they quit feeding you, you're going to go somewhere else too.

At times, especially in winter, herring will lay in the trenches, relatively motionless, perhaps not feeding much at all. Winter bait fishermen have become adept at locating herring schools in winter. Longtime Petersburg herring fisherman Nels Otness observes: "The bait herring was done in the wintertime and that's when the schools of herring were easier to identify. They schooled up so much better." Bait fishing, which had been previously carried out a small scale locally with herring rakes,

small gillnets, and hook and line, became industrialized after the war. According to Mr. Otness, “The cold storages got bigger and they got to be more demand for the halibut, black cod, the different fisheries, and then of course when that happened then the herring went right along with it: more demand for the herring.” Bait fishing was virtually unregulated until the 1960s, when a minimal management scheme was adopted to track how much bait was taken in various areas. Fishermen report that the scheme relied on accurate reporting of catch locations by skippers, who did not always comply (Ketchikan Focus Group).

Other important winter bait fisheries occurred in Seymour Canal, Tenakee Inlet, Meares Pass, Boca de Fines, Behm Canal, and numerous other areas, which are described in more detail in the area chapters. The comments below point out some of the impacts and management issues that developed with the bait fisheries; additional comments can be found in the area chapters.

Lawrence “Snapper” Carson was for many years a tender for the herring bait fisheries and explains how poorly they were regulated.

I know there’s a famous seiner in Ketchikan whose name is [PR, a non-Native commercial fishermen]. ... and [he] basically fished in George Inlet and Carroll Inlet just south of town. And I remember one winter when it had opened and there was a big quota for bait, a friend of mine [FW], a guy I knew came down from Wrangell and he wanted me to tend the fish to Wrangell and we went up there and. ... [PR], the guy that had been fishing would do a pretty good job. He’d try to cut off a chunk of a school and be able to get them aboard. In those days they were brailing. We didn’t have pumps. But anyway, FW made this huge set on these herring and they died in the seine. And that was pretty scary. Because I was made up to them and he was made up to them and we had to cut the line or it would have pulled the boats down. It was that big. I mean the net

didn't break, we cut 'er. And basically, I think after, there might have been a year or two after that but basically, that herring stock's gone and it never has come back. There's never been herring in George Inlet like that.

Another place that's interesting—I just looked this up because there was several years after that, the bait fishery opened in October and we were in North Behm Canal and there was a school of herring up off the Unuk River and there was RP, the same fellow that fished up here, he found them in Spacious Bay, and they were up shallow. And he made this huge set. And we loaded, well there was 240 tons. The interesting thing about that, we loaded two of my vessels, and we loaded his boat. ... Anyways, it was 240 tons of winter herring. I looked the other day. I have the article out of the newspaper. You know, sometimes when things like this happen, you really didn't want the general public to know. And it says that these herring were captured north of Smeaton Bay. Well Smeaton Bay's down [south] there 100 some miles. They were north of Smeaton Bay (laughter). But anyway, so I don't think--there are herring up there. But I think to take that much at that time out of that space was a small winter (stock), you know, I think we pretty much got 'em.

A similar event took place at Tenakee Inlet, though in this case, over a million pounds of herring were taken in a small area in the Inlet, but the catch was reported to Fish & Game as being "from all over." Tom Copeland, a long-time Fish and Game biologist from Ketchikan saw the problem from the other end, where herring he sampled from ostensibly different places looked like they came from the same place:

pretty soon I'm looking and all my data looks like it came from the same place. And so what was happening is, because they knew when we got close to the threshold—remember this is all on a 'Boy Scout' thing—they would say well, we caught some in Thorne Bay, we caught some in Kasaan, maybe Meyer's Chuck.

And so I'd work these up as individual areas, but the fishery was being hammered on one stock of herring. That's why all my data looked really good.

Bait fisheries also targeted herring by size, favoring larger schools. According to Mr. Copeland:

And you know they were big herring. You usually found the big herring where maybe the whales were or something. They [bait fishers] like big herring. But it became harder. And a lot of areas like Sea Otter Sound would open up some years and they couldn't get big herring so they wouldn't even get the quota out of there because they couldn't find fish big enough. Because everybody wanted big bait. And then it got to where, well, Sitka Sound get their bait and then you'd buy their bait the next year and there was a lot of mix, you know. So people finally just decided, well, we better get some bait. But originally they always wanted big herring for the crab fleet and the halibut fleet. That's what they look for.

Some local fishers believe that this bias towards big fish changed the stock structures significantly. According to Andy Rauwolf,

When I first started voicing concern about the size of the herring diminishing and the age, per age group over time, the stance that I got from Fish and Game was, 'Well that's an excellent sign of good recruitment. We got a lot of little ones.' Well, in a sense that is [true], but they weren't reading their own data that was showing that a five year old herring was 60% of the weight of a five year old herring, fifteen years previous.

This, in turn, can stress the reproductive capacity of a school and lead to stock declines or collapses.

The supply of krill and other feed is an important limiting factor on the distribution of adult herring. Floyd Peterson from Hoonah relates:

Yeah, they eat a lot of krill. And when they're flipping they're eating krill like out around Point Adolphus you see the little krill on the surface spinning and the herring come up and every flip represents a strike at krill. But they'll eat any kind of little tiny thing you throw overboard (laughing). Gold hooks, or whatever those are.

Karl Greenwald, also of Hoonah, adds:

You'll notice sometimes whales are out [at Point Adolphus]. ... You think, geez what the heck are they...? There's feed down there. That's why. ... but them herring are deep, you know. Yeah, they're not just a surface fish. ...

Port Adolphus here, [there's] ... a lot of krill out there, and the tide comes through Inian Islands and it hits Point Adolphus and the krill ... it circulates there. And that's the herring feeds on the krill, the whales feed on the herring and krill. But yeah, it's—you hear a lot about Glacier Bay [and whales]. It's not in the Glacier Bay, it's all Point Adolphus and the krill.

### *Predation*

Several interviewees noted that whales typically swallow herring one at a time. As Floyd Peterson of Hoonah points out:

A whale can't swallow anything much bigger than a herring. I've witnessed that. One time they were, there was one bunch feeding out at Point Adolphus, in the evening. Of course we see a lot of them now, and I was anchored out there commercial salmon fishing at the time and see this whale coming up under these balls of capelin that happened to be along the beach there. Pretty soon they come up alongside of the boat and he was shaking his head. ... Seagulls were diving on the capelin also. And then the whale was coming up with his mouth open. Pretty soon, he comes up alongside of my boat and he's shaking his head—or her head—

and I thought, ‘Geez, that’s weird, I’ve never seen a whale do that before.’ Pretty soon, out pops three seagulls!

Still, if a pod of whales targets herring for feeding the impact can be significant. Whales often exhibit a pattern of “bubble feeding” when they prey on herring. As Mr. Peterson notes,

They’ll work as a team. They’ll all dive if they’re feeding on herring deep, they’ll all dive at the same time. And they’ll just be chattering on the hydrophone. I don’t know. They’re communicating as they’re feeding down deep. Then, of course when the herring are on the surface, they make a ring of bubbles, gather the herring up within that ring, then they all come up—maybe one whale will do it. Maybe a dozen of them, but there’s only one that will bellow just before, and you hear that on the hydrophone just before they all come up—[the] one under that mass of herring within that ring of bubbles.

[Interviewer]: He’s a leader?

FP: [imitates noise of whale bellowing] And then, ‘Ok. Where’s the bubbles?’ As soon as you hear that sound, ‘Oh, they’re right ... up, [they] come up.

It’s interesting. You learn more all the time as you spend time with them.

If we’re going to maintain our big increase in whales, I think we better take care of those herring because I think they must eat a tremendous amount of them.

And if we want to protect whales, we better protect our herring stocks.

Just how many herring do whales eat? It seems to depend on a number of factors, including season, abundance of herring vis-à-vis other feed in a particular area, and perhaps other factors. A recent study done by Witteveen (2003) examining historical and current prey consumption of humpback whales found they consume about half a ton of feed per day, and not all herring. A large scale study called SPLASH determined that

as of 2005 there were from 3000-5000 humpbacks feeding between Southeast Alaska, Northern British Columbia and shelf waters to Yakutat, with perhaps 25-30% of those concentrated in Southeast, a significant increase over the 1960s and 1970s, when whales were just beginning to recover from commercial overexploitation and numbered less than 100 in Southeast (Straley et al. 2008). In recent years, with up to several dozen whales feeding in the vicinity of Sitka Sound year round, it is likely that their their impact on local herring populations has increased.

Despite the significant increase in whale numbers, most scientists do not find them to be a primary force in driving herring populations down. However, in areas where herring populations are already depressed or in trouble, whales may be having the effect of preventing rebounding (J. Straley, pers. comm. 2008). University of Alaska biologist Joe Liddle, who is using whale data from Sitka Sound to correlate biomass and whale numbers, concludes that “‘It’s like a fishery.’ The whales skim off the surplus production which doesn't actually reduce the population level.” He characterizes the whale-herring predator-prey model as one of bottom-up control, wherein lack of herring would reduce whale abundance (J. Liddle pers. comm. 2008). Local fishers like Herman Kitka seem to agree: “You know they built a whale park in Silver Bay because before the herring roe fisheries, the whales used to feed on those herring—that local herring, that’s there. Seiners wiped them out and they, in Katlian Bay, the ferry boats used to have a hard time trying to get them [the herring] to move out of the way.”

While the question of how much herring whales eat may be answered, the larger question of their impact on herring schools may hinge on whether baseline herring populations have shifted, perhaps upward in response to depressed whale populations during the era of commercial whaling, or downward as whales and other predators, humans especially, have targeted dense schools. A simple “bottom-up” prey model is complicated by the activities of other predators. As Andy Rauwolf points out, the rise of

some herring prey populations puts a” huge amount of competition out there for a diminishing supply of feed.”

Long-time fishermen in Ketchikan see a clear increase in whale numbers. As Ken Kiffer observes:

I know when I fished with dad in the late 40s and early 50s, it was exciting to see a whale. Because you hardly ever saw a whale. You saw more killer whales than you saw whales. And orcas, there was more of those around then there was big, big whales. But I go out now fishing and if you don't see 8-10 whales a day you're sleeping because you're not watching out, because there's that many out there. They're all over the place.

In other communities the trends are less clear. For example in Sitka some interviewees report healthy populations of whales prior to 1980 but declines during the 1980s and 1990s, with some recovery in recent years. Hoonah has always had strong whale populations feeding on herring and krill by Point Adolphus.

### *Spawning*

More than any other phase of the life cycle, we documented information on spawning behavior of herring. As noted above, this is a function of the proximity and visibility of spawning near shore and the active monitoring and interventions that occur during this phase. If learning through fishing (Pálsson 1998) is indeed a way of knowing than we should not be surprised to find a concentration of LTK in this phase.

The beginning of herring spawning is signaled by a number of factors, including tides, water temperature, light, and the “fuss” that predators make, from marine mammals to ducks, gulls, eagles, and birdlife of all sorts, to salmon and non-salmon fish, including halibut, to terrestrial mammals such as mink, and even brown bears.

Birds are the most obvious observers of herring and gulls perhaps the most perspicacious and cacophonous observers in heralding their spawning. Walter Soboleff originally from Angoon, observes:

The seagull tells us [the herring are spawning]. And I've heard it. There's a particular sound the seagulls make when herring are spawning. Maybe everybody knows that now. Then in the 60s or 70s I moved to Tenakee and a boy who was visiting me in Tenakee, we were sitting in the living room I said, 'Tom. I think herring are spawning here!'

"How do you know?"

'The gulls are telling me.'

'Oh,' he said, 'I was born here and I've never known herring to spawn here.'

'Well, let's go out and see. Let's look on the water.' We went out, and sure enough the whole shoreline was milky. The herring were spawning. The gulls told me.

Seagulls are said to have named herring, as noted above, on the basis of the "yaaw" sound they make when spawning herring are present (Herman Kitka). Clara Peratrovich observes:

Yeah. You can always hear when the seagulls come in you know, before the spawn. The people used to listen to the seagulls that fly in search [of herring]. And sometimes they'll sit and they all make noise, you know, squawk. You can hear when they're full. Their voice sounds different when they're cheering. They say, 'It's got herring sound in its mouth. It sounds like it ate herring.' So they start searching. Sure enough they see the herring moving in. ... That's the sign of wealth coming in. 'Yaaw.'

Similarly, Henry Katasse explains that it is gulls that signal changes in the herring life cycle, the commencement of spawning:

Seagulls are watched and listened to because they forecast the news. When it is close to herring spawning time, the Tlingit listen for the announcement from the seagulls. The sound of their call changes ... perhaps from eating all the herring eggs. Sure enough, herring is coming, getting ready to spawn. Men get ready to harvest herring eggs on branches, seaweed, or whatever they prefer. (Newton and Moss 2005:15)

Along with gulls and other birds, halibut and king salmon also move in with herring. Herman Kitka observes:

King salmon and halibut, they migrate. I don't know how big a circle they make. But the ones tagged off of California sometimes they catch them up in Kodiak. So they migrate a long ways. And they don't hang around until they find enough feed. When they first start taking halibut, they build Booth Fisheries: a Canadian cold storage here in Sitka. And they had two schooners. After that schooner, the fishermen were fishing two men to a dory. And then the reduction plant, the big sardine boats, they start fishing the herring at Sitka Sound, and those other schooners couldn't catch a fish anymore. Booth Fisheries sold the cold storage and it became Sitka Cold Storage. That was in the 30s. ...

If halibut can't find food in the area, they're not going to stay. Halibut is no local fish. They're a migratory fish. ... They used to come in with the [herring]—February. That halibut, big schools of halibut used to come in and they stay in the channel from Middle Island all the way into Sitka. All the people used to go out in their boats and jig for the halibut in the channel. And they used to bring it ashore at Halibut Point by the stream. That's where they used to clean

them: all white bellies all along the beach. That's why the people started calling it 'Halibut Point.'

[Now] There's no halibut come in. No big herring stock coming early anymore. You know, all the sea lions used to come in with that herring and they used to hang around all in front of the Sitka village. They never cared. Even if you throw a stone at them, they won't duck!

When herring were plentiful and returning to spawn, the bounty made for a happy time. People moved to where the herring gathered. As Marvin Kadake recalls, witnessing the return of the herring at his family's camp at *Kein Séet*, north of Kake:

in *Kein Séet* we stayed mostly. ... you could hear the herrings. It'll wake you up there's so much. The whole Frederick Sound would be just boiling and all the way down the Chatham. You name it. It'd be spawning just real—flipping all over the place. I don't know whether the kings were jumping but also the halibut were jumping. And the halibut, they're flat, right? You think they chase the herrings this way? No. They come up sideways like this. And they feed on the herrings this way. And we witnessed that over in—how many times out Turnabout Island. It'd just be boiling out there and we used to go out there and watch them and watch all the halibut. It'd be just thousands, millions of herrings just all over the place. And you could see the eagles just diving: no end, you know. But anyway, there's a lot of halibut. You name it, the kings jumping all over the place. And you can tell when they come up at certain tides, you know. And somebody would holler, would ask *yaaw geix kawahin*. Is 'the herrings come up?' And somebody would holler back, "*keiwahin* (Tlingit 16:25)." And everybody would take off you know, out in the tides and start raking. And they'd be hollering, "Ho, ho, ho." And shaking it like that. "Ho, ho, ho." That's where that 'Ho, ho, ho,' came from, you

know. And that was a favorite saying. ... And besides that, we had the—we'd be getting a lot of water same time you're raking and you start to get water in your boat, they call it sheen [Tlingit phrase?] It's some like this. Somebody has some in town. And you bail water out, I guess. Anyway, whoever's out in the bow of the boat is always having fun. My brother and I used to fight for that position (laughs). So it was a lot of fun. But most of the time I'd win, you know. If I had a nickel, I'd give him a nickel, and then his turn (laughs). But anyway, that was just a short story about how it used to be, you know. Just a lot of fun. And then when it's all over and the herrings go down, you could hear people, some of the old people singing. They'd be pounding the oars on the side of the boat (singing). They'd sing a happy song that they got some herrings. But everybody used to smoke it. We smoked it too. So it's a time of harvest. And while we're out there in the camp, then they used to put up a lot of halibut and all that stuff so it'd be dried fish all over the place. And we didn't have tents like in the olden days, just the main tents. But to make a smokehouse we used to use cedar and the marks are still out there at *Kein Séet*. You can see where we used to go up the mountain and pack rolls and rolls of cedar. And we'd make a smokehouse out of that. And, anyway, that was part of our project, you know. ... Our trademarks are still there.

Martin Perez of Ketchikan also comments on the unique experience of watching halibut feed on herring: “I seen halibut jump out of the water like the humpy chasing the herring that's on the surface. ... They come from underneath and grab it. Look like they're jumping but they're coming out of the water when they grab the herring. That's in the days when there were a lot of herring, you know.”



Figure 3.2. Eagles lining up to take wounded herring, Sitka Sound sac roe fishery, 2009.

In Sitka, like Kake and other areas, raking was a primary means of engaging herring in the early stages of their return to spawning grounds. “You see, the herring used to come into the shores February, the first part of February,” Herman Kitka observes, but “They never spawn until in March, toward the end of March. So everybody used to rake them into canoes to make herring oil.” Unfortunately, herring raking is virtually a lost art, as is rendering herring oil. Raking is no longer practical due to the lack of herring concentrations near the surface. Today, cast nets, gill nets or jigs are preferred. Similarly, consultants suggest herring oil is a lot of work as compared to rendering seal oil or acquiring eulachon oil (typically through trade) or store-bought cooking oils.

As the female herring ripen they move toward shore in preparation for spawning. This is a critical period, and in some communities it was considered taboo to disturb the spawning areas when the herring were moving in. Harold Martin of Kake described it as

part of a broader Tlingit “traditional respect for the reproduction period. ... we don’t bother them [during spawning].” Dick Stokes of Wrangell notes, “we weren’t allowed to do anything in there [the spawning grounds]. ...Yeah, we just had to stay away. We’d go in and set the ... young hemlocks. They used young hemlock trees, or branches because if you use the old, it’s real bitter. [Then would move out]. Similarly, Byron Skinna of Klawock remembers that in the spawning areas,

You weren’t allowed to use an outboard motor. A big boat was not allowed in there. You had to use skiffs and you had to row in. Any spawning area whether it was Fish Egg Island or some other place that they spawned. You weren’t allowed to run in there with outboards, or everybody in town was hollering at you. Everybody! Not just one or two people. Boy, the people really got mad at you. They just really read you the riot act if you got to the beach.

The reason ... is because we didn’t want the herring disturbed. You had to row. ... [Today] you’ve got all kinds of traffic out there. You’ve got seine boats, power skiffs, speed boats, small people that are doing the commercial herring spawn out there. And they’re running full bore through there. ...Yeah. They run wide open and they’re disturbing the herring.

Lily White of Hoonah echoes this principle:

They knew when it was going to spawn so they kept the place clear of people going over and everything: leave it alone, let them spawn. Don’t want to disturb them. ... They’ll tell the people, “Nobody runs out on a boat up there. Just leave it alone. They’re coming in now.” Nobody runs around it and messes up the waters. They knew how to preserve what they’re going to get: what they’re going to eat. They knew the seasons, the movement of stuff, even clams and cockles: when to dig them. When not to touch it.

Similarly, Harold Martin observes:

When we settled this area, the territory was rich in fish and wildlife and so we came up with ways to preserve the annual—we had seasons. We actually had seasons, a Tlingit calendar. We had harvest moons. And we gave the animals time to reproduce. We knew how aquatic plants grew and we had harvests for them. So we didn't exploit anything that we were dependant upon for our livelihood and our spiritual well being. ... As John [Martin] said, as Tlingit people, we're very spiritual people. We believe everything has a spirit and we have great respect for environment. We used to have ceremonies to welcome the salmon back. When we took an animal, we talked to the animal and sent it back to the spirit world so it could come back again. Everything we did was based on respect for the environment.

Arthur Kennedy of Craig remembers, "we used to have to paddle. Our elders, our elders a long time ago when we were young, we used to have to paddle around so we don't disturb the herring" during spawning. Burt Cosgrove of Klawock adds, "If they were disturbed, you don't know where they're going to spawn because they're interrupting everything." And Clara Peratrovich, also of Klawock, remarks:

people were not allowed to use any motorboats around the island because the sound vibration in the water spooks the herring away and so they don't spawn. So no one was allowed to use a motor or bring a motorboat. If they brought their big boats they had to anchor way out, turn off and then come in really quietly ... with oars, you know you row in.

Byron Skinna adds:

You weren't allowed to use an outboard motor. A big boat was not allowed in there. You had to use skiffs and you had to row in. Any spawning area whether it was Fish Egg Island or some other place that they spawned. You weren't allowed to run in there with outboards, or everybody in town was hollering at

you. Everybody! Not just one or two people. Boy, the people really got mad at you. They just really read you the riot act if you got to the beach.

This last statement suggests that there was collective enforcement of this prescription.

Franklin James Sr. of Ketchikan tells of seeing spawn at Mountain Point in Ketchikan in the spring of 2007 for the first time since he moved there in 1957, and being concerned about its being disturbed by:

speed boating running all over in that place, people setting nets right into the spawn.' That should not—be a no-no. Our people wouldn't let us row hardly, you'd have to barely [row] going into the spawning area. And shoot all the sea lions and sawbills [mergansers] that goes there, that are hovering around, so it doesn't disturb the spawn. Yet they had everybody, every father and son and grandkid and you name it, was running through that and setting nets in there. That should automatically be fines and I told them, 'You guys should have that in regulations, now what you just did, is you're going to move that spawn away. The milt's there and what are the females going to do with no milt?' They're going to lay someplace else and, you know, they got no milt. ... But what it is is they're not going to spawn!

Disturbance and degradation of the spawning areas was also cited as a reason for the declines in Auke Bay herring spawning (see area chapter). For example, Ralph Guthrie observes:

part of the demise of the herring in Auke Bay, I think it's the propellers. You know, I think the ferry system going in and out of there and probably 3,000 skiffs and outboards running through the schools. And besides the normal mortality of ducks and stuff, I think that finally decimated that stock. I think part of it, you know, the last herring there.

On the other hand, few Sitkans cited noise or disturbance of spawning by motorboats as a major concern. Herman Kitka notes, “Everything is there after the herring,” and it “Don’t seem to matter to the herring.” It may be that noise disturbance has less impact in large, less enclosed waters, such as Sitka Sound, than smaller protected bays like Auke Bay and Indian Cove. (For more analysis of the impact of vessel noise and disturbance on herring, see Cherry Point Reach Management Plan, June 2008).

More stressful than noise or motors, according to Sitkan interviewees, are the “test sets” made by commercial sac roe fishers to measure the degree of female ripeness with eggs. Dozens of such tests can be conducted during the course of a commercial opening, which has raised concerns among some local Sitkans. Nels Lawson states:

a very large concern I have is with the test fishery, constantly setting on the herring. And I firmly believe that the test setting disturbs the stock, or stresses the stock. If the stock is stressed like I believe then they’ll try to spawn before they’re really ready. Herman Kitka reported that some of the people that set branches had spotty eggs. Some people didn’t get any eggs on their branches. That’s a false spawn: milt with no eggs.

Mike Baines adds:

If you didn’t have your branches in the water just right at the time they started spawning you didn’t get herring eggs at all last year. ... I’m sure it has lots to do with the fishing. They’re test setting more to increase the quality of their sac roe and...There’s a lot more test setting to make sure they have a good percentage of mature sac roe. There’s more pressure to increase the quality and that’s why there’s more test setting. ... I’m pretty sure that it harms... I think the herring lose a lot of scales, they can only lose so many scales...and if it doesn’t kill them right there in the test set they’ll die eventually because of the loss of scales. ...

The last few years, seems to be that the fishing is held at the same time as the herring are coming in to the coves. So there's quite a bit of difference lately as far as that's concerned. So I don't know what causes it. But the difference I think might have to do with them test setting more. They have to wait longer and longer until they get more of a higher percentage of mature sac roe. But other than that, I don't know what causes it. They used to fish, get all the fish and leave then we could get all our eggs, and there was no conflict; and nowadays that's not what happens any more. ...

They used to, on channel 10, they used to announce the size of the test set. But after we told them our, we're concerned about the mortality, they stopped announcing the estimated size. They're not concerned at all about our herring eggs: whether we get them or not. I think they're going to—if they make one mistake or something happened out in the ocean. If the whales eat more than they think there's going to be a catastrophe. They wiped out stocks in other areas and I think they're going to do the same thing here. That's my prediction.

Bob Kirkman, a longtime crewman on herring seine boats, observes:

I have, this is my opinion you know, if the Fish and Game would just not make no test sets and let the herring come to the beach by themselves and then they'll let you know when they're ready to start spawning. But over at Halibut Point here, they go out there every morning, the same bunch of fish there. They'll go out and make test sets on them: sample them. And you know when you have a pregnant woman, if you squeeze her belly, she's going to start having her kids. That's the herring are the same way. They pull them up and squish them up one morning. The next morning they do the same thing. ... Once they start the test setting, it's going to speed up the [spawning] process, but just the ones they test on, they get them all stressed out and excited and then they start making milky water.

Not all commercial sac roe fishermen agree, however, and many see the test set program as necessary to appropriately target ripe herring. Dick Eide of Petersburg doubts that test setting significantly stresses herring schools or leads to a 10% mortality rate (a figure sometimes quoted):

I don't think it's that much. I don't think it's any really. I mean you get a few caught in the web and that's about it. I don't think you—you may, you know some guys might tighten them up a little bit too much and they probably just run to the beach and spawn or something, but eh. It's not necessary to do anything but surround them.

But others maintain that “a netted herring is a dead herring” and thus all test-netted herring—amounting to thousands of tons a year—should counted as part of the commercial catch (H. Meuret-Woody, pers. comm. 2010; Cherry Point Management Plan 2008; Rottigen et al 2002;). Sitka Tribe has proposed to the Alaska Board of Fish that “herring seined in test sets be included as herring harvested in the guideline harvest level” (Sitka Tribe of Alaska 2008b) but so far this proposal has not been accepted by the state.<sup>4</sup>

Another concern about test setting is that it makes herring flighty. Al Wilson also suggests that herring “learn” to avoid nets, if too many are set on them. In combination these factors may stress herring and adversely affect herring spawning.

If not stressed into spawning by test sets or other stimuli, many interviewees link the beginning of spawning to the first “big” or minus tides of spring. Phil Nielsen states,

I look at the tide. At the big minus tide of the year. And April has one coming up, April 9th. If I was going to place all my chips on a date that would be

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<sup>4</sup> In 2008 Sitka Tribe hired a diver to examine the after effects of a sac roe opening in Sitka Sound on netted herring. The diver found over 2000 dead herring on the ocean bottom and it is assumed that the mortality was in fact much higher due to scavenging and consumption by other predators (H. Meuret-Woody, pers. comm.. 2010)

the date that you'll see the spawn happen. And it has to do with the, I think because of the greatest pull of gravity during that time and not only that would be the minus tide that herring always spawn. It seems like the lowest part to get their eggs to like they almost know like a survival rate: this the best time. To have their eggs less out of the water and still be able to have not too deep. To have a good chance of their eggs hatching. I don't really believe temperature has much to do with it, but some people do. I've been out when it was snowing miserably.

Harvey Kitka suggests that the timing of the spawn is due to a combination of factors:

Part of it is water temperature, part of it is the time of the year, part of it's the first minus tide. Usually the first minus tide ... toward the end of the month, or the last of the minus tides, whatever you want to call it, in the first part of April.

Usually, you can almost gauge it around there.

Brown and Carls (1998:2) summarize the scientific literature by stating "Readiness to spawn appears to be related to winter and spring sea-surface temperatures. In general, herring spawn when ocean currents are weak, reducing the chance that the tiny larvae will be swept offshore."

Perhaps as a result of sea surface temperature gradients, herring tend to spawn from south to north within their entire range, including Southeast Alaska, with some exceptions. Mike Miller of Sitka notes that this also happens on a smaller scale in Sitka Sound.

Even the south to north even worked in the Sound. ... they would spawn first at Samsing and places like that and then they would work further north and a lot of the last spots were all the way up in Katlian Bay and Nakwasina Bay further up. So people would be able to do that and that was always kind of a nice situation because you would always have somebody else that calls up when you're out of eggs, Oh, you know I want to get some. Either that or if you did miss a

certain place or had branches stolen or washed away or whatever the case, you still had time to go up and make sets further up...

However, Mr. Miller also comments on micro-ecological changes in the timing of the spawn, and links it to broader changes in the age structure of the stocks at Sitka:

When you'd get right on the tail of the biggest minus tides is when they'd start to spawn. And growing up I always thought that was just kind of to make sure the eggs weren't going to be uncovered. If they laid the eggs at a water level prior to the big minus tides a whole bunch of those eggs would be uncovered at the low tides. So that was kind of when they'd start. But again, in the last 5, 6, 7 years they haven't really been following that pattern as much and I think if that was the case they'd probably should be spawning right now here because I think we're on the tail end of that again.

So, there's definitely something changing. Although since I've been here, the fish have changed completely. It was, you know, in the mid-80s to the early 90s you just didn't see old fish here and I think even in the industry the belief was that they didn't get above 7 or 8 and either they died it was thought, or they went somewhere else. And now we're looking at a population that is, I mean, ancient compared to that. It's in the probably I think between 80 and 90 percent of the biomass is comprised of fish that are over 5. And previously it was about 90 percent of the population was fish that were 3, and 4 and 5 year olds. And so where you had a big fish before was a 100-gram fish out here and that was the bulk of the fishery and now we're looking at almost 200-gram fish because the bulk of the fishery is definitely completely different fish. And they act different. The younger fish don't spawn en masse quite like the older fish do. Typically the older fish usually spawn first and they spawn as a group. The younger fish spread it out longer and I don't know if that's affecting our ability to harvest. Like I say if

you didn't get there on the first day you know there was only about between 2 and 3 days of good spawn and I don't know if that's a result of all these old fish that all spawn together or what exactly that is. So yeah, definitely we're looking at a lot of different conditions.

Specific spawning locations are discussed in more detail in the area chapters, but, in general, herring prefer sheltered beaches with suitable vegetation or substrate on which they can deposit their spawn. Herman Kitka notes, "They seem to like the spawn when there's a lot of kelp on the beaches. I don't know what you call those little bunch ones. Some of them, they have bulbs that when you step on them they—when they break, they make noise like firecrackers [*Fucus distichus*] ... All the areas they spawn in, Middle Island, all the beaches have that." Eelgrass (*Zostera marina*), macrocystis kelp (*Macrocystis pyrifra*), hair kelp (*Desmarestia viridis* sp.), and other substrates are also preferred, including hemlock branches placed in the waters by subsistence egg harvesters.

Herring preparing to spawn are said to scout out their destination before actual spawning. Marvin Kadake of Kake observes,

When they're getting ready to spawn this is the reaction. They come and they go along the shores all like they're investigating. They're checking out where they're going to spawn, you know. And see all the kelps and that, they come and go through that. They make their cycle around here. And they stay around that area and you can tell what's going to happen. Sometimes out here in Camden, they stay out in the middle and you can tell when they're getting ready. Then they do the disappearing act: there'll be nothing. Then they go down, out to the channel and they go right down to the bottom, right to the bottom. And then it loosens up their eggs and everything. And then they make one mad dash after

they come back to shore: then they let loose. The same thing happens in Sitka. You'll see them there, then they disappear, then they're back again. That's the cycle they go through. They go back to deep water then back. Then they know where to go and they let loose.

Some people suggest that the males, perhaps older males do the scouting, while females hang back offshore a bit. As they come ashore, the scouts would brush against the spawning substrate to mark it and "clean" it prior to spawning (Dan Moreno, pers. comm., 2010). Harvey Kitka explains,

I do know that those first three days when the males were the only ones that were there and putting milt in the water, I don't think the females were really that close to them at that point. Maybe at times they do separate. I think last year, one of the times when they caught basically the females without too many males, and kind of wiped them all out of the mouth. Now there are a lot of areas where there's milt with no eggs. ... It seems it's [the milt's] something that gets them going. It was quite a shock to make a change from—we used to go out—even when the percentage of what they took was a lot smaller we were still able to wait the three days before we'd go out and set the branches. Let the herring settle down. And as the percentages got bigger the length of time before [spawn] got less and less. Now if you wait more than a day you're, you've missed out. You weren't going to get anything.

Herman Kitka adds,

I've been trying to get the biologist to come up [and study to see]—if the herring is the same as salmon. I worked for the hatchery from the time it was being—putting it together, and I even donated my boat for the egg-take for stock at the hatchery. And we found out that when they came back, the males came back

[first]. And when the females joined them, that's the end of the run. And I was wondering if the herring also have that practice because when it gets milky, there's a shortage of females. That's how come it's just speckled, the branches they put in. ... While they were still separated, they opened that area [for commercial sac roe fishing] before any spawn formed. It didn't seem to affect them when they opened it after the herring started spawning because they separated and joined together. ...

It never hurt it when—after they start spawning, open up the fisheries. The only thing they've done is they've wiped out the local. But the ones that come in, it didn't seem to bother them. But now it's getting less because they start fishing it before the herring start spawning. That's why I'm beginning to wonder if the females stay separate from the males until they're ready to spawn.

Charlie Skultka, a permit holder in the sac roe fishery, concurs that sac roe seining prior to spawning can have adverse impacts on local schools.

It would be less impact on the herring as far as leaving them do their natural thing. And prior to the last couple of years here, that was a real significant part of the strategy of the Fish and Game to where they would have an actual spawn start, and then we would start harvesting after that. Well, they've gotten away from that and gone by percentage numbers now instead of spawn. And I don't know. My own opinion is I think it's detrimental to mess with the fish before they spawn. ...

This is personal belief. I'm no scientist, but I believe that they set the spawn off early. And my outlook on it is I've watched the herring spawn since we really started the intensive test-hauling. And I've read several things on this and I'm one of the people that's made the comments on it before. ... I believe it sets off a premature spawn. Only the males go up there and spawn because they can't

hold it back and you'll get a real light, if any spawn by the females underneath all of this. And people have come through here and said it and checked it out and stuff and it kind of bears out that way. And I don't know what the Fish and Game think about it or anybody else, but that's been my opinion and I voice it at times. And nobody has to agree with it. I just feel comfortable with saying it because this is what I see.

And, ok. The fish will move from that area where they started and then they'll spawn real intensively somewhere else. So, that just kind of sets it off. We've been fishing, oh, in the last 15 years, we've really been doing a lot of fishing in mid-March to late-March. And prior to that, most of our fishing took place in like the first and second week in April. And this is a personal opinion: I just think that all that test-hauling moved them [the spawning herring] up a bit. This earlier the spawn, the earlier they come back. I mean, it's simple logic. I don't know. They started spawning them earlier and whether it's natural causes or them setting them off early, we're getting a little bit of earlier run.

Warmer sea surface temperatures as a result of climate change might be another factor in "setting off" the herring earlier. Martin Perez stresses that caution must be exercised both at the beginning of the spawning process, when herring are settling, and also toward the end: "After they start spawning heavy, then they leave them alone because when they spawn, if you notice, they get a little black spot on them. And that's the eye of the herring. Then they quit. They don't touch the spawn no more."

Herring also will segregate to some extent by age when they spawn. As Tom Copeland details:

They become gravitant in the third year so that they'll be present in the spawning areas, you know they come in there when they're three years and if

we're seeing a lot of young fish that means you got a healthy population coming there. And it looks like, what I've seen in some areas, that the young fish they segregate. I've been flying up on lower Baranof and come across just hundreds and hundreds and hundreds and hundreds of schools of what we call firecrackers: immature herring. And you didn't see any and they were going right up into shallow water at the head of some of these bays. But that was coming from lots and lots and lots of flying. So there's, I think, lots of things that we really don't know about these herring. And we've been at it a long time.

Non-reproductive adults, be they too young or too old, appear to segregate during spawning itself, but all classes travel together in mixed groups to the spawning areas. According to Franklin James "the big ones do travel with [the] other ones, the smaller ones, the younger generation. But the big ones don't after--what is it--after eleven years, they don't spawn no more, but they do travel with them. So you see a lot of them, when they make those big sets have to dump them." The mixed age classes represent a healthy stock then, whereas too many larger, older fish could mean that the stock is in danger of collapsing as the larger fish cease to be productive.

Scientists refer to the process of older fish initiating younger fish to migration paths and spawning areas as "entrainment." The entrainment hypothesis (Petitgas, et al 2006) posits that "spawning migrations are sustained by repeat spawners," mature fish that have "knowledge of migration routes" and thus "are responsible for the persistence of the life cycle spatial organization" and connectivity of disparate spawning populations (Secor, et al 2009) by leading first spawners from feeding grounds to spawning destinations. From this perspective, a diverse population age structure is critical to maintaining the spatial distributions of herring stocks. Loss of too many spawners in a local stock, especial repeat spawners, can can jeopardize entrainment and lead to the

abandonment of local spawning areas. This hypothesis has not been thoroughly tested on herring, but seems worthy of further investigation in light of its convergence with the LTK citing the importance of mature fish leading first time spawners to various spawning grounds.

Herring show fidelity toward favored spawning areas but to what degree is not well understood. As discussed above, there is mixing between spawning stocks during recruitment and, genetically, herring in Southeast are not easily distinguished. At present, scientists posit that Pacific herring exist in a metapopulation, which distributes herring over a large region in response to climatic and population conditions. Based on limited tagging studies, Hay et al. (2001) concluded that approximately 10 to 20 percent of the spawning biomass in a particular region may move to adjacent spawning regions in subsequent years. Ware and Schweigert (2002), seeking to build a structured metapopulation model, hypothesize that “The appearance of a large year-class in one of the local populations will set up a dispersal wave, which radiates throughout the metapopulation until it is depleted by natural and fishing mortality.” Their studies indicate that in the British Columbia metapopulation, “seven, large dispersal waves probably occurred since 1951.” Dispersal appears to be an important species adaptation,

because it tends to stabilize the spatial distribution of spawners in the metapopulation, and increases the persistence time of the less productive, local populations in two ways: 1) the density-dependent dispersal response increases the fidelity rate when a population is declining, and (2) declining populations will tend to receive more migrants from other populations than they export. Dispersal is also important because it recolonizes new (or vacant) spawning habitat. This enables the metapopulation to adapt to habitat changes, and to alter its spatial

distribution in response to low frequency trends in climate, and other factors.

(Ware and Schweigert 2002)

This metapopulation theory was cited by the U.S. government's Biological Review Team as a basis for rejecting a petition by the Sierra Club to list Lynn Canal herring as a depleted population segment (DPS), under the US Endangered Species Act (Carls et al. 2008). The Team concluded by a 6 to 4 vote that Lynn Canal herring were not a DPS because they were not markedly discrete from other populations of the same taxon in Southeast Alaska. The closeness of the vote suggests that there is still debate about the metapopulation theory and to what extent local herring populations are discrete. The team used the British Columbia studies to estimate herring fidelity in a management area the size of the Lynn Canal to be approximately 40%. However, it is clear that more research is needed, especially among Southeast herring stocks, to determine to what extent local herring spawning populations in the region are discrete.

When combined with scientific studies, LTK of herring life cycles and population ecology can play an important role in helping to understand the relationships affecting the status and health of local herring populations. In addition, LTK suggests important ways that the quality of existing spawning populations and their habitats can be conserved, and how areas of historical herring abundance might be restored.

#### **IV. ARCHAEOLOGICAL SYNTHESIS <sup>1</sup>**

##### **The Role of Zooarchaeology in the Herring Synthesis Project**

The Herring Synthesis Project aims to synthesize historical, ethnographic, archaeological, and biological information along with local and traditional ecological knowledge to understand the history of herring (*Clupea pallasii*) use in Southeast Alaska. Individuals in the small communities of Southeast Alaska have witnessed the reduction of herring populations and of spawning areas during their lifetimes, due to a variety of factors that are still being studied, including over-harvesting of sac roe and fish, increases in sea mammal predation, disease, habitat destruction, and climate change. We hope to be able to assess how humans and herring have interacted as part of a dynamic ecosystem over the long term. Ultimately, we would like to provide information that can be used to manage herring more effectively, which may involve protecting and potentially restoring areas where herring spawned and schooled in the past.

Our role in the Herring Synthesis Project has been to study past herring distribution and abundance using zooarchaeology. Our work has three main parts. In the first phase, we have created a database summarizing our current knowledge of zooarchaeological records from Southeast Alaska. Taxonomic information for herring and other vertebrate and invertebrate fauna has been compiled from all existing archaeological site reports including Forest Service and contract reports that are not widely distributed. We have targeted sites that received some sub-surface testing—from shovel probes to substantial excavation. All of the faunal data is included to provide estimates of relative abundance. Direct measurement of absolute prehistoric animal

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population levels using zooarchaeology is difficult; our approach is to examine trends by comparing herring abundance relative to other taxa. Reviewing the entire faunal record should allow us to consider ways the Tlingit, Haida, and their ancestors relied on broader food webs and how these strategies may have varied over time and space. The database we have developed lists the published and unpublished site reports, excavation methods, including screen size, volume excavated, condition and age estimate from radiocarbon or other methods, and site location. Importantly, excavation methods, particularly screen size used to recover bones and teeth, affect measures of taxonomic abundance. Given their small size, herring remains are especially prone to loss and are numerically under-represented unless fine mesh sieving and laboratory analysis of bulk samples are undertaken. As part of our analysis, we consider variation in analytic decisions and sampling approaches across the site records to insure comparability. We have identified 26 sites with herring remains, and for each, we present a site summary, organized by contemporary communities from which Local and Traditional Knowledge (LTK) information was obtained. This organization should facilitate integration of the archaeological, historical, and contemporary data on herring in the future.

The second phase of the project involved close analysis of faunal records to identify temporal and spatial trends in herring relative to other fish. The final part of the project incorporates the archaeological herring records (site location and other attributes, such as age, site function, other animal bone records) into the Herring Synthesis GIS which is being developed concurrently based on LTK, and historic catch and herring resource records. This final integration phase of the project is still in development.

## **Ethnographic Background in the Context of Archaeological Research on the Northwest Coast**

Long-term use of herring by the Tlingit (and the Haida, also of Southeast Alaska) is not well-documented over space or through time, yet can inform us about pre-industrial patterns of herring abundance and distribution.<sup>5</sup> Here, we briefly describe Tlingit use of herring known from ethnographic sources and contemporary practice before we describe our compilation of data from zooarchaeological records. Such information provides insight into the indigenous herring fishery of Southeast Alaska—capture methods, seasons of use, and the value of eggs, meat, and oil. Herring were eaten as fresh food, dried and smoked, rendered for their oil, and used as bait. Ethnographic and traditional uses are described below tracing the seasons of use. We emphasize, however, that background on traditional practices, largely derived from the 19<sup>th</sup> and 20<sup>th</sup> century sources, cannot be projected onto the deeper past *in toto*.

The spring arrival of herring was (and is) a critically important time for the Tlingit, when eggs were (and are) harvested from sub-tidal eelgrass beds or from hemlock branches and kelp strategically placed in the intertidal zone (Emmons and de Laguna 1991:147; Newton and Moss 2005:15; Niblack 1890:299; Oberg 1973:69; Schroeder and Kookesh 1990; Swanton 1905a). Herring spawning times vary by location. In Craig, herring spawn in mid-March, in Sitka, they spawn in late March or early April, in Auke Bay, herring spawn in late April, and in Yakutat, they spawn in May (Hay et al. 2000:419; de Laguna 1972:403; Skud 1959:4). Skud (1959:2) states that spawning in any location can continue for as long as five weeks. Herring eggs were eaten fresh, but were also dried and mixed with fat for winter use and trade (Emmons and de Laguna

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<sup>5</sup> Although this section of the report focuses on the Tlingit, the Kaigani Haida also occupied Southeast Alaska prior to European contact (Emmons and de Laguna 1991; Langdon 1979; Moss 2008a). The Kaigani used herring and the community of Hydaburg, in particular, continues to collect herring eggs in the spring (Schroeder and Kookesh 1990).

1991:147; Krause 1979:123; Niblack 1890:299; Schroeder and Kookesh 1990:10). Besides eggs, schooling herring were also taken in the spring, using herring rakes and a variety of traps and nets (Krause 1979:123; de Laguna 1960:28-29, 116-117; Niblack 1890:292, 299; Oberg 1973:69). Oberg (1973:69) states that herring oil was processed during May on the islands.<sup>6</sup> Herring were also dried on strings or alder sticks and cured in the smokehouse for future use (Krause 1979:123).

The Tlingit and other Northwest Coast groups did not always focus exclusively on herring during the spring spawn. The spectacular phenomenon of herring spawning also attracted a host of other animals, including birds (gulls, ducks, geese, eagles, and crows), fish (chinook and coho salmon, lingcod, halibut, Pacific cod, hake, black cod, dogfish), and marine mammals (harbor seals, Steller sea lions, porpoises, whales; de Laguna 1960:29; Newton and Moss 2005:15; Niblack 1890:299; Skud 1959; Schroeder and Kookesh 1990:16). While spawning occurs fairly quickly, it is an event that concentrates a variety of species, all animals of interest to Tlingit fishers. In some places along the Northwest Coast, people took advantage of this massing behavior, extending it in time, to permit a wide range of animals to be harvested. Monks (1987) called this strategy “prey as bait,” and proposed that the stone fish trap at Deep Bay on Vancouver Island was used in this way, based on the faunal remains nearby. By retaining herring in the stone trap, the aboriginal people were able to take not just herring, but all the other species that prey upon herring. Caldwell (n.d.) has presented a strong case that the fish traps in Comox Harbor, also on Vancouver Island, were used to take herring with a specialized focus, although her samples are too small to reliably gauge the use of mammals and birds. Mobley and McCallum (2001:43) have documented the double-lead-and-enclosure fish trap type in four sites near Petersburg, Alaska, that they suggested might have been used

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<sup>6</sup> Despite Oberg’s (1973:69) statement, according to Cobb (1906:21), breeding herring are very lean and do not begin to feed and fatten until June.

to catch herring. Whether or not the Tlingit used intertidal stone traps to focus on herring or take herring along with other species attracted by the spring spawn is a topic for future research.

Besides the early spring fishery, the Tlingit (and birds, fish, and mammals) also took herring later in the spring, during summer, and into the fall seasons. Today, schools of herring congregate into what some observers call “hot spots,” attracting humpback whales and other species mentioned above (Nahmens 2008). Although herring abundance can be fleeting, herring were taken opportunistically during such times. In some places, herring were abundant in large schools during seasons other than the spring. For example, in the 1880s, travel writer Eliza Scidmore stated that from “August into January the waters of Chatham Strait are black with herring,” and in the same locality “once in August the mail steamer passed through one school for four hours” (see Chapter V).

During the fall, the fat content of herring is at its highest in its annual cycle (Emmons and de Laguna 1991:145).<sup>7</sup> Emmons’ account suggests that it was the surplus of herring in the fall that were taken for oil production and prepared for winter. The herring were boiled in boxes or a small canoe to extract the oil, which was skimmed off the top and placed in seal bladders or boxes for storage (Emmons and de Laguna 1991:143-145). The herring mash was also eaten (Newton and Moss 2005:15). Favorite Bay near Angoon is a famous locality for harvesting herring for oil production, and this is where many Tlingit were staying in late October, 1882, when the U.S. Navy bombarded Angoon (de Laguna 1960:42, 168, 170). An eyewitness to these events, Billy Jones, described how Angoon residents were putting up the fall run of herring and rendering

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<sup>7</sup> Cobb (1906:21) provides information on the yield of oil from herring taken during different times from the industrial plant at Killisnoo. In June, one barrel of herring produced a half gallon of oil, by early September, one barrel produced 3.5 gallons, and in December, one barrel yielded 2 gallons of oil (Cobb 1906:21). This suggests that the optimal time to harvest herring for oil is in the fall. The exact timing of peak herring oil yield probably varies by location.

the oil at the time the gunboats came to Angoon. In Jones's words, "they left us homeless on the beach" (de Laguna 1960; Reckley 1982:11). This helps to illustrate how critical herring oil produced in the fall was to the winter food supply of the Angoon Tlingit.<sup>8</sup>

For Tlingit and Haida, herring was important not just for eggs, but also for meat, oil, and bait. Herring was an important resource available throughout much of the seasonal cycle, but not necessarily from the same locality. In Southeast Alaska, herring were available from March through the spring and summer and into late fall and winter, for as many as eight to ten months of the year. Herring abundance does not appear to have been consistent across the seasons—in fact Cobb (1906:21) described herring as "erratic in their movements."

### **Herring Bones in Archaeological Sites – Challenges to Recovery**

The main challenge to archaeological recovery of herring bones is that herring are small-bodied fish. In Southeast Alaska, adult herring can reach a length of 38 cm (15 in.; O'Clair and O'Clair 1998:343), but most herring are smaller, usually less than 30 cm long (Hay et al. 2000:420). The jaws (dentaries and premaxillae) lack teeth, but the vomer does have fine teeth. Herring cranial and pectoral bones are light and thin, and typically fragment into small pieces. Exceptions are the prootic and pterotic, which are quite robust and distinctive and can be found in abundance in archaeological deposits. The most numerous elements in any fish are the vertebrae, rays, and spines. Rays and spines are generally not diagnostic to species, however, so the herring vertebra is the most abundant and readily identified element. While the haemal and neural spines usually break off, vertebral centra are often found intact (Figure 4.1). The number of vertebrae in a herring varies by geographic region, but ranges from 46 to 55 per individual (Lassuy 1989).

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<sup>8</sup> For more on the bombing of Angoon, see de Laguna (1960). This event is still remembered in Angoon today (Bowers and Moss 2006), partly because the U.S. Navy has never apologized for it.

The individual skeletal elements of the species are quite small; of course when fragmented, they become smaller still. Both whole and fragmentary bones can fall through the screens archaeologists use while excavating if the mesh size is too large. Although herring bones can be recovered by sharp-eyed screeners using 1/4 inch mesh, this is not routine and most herring bones will fall through screens with openings this size; in fact, even 1/8 inch mesh screens are not adequate for recovery for herring remains. Based on comparison of fish bone recovery at the Namu site (ElSx-1) on the northern coast of British Columbia, Cannon (2000:728) asserts that “the vast majority of herring vertebrae would easily pass through 1/8 inch mesh screen.”

In the history of Southeast Alaskan archaeology, early excavations (and into the 1980s; Rachel Myron, 2009, pers. comm.) were done without any screening of site sediments, so that if herring bones are not reported, it does not mean that they were not present. The same statement is true of any excavation that has not used screens at least as fine as 1/8 inch. Most excavations, even in the 21<sup>st</sup> century, employ 1/4 inch screens even though these are inadequate for herring bone recovery. To compensate for this, some of us take bulk samples (typically two liters or more) in which a specified volume of the archaeological deposit is recovered in its entirety, and then this material is sorted and analyzed in the laboratory under controlled conditions. Such bulk samples then provide a more adequate indication of herring abundance.

## **Zooarchaeological Records of Herring in Southeast Alaska**

### Methods and Materials

Our first task was to identify all potential sites in Southeast Alaska that had received some sub-surface testing, which would have the greatest likelihood of containing preserved faunal remains. Moss (1998:93-99) compiled a list of sites investigated in Southeast Alaska and we located all site reports included in that list first.

To identify and obtain site reports for sites tested since 1998, Moss contacted USDA Forest Service personnel for assistance, since the Tongass National Forest has been the primary landowner over the years, and has the most complete records of sites and site investigations in the region.<sup>9</sup> Moss also contacted the Alaska Office of History and Archaeology to obtain access to their Alaska Heritage Resource Survey (AHRS) for information about additional sites that may have been tested between 1998 and 2008. In short, our compilation of records of tested sites was as complete as possible. The reports we examined included dissertations, peer-reviewed journal articles, monographs, and contract reports either written by land management agencies or contractors hired by agencies.

Moss, Butler, and Elder then developed two spreadsheet forms that were used to record information from the reports. The first form related to site background, which we refer to as the *Metadata File*: AHRS site number, site name, author and year of publication, page numbers for faunal data and/or sampling methods, site testing methods, mesh size used, whether herring were present, and the site's latitude and longitude. We intended to record site area and excavation volumes associated with each tested site, factors that affect faunal analysis, but after reviewing several reports, realized such information was inconsistently presented. We did obtain some of these site details from plan maps and profile drawings, but again, this information was not always available. Considering time constraints and larger project goals, we dropped this variable from our study. Elder conducted most of this analysis, which was checked by Butler and Moss.

The second spreadsheet form was designed to record all the faunal records from tested sites, called the *Taxon Record* form. While the focus of our project is past herring

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<sup>9</sup> Many archaeological sites have since been transferred out of Forest Service ownership to the State of Alaska, municipalities, and to regional and village Native corporations. We do not systematically include all information on these land transfers in this study.

use, we chose to record the larger array of faunal data (birds, mammals, and shellfish) to estimate relative abundance of herring compared to other resources. For present purposes, we focus on fish. We compiled the finest taxonomic information provided in the project report (species, genus, family) using number of identified specimens (NISP) as the counting unit, since this was the most commonly used measure across sites. As noted above, mesh size used greatly affects results of fish faunal analysis and thus in our faunal data compilation, we noted mesh size used and distinguished sites and parts of sites that were sampled using different mesh sizes. Elder carried out this part of the work, which was checked by Butler and Moss.

To study temporal variation in herring and fisheries overall, we assigned sites and within-site components to the finest chronological unit possible using radiocarbon records. Radiocarbon ages were converted to calibrated calendar years using the CALIB program by Stuiver and Reimer (copyright 1986-2005, M. Stuiver and P. J. Reimer [1993], version 5.0.2). For each calibrated radiocarbon sample, we selected the age range at one standard deviation that had the highest probability of being correct. We determined the age range for analytic units (the site or within-site component) with multiple radiocarbon ages and thus calibrated ranges, by using youngest and oldest age ranges of the set of dates. We rounded ages to the nearest decade, following Stuiver and Pollach (1977:362). For visual analysis of trends, we plotted the midpoints of the calibrated age ranges. The protocol used to calibrate shell dates involved using CALIB (Hughen et al. 2004), adding 400 years to the uncorrected radiocarbon date to correct for the  $^{13}\text{C}/^{12}\text{C}$  ratios on marine or estuarine shell (Moss 2004a:60) and using a local reservoir correction of  $280 \pm 50$  years (Moss et al. 1989). The ages may differ slightly from those presented in earlier publications, given changes with the updated CALIB program, inclusion of additional samples, or different ways of sub-dividing or aggregating site components.

All site locations were mapped using ESRI ArcView version 9.3. Sites were plotted by importing the GPS coordinates provided as X, Y data and then projecting these points using the NAD27 coordinate system. The maps enable us to examine spatial trends; maps were generated plotting locations of archaeological sites for subsets of interest.

Exploratory data analysis was carried out to identify spatial and temporal trends in herring and other fish proportional representation; statistical analyses (Chi Square, Spearman's rank order correlation) to test for the significance. Sites or components within sites that contained  $\geq 50$  NISP were included in this quantitative analysis.

### Overview of Results

As of March, 2009, 2846 archaeological sites are recorded in Southeast Alaska (McCallum 2009).<sup>10</sup> We have reviewed 66 excavation reports; 22 were published in peer review journals, theses, dissertations, or monographs, and 44 were from less accessible contract and Forest Service reports. Based on these reports, we found that 181 sites have undergone some subsurface testing or excavation; most of these are shell midden sites where the shell helps preserve bone. We believe that 181 tested sites is a minimum number; we know that Forest Service employees have tested more sites than this over the years, but that these have not always been reported in formats accessible to us. Of these 181 sites, faunal remains were recovered from 93 sites (Figure 4.2).

Of these 93 sites, 29 could not be included in any quantitative analysis of spatial and temporal trends for various reasons: mesh size and other recovery methods were not presented or incompletely reported; faunal identifications were incomplete (either

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<sup>10</sup> According to Mark McCallum (2009 pers. comm.), the 2,846 sites listed on the Alaska Heritage Resource Survey for the Tongass National Forest do not include sites on Alaska Native corporation lands, other federal lands, or private lands, except for a few hundred weirs and traps found on State tide lands. This total also includes historical mines, fox farms, etc., including those of primarily Euro-american affiliation.

determined by admission of analyst or inferred from the extremely narrow range of taxa identified when combined with limited information on analytic methods); and inability to assign to time period, given absence of radiocarbon or other dating method. A total of 64 sites were reported and described in sufficient detail for us to potentially use in quantitative analysis (Figure 4.3).

There were 28 sites at which 1/8 inch or finer mesh screens were used producing results we judge as reliable for quantitative analyses of herring representation based on the comparative collections employed and/or analyst expertise (Figure 4.4). Of this subset of 28 sites, 21 (75%) contained herring bones (Figure 4.5), which indicates that when adequate recovery methods are used, the archaeological record shows widespread use of herring in the past. Five other sites yielded herring bones despite the methods used (49-CRG-237, 49-CRG-408, 49-CRG-409, 49-CRG-412, 49-CRG-443); these are also included in Figure 4.5 for a total of 26 sites with herring.

Of the 26 sites with herring bones, 13 sites contained in excess of 50 herring remains. Seven of the 26 sites were studied as part of Moss's (1989a) dissertation research on Admiralty Island where 2 mm mesh screens were used to analyze bulk samples. All but one of the sites excavated in that study produced herring bones. Another seven sites are sites Moss has been involved in excavating and analyzing at some point, and all included at least some fine mesh screening. To reiterate, if fine mesh screens are used, herring bones will likely be found.

#### Sites with Herring

To promote consistency between the components of the Herring Synthesis Project, we have organized archaeological sites that yielded herring bones by the communities in which Tom Thornton (and colleagues) conducted interviews to obtain environmental knowledge. The grouping of archaeological sites by community generally

follows kwáan territories as mapped in Chart 4 in Goldschmidt and Haas (1998:188-189). In some cases, multiple kwáan territories are grouped. The communities are ordered south to north and sites are ordered by site number under the community heading.

Relatively few archaeological investigations have occurred within the territories of the Yakutat, Chilkat, Chilkoot, and Huna kwáans located in the northern part of Southeast Alaska. We know of no subsurface investigations of any pre-contact site in Klukwan/Chilkat/Chilkoot territory. Only 2 sites in Yakutat and only 10 sites in Huna territory have been tested. Thus, the limited extent of investigations and the fact that 1/8 inch (or finer mesh) screens were not employed in any of these studies explains the absence of herring records in this area. The contemporary communities in Yakutat, Haines, and Klukwan were not included in the TEK interview process, so we have not included them here. At the southern end of Southeast Alaska are areas where environmental knowledge may also reside with contemporary communities located in British Columbia. This is particularly true for those areas occupied historically by Tsimshian and Haida. These data gaps should be filled in the future. Regarding archaeological coverage, significant data gaps are also readily apparent and will be summarized after the site descriptions.

In discussions that follow, the number of fish bones identified at least to the level of family is presented, and proportions, when given, do not consider specimens identified as “unidentified fish” in the total. Shellfish abundance is quantified by shell weight unless specified otherwise. Percentages provided for shell taxa often do include categories larger than family level identifications, including “unidentified clam” or “unidentified shell” in the total. The proportions of these more general categories are typically not presented in the discussion that follows, so consequently, the reported percentages often add up to substantially less than 100%. Although we strived for

consistency in reporting taxonomic abundances, the source materials precluded this in several cases.

*Taant'a/Sanyaa Kwáan: Ketchikan/Saxman*

Leask Site (49-KET-229):

The Leask Site is located on the south edge of Metlakatla, the main settlement on Annette Island. Annette Island is located south of Ketchikan within Tongass Tlingit territory, but was settled by Tsimshian who left Prince Rupert, British Columbia, with missionary William Duncan in 1887 (Dunn and Booth 1990:294). The site is located just south of the largest embayment on the west side of Annette Island, Port Chester. While the Leask Site is positioned outside the bay along its southwest entrance, the site is situated along Nichols Passage, with Gravina Island providing some protection. The site occurs on a bench 5 m above the beach alongside “an extensive sand and gravel reef” that is “one of the most productive clam habitats on Annette Island,” according to Minor et al. (1986:3). A small salmon stream is located 1 km south of the site.

In 1985, Minor et al. were contracted by the Bureau of Indian Affairs to conduct data recovery after the site had sustained considerable damage from bulldozing. Their map indicates site remnants covered an area 10 m x 10 m, with the shell deposit across 45 m<sup>2</sup> (Minor et al. 1986:8-10). Minor et al. excavated 12 m<sup>2</sup> and all fill was screened over 1/8 inch mesh. They defined two components, dated to 2490-2310 cal BP and 1950-1720 cal BP. Most of the faunal remains derive from the more recent shell-rich component; for descriptive purposes here, the fish remains from both components are lumped together. Of 599 fish bones, 51% were cod (Gadidae, but most likely *Gadus macrocephalus*, Pacific cod), 19% were salmon (*Oncorhynchus* spp.), and 17% were herring. Rockfish (*Sebastes* spp), spiny dogfish (*Squalus acanthias*), ratfish (*Hydrolagus collieri*), and flatfish (Pleuronectidae) were also identified. From three column samples, the most common

taxa were butter clams (*Saxidomus giganteus*; 64-79%) and littleneck clams (*Protothaca staminea*; 5-8%). Minor et al. (1986:42) characterized the site as a seasonally-occupied campsite from which nearshore fishing and shellfish gathering occurred in the immediate area. Based on ethnographic and environmental information, as well as analysis of growth rings on nine shells, they suggested the site was occupied during spring to early summer. The high proportion of herring co-occurring with the substantial proportion of cod is an association noted for other sites in Southeast Alaska, as described below.

*Hinyaa Kwáan: Craig/Klawock/Hydaburg*

Obsidian Cove (49-CRG-088) Rockshelter and Sea Cave:

Obsidian Cove is a very small cove located 4 km east of Cape Felix on the southwestern tip of Suemez Island. The site is about 35 km from Craig, and Suemez is one of the outer islands in the Prince of Wales Archipelago. The southwest side of Suemez Island faces the open sea, and is exposed to the full force of waves and weather moving across the north Pacific. Obsidian Cove is somewhat protected from full exposure, but travel to the site would likely be limited to days of relatively calm seas. The cove is named for obsidian nodules found along the beach (Moss and Erlandson 2001). Suemez Island obsidian has been geochemically identified in lithic assemblages of several early Holocene sites in Southeast Alaska, which prompted investigations in 1994 and 1995.

49-CRG-088 is comprised of two loci, a sea cave and a shallow rockshelter. The sea cave interior measures 38 m x 17 m, across which nine surface features were identified and four were sampled. The hearths and pit features in the cave were constructed into a matrix of rounded beach cobbles. Only two of the four dated features overlap in age, indicating they were deposited during at least three discrete occupational

episodes between 2940 and 960 cal BP. From small bulk samples (~1 liter), materials retained in the 1/8 inch screen were analyzed. Herring were represented by single bones in each of two features. Although the samples from the four features are small, rockfish, prickleback (Stichaeidae), lingcod (*Ophiodon elongatus*), greenling (*Hexagrammos* spp.), cod, and salmon were also identified, along with deer (*Odocoileus hemionus sitkensis*), sea otter (*Enhydra lutris*), duck (Anatidae), and cormorant (*Phalacrocorax* spp.). Of the shellfish, 91% are California mussel (*Mytilus californianus*), a species characteristic of outer coast surf-beaten shores. Barnacles (Balanomorpha) contributed 6% of the shell weight (Moss and Erlandson 2001:36-37).

In the rockshelter or overhang along a vertical cliff face, a 1 m x 1 m test pit was excavated into cultural materials admixed with beach cobbles. A single date from a middle depth overlaps with the age of Feature 1 in the sea cave: 1350-1260 cal BP. From material recovered in 1/8 inch screens, a single herring bone was identified, with salmon and rockfish the most abundant fish, followed by halibut (*Hippoglossus stenolepis*), lingcod, sculpin (Cottidae), greenling, cod, and spiny dogfish. California mussels comprised 98% of the shellfish (Moss and Erlandson 2001:40-41).

49-CRG-088 appears to have been a locality where small groups of people camped for short periods of time. All the food resources found in the archaeological deposit could be obtained from the rocky intertidal zone adjacent to the site and nearshore waters in the immediate vicinity. The taking of herring appears to have been incidental to the other activities conducted from the site, although the archaeological samples are very small.

Cape Addington Rockshelter (49-CRG-188):

Cape Addington Rockshelter is located on southwest Noyes Island in the outer Prince of Wales Archipelago, about 45 km west of Craig. The site occurs on the south shore of the narrow peninsula known as Cape Addington and is situated along the west

side of a headland. The archaeological deposit within this wave-cut shelter measures 20 m x 10 m at an elevation of 16.5 m asl. Investigations in 1996 and 1997 resulted in the excavation of ~9.5 cubic meters (Moss 2004a). For the purposes of the Herring Synthesis Project, the site deposits have been divided into two components, dated to 2000-690 cal BP and 700-140 cal BP, respectively.<sup>11</sup>

From the older component, of 2178 fish bones recovered in the ¼ inch field screens, halibut (34%), salmon (31%), Pacific cod (28%) and rockfish (4%) were most common. Only 5 herring bones were recovered. Other taxa identified included other fish, and prominent among the larger animals, deer, sea otter, harbor seal (*Phoca vitulina*), Steller sea lion (*Eumetopias jubatus*), northern fur seal (*Callorhinus ursinus*), albatross (*Phoebastria albatrus*), and eagle (*Haliaeetus leucocephalus*). Seabirds were also represented in low numbers. From the bulk samples screened over 0.132 inch mesh, only 7 herring bones were found among 49 fish bones. In these samples, halibut and cod bones were more numerous than herring.

From the more recent component, of 224 fish bones recovered in the ¼ inch field screens, halibut (39%) and salmon (36%) were most common, followed by cod (11%) and herring (10%). Other major taxa included deer, harbor seal, and Steller sea lion. From the bulk samples screened over 0.132 mesh, only 26 fish bones were recovered, of these 50% were salmon and 31% were herring. The shellfish assemblage from both components is dominated by California mussel, which comprises 90% of the shell weight. Rocky shore chitons (mostly *Katharina tunicata*) and barnacles generally make up 2-3% each.

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<sup>11</sup> These two components differ from the analytical units used in the site monograph (Moss 2004a). The older component is made up of Levels III, IV, V, and VI from Units 1-3 and Levels C-J from Units 6-7. The younger component is made up of Levels I-II from Units 1-3 and Levels A-B from Units 6-7. Twenty-two bulk samples from 1997 are included here, 17 from the older component and 5 from the more recent component.

The site was interpreted as a seasonal campsite, used in the spring and summer to obtain deer, halibut, salmon, Pacific cod, marine mammals, and seabirds. Not all of these resources are confined to the outer coast, although Steller sea lions, northern fur seals, and seabirds probably were. The rockshelter may have also been used to process and smoke fish such as cod, salmon, and halibut (Moss 2004a; Smith 2008). Considering the amount of excavation and the number of bulk samples, herring was not a focus of site activities.

Chuck Lake (49-CRG-237):

The Chuck Lake Locality 1 site is located on Heceta Island in the Prince of Wales Archipelago, about 45 km northwest of Craig. Heceta Island is one of the outer islands, but the Chuck Lake site was located well within a protected estuary on the southeast side of the island at the time it was occupied. The site occurs at 15-18 m asl and is currently about 800 m from saltwater, but at 9310-7930 cal BP, it was positioned at the head of an estuary. With isostatic uplift, the site is now stranded away from the beach. Ackerman et al. (1985) investigated the site after some portion of it had been destroyed in road construction. The Chuck Lake site is the oldest shell midden in Southeast Alaska. The shell along with the limestone bedrock in the area undoubtedly aided long-term preservation of cultural material.

It is not clear if screens were used during excavation to recover cultural remains from the site. It appears that at least eight bulk samples were taken, and shell was analyzed from five of these (Ackerman et al. 1985:118). Whether or not the bulk samples used in the shell analysis were also the source of the analyzed fish bones is not indicated. Of 614 fish bones, only 7 were herring. Most fish remains were cod (58%), greenling (23%), sculpin (9%), and rockfish (6%; Ackerman et al. 1989). Among the shellfish, butter clams and littleneck clams predominate, each contributing 31%. Another 37% of

the shell weight is comprised of the combined butter clam-littleneck clam category (Ackerman et al. 1985:118).

The Chuck Lake site has produced the oldest herring bones recovered from any archaeological site in Southeast Alaska. Although the quantity of herring used by site residents is undoubtedly under-represented, the site is important because it demonstrates herring were present in the area and being used 9310-7930 cal BP.

49-CRG-408:

This unnamed site was identified during the course of a timber sale survey (Greiser et al. 1994). It is located about 16 km northwest of Craig on Prince of Wales Island, along San Christoval Channel. The area is semi-protected by a scatter of small islands and the larger San Fernando Island to the south. The site occurs south of a small cove which lies northeast of the northern tip of the small Rosary Island. The site occurs about 15-20 m in from the beach, across a 60 m x 20 m area, at 3 to 6 m asl, between two small intermittent drainages. As they did elsewhere in their project area (see below), Greiser et al. (1994:2-4) used shovel tests (50 cm x 50 cm) to test for buried deposits, excavated these in 10 cm levels, and dry-screened the matrix over ¼ in mesh. They dated the subsurface shell deposit from 49-CRG-408 to 800-690 cal BP. Shell was encountered but not quantified. Among the 11 fish bones identified, one herring cleithrum was found in addition to rockfish, small flatfish, salmon, and cod/pollock bones.<sup>12</sup> Greiser et al. (1994:4-9) identified the site as a campsite where food processing occurred. This is another case in which herring was identified despite the use of coarse mesh screens.

49-CRG-409:

This unnamed site was also identified by Greiser et al. (1994) in their timber sale survey. The site is located about 22 km northwest of Craig on Prince of Wales Island

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<sup>12</sup> Susan Crockford, in an appendix to Greiser et al. (1994), identifies bones to the category of “large cod and/or pollock.”

where San Christoval Channel opens up into the Gulf of Esquibel. The site occurs near the base of the Blanquizal Point peninsula adjacent to a narrow channel across from the Blanquizal Islands. Buried cultural material was found on the top and along side of a limestone outcrop about 9 m high and extends over a 20 m x 30 m area. Greiser et al. (1994:4-10) classified the site as a fortification based on landform characteristics. It also appears to be strategically located. Two shovel test units (each 50 cm x 50 cm) were excavated and samples were dated to 800-430 cal BP. Shell was not quantified, but of the 76 fish bones recovered, 96% were salmon. A single herring dentary was found in addition to cod/pollock and rockfish. Like sites 49-CRG-237 and 49-CRG-408, herring was identified but is undoubtedly under-represented because of the coarse screen size used in recovery.

49-CRG-412:

This unnamed site was also identified by Greiser et al. (1994) and is located ~26 km northwest of Craig on Prince of Wales Island. It is situated along the shoreline of the Gulf of Esquibel, across from Heceta Island to the west-northwest. The site is positioned on the east (protected) side of the peninsula immediately south of the entrance to Salt Lake Bay. Two shell midden loci were found over a 60 m x 20 m area, 5 m asl. Samples from a shovel test unit (50 cm x 50 cm) dug into buried shell midden deposits dated to 1820-1360 cal BP. Of 124 fish bones, 97% were cod/pollock and single bones of herring, salmon, rockfish, and ratfish were found. Greiser et al. (1994:4-9) identified the site as a campsite where food processing occurred. This is yet another site where herring was identified despite the use of coarse mesh screens.

Craig Administrative Site (49-CRG-443):

The Craig Administrative Site is located within the bounds of the headquarters of the Craig Ranger District in the city of Craig, located on the west side of Prince of Wales Island. The site is positioned on the west side of Shore Cove, also known as South Harbor

in Craig. Prince of Wales Island is the largest island within the Alexander Archipelago and has an extremely convoluted coastline. Even the west side of the island is well-protected by the numerous smaller islands; Craig faces San Alberto Bay, but is protected by San Juan Bautista, San Fernando, Fish Egg, and other islands. The archaeological site has been damaged by on-going use and construction over the last century, but was estimated to have covered a minimum of 65 m by 50 m. As noted by Hanson and Broderick (1995:1), at least 14 archaeological sites have been recorded within a 5 mile (~8 km) radius of 49-CRG-443. Hanson and Broderick (1995:2-3) excavated three test pits at the site in 1995, and “tentatively” identified herring, but they did not report any numbers of specimens identified for any taxon. Because Hanson and Broderick used only ¼ inch mesh, their excavations are not further detailed here.

In 2007, Shona Pierce (an undergraduate at Western Washington University and a Craig Ranger District employee) excavated three “trenches” at the site (each smaller than a 1 m x 1 m unit). Dates from both investigations indicate the shell midden deposits range from 2250 to 1530 cal BP. Pierce took nine bulk samples (each 2 liters) from “each defined layer” in Trench 1. These samples were size-graded in the lab into ¼ inch, 1/8 inch, and 1/16 inch fractions. For all nine bulk samples, all bone in the ¼ inch fraction and bone in 100 ml of the 1/8 inch fraction was analyzed. Bone in 10 ml of the 1/16 inch fraction from only two bulk samples was analyzed. Although the numbers are not clearly reported (they appear in a labeled bar chart, not a table; [Pierce 2008:20]), it appears that: 1) in the 1/4 inch samples, 15 halibut bones, 81 herring vertebrae, and 20 herring prootics were identified, 2) in the 1/8 inch samples, 378 herring vertebrae and 55 herring prootics were identified, and 3) only "fish frags" were identified in the 1/16 inch samples. Because the salmon, herring, and halibut remains alone were identified, faunal records from this site cannot be used in quantitative analysis. The shellfish remains were quantified by NISP (in this case, number of identifiable fragments). Of the shellfish,

littleneck clam was most abundant in the 1/4 inch fraction and blue mussel (*Mytilus trossulus*<sup>13</sup> was most abundant in the 1/8 inch fraction (Pierce 2008:18). It is unfortunate that so little data have been recovered from what was probably a very rich archaeological site. Because herring were historically so abundant in the area of Craig, more work is clearly needed to sample sites in its immediate vicinity.

Kit'n'Kaboodle Cave (49-DIX-046):

Kit'n'Kaboodle Cave is located on the remote west coast of Dall Island in the outer Prince of Wales Archipelago. The site is positioned at the head of Gold Harbor, about 65 km south of Craig. The site is semi-protected within Gold Harbor, but travel to this region would be somewhat limited, as the west side of Dall Island is fully exposed to the north Pacific. The archaeological site is found within a complex solution cave system formed in limestone bedrock, with multiple entrances, levels, and passages. Archaeological remains occur in various areas in the cave and also in an adjacent rockshelter to the north. Test excavations in 1996 and 1998 and radiocarbon dating have shown that the rockshelter was occupied between 5600 and 3000 cal BP (Erlandson and Moss 2004), but faunal remains from the oldest deposits are still being analyzed. The components analyzed here date 2740-2460 cal BP and 2580-1570 cal BP. Although these components overlap in age, they derive from different areas of the site. From analysis of several bulk samples, small quantities of vertebrate remains were recovered.

From the 1/4 inch fish remains in the 2740-2460 cal BP component, 12 rockfish and 4 halibut bones were identified. In the 0.132 inch materials, 6 herring bones were found among 60 fish bones. Fish more common than herring in this fraction include prickleback and greenling. From the 1/4 inch fish remains in the 2580-1570 cal BP

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<sup>13</sup> *Mytilus trossulus* is the edible or blue mussel of the Pacific coast, formerly known as *Mytilus edulis*. *Mytilus edulis* is the native edible mussel of Europe and the Atlantic region (Lobel et al. 1990; O'Clair and O'Clair 1998:114). Even though almost all sources reviewed in this paper use the old terminology (*M. edulis*), we are using the updated *M. trossulus* here.

component, 84 fish bones were identified, 93% of which were rockfish. In the 0.132 materials, 4 herring were found among 34 fish bones. Rockfish make up 74% of these 0.132 inch fish remains. Deer are the most common mammal in both components and the shellfish remains are dominated by mussels (both blue and California) and barnacles (mostly *Semibalanus cariosus*).

Kit'n'Kaboodle appears to have been a place where small groups of people camped for short periods of time. All food resources found in the archaeological deposit could be obtained from the rocky intertidal zone and nearshore waters in the site vicinity. Like at Cape Addington and Obsidian Cove, apparently herring use was incidental to other activities at this site.<sup>14</sup>

*Shtax'héen Kwáan: Wrangell/Petersburg*

Coffman Cove Site (49-PET-067):

Coffman Cove is located on the northeast shore of Prince of Wales Island, about 60 km from the town of Wrangell. A former camp was located “near the head” of Coffman Cove, and a fort was situated nearby (Goldschmidt and Haas 1998:77). This area is very well-protected as it is situated on the east side of Prince of Wales Island, with Etolin Island across Clarence Strait to the east. The Coffman Cove Site has been known since 1970, and has suffered continuous loss due to logging camp, road, residential, municipal, and other construction over the last 50 years. The site underwent archaeological testing by the Forest Service in the 1970s and the State Office of History and Archaeology in 1993 (Clark 1979, 1981; Reger 1995), as well as smaller-scale work (e.g., Rushmore et al. 1998). Although faunal remains were recovered during those investigations, they are not part of this analysis.

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<sup>14</sup> Concentrations of small fish bone were observed during excavation, and at least some of these are thought to have been the results of land otter activity. Analysis of these samples is on-going.

Here we use data from excavations conducted by Northern Land Use Research in 2006, and focus on Area B-West, where 12 1 m x 1 m units were excavated. Vertebrate remains were recovered: 1) during wet-screening of fill through ¼ inch mesh, 2) in bulk samples, and 3) in “grab” samples of matrix (Moss 2008b). Even though there are no clear breaks in the history of site occupation, four components have been defined based on age-depth relationships: I (4160-4080 cal BP, Levels 5, 6), II (3800-3720 cal BP, Levels 3, 4), III (3510-3300 cal BP, Level 2) and IV (2100-1930 cal BP, Level 1). Faunal remains from levels were assigned to components for quantitative analysis. Here, we aggregate all components sampled using the ¼ inch mesh, which produced a total of 10,645 fish bones, 89% are salmon, followed by 5% cod, 3% sculpin and less than 1% herring (n=66). Other major taxa found in the ¼ inch samples include harbor seal, dog (*Canis familiaris*), beaver (*Castor canadensis*), sea otter and ducks; harbor porpoise (*Phocoena phocoena*) and black bear (*Ursus americanus*) were also identified. Of the 391 fish bones recovered in six bulk samples screened over 0.132 mesh, 62% were salmon, 23% were herring (n=88), and 14% were sculpin. Notably, herring bones were recovered during field-screening with ¼ inch mesh, but with the use of finer mesh, their abundance increased from 1% of the fish assemblage to 23%. Of the shell analyzed from bulk samples, the most common were butter clams (67%), littleneck clams (11%), and blue mussels (4%).

From Moss’s observation excavating 49-PET-067, it was clear that herring bones were not evenly distributed throughout the shell midden. During excavation of Level 4D in unit N 201/E 182, a concentration of bone was observed in the field and consequently collected as a small bulk sample (~250 ml). This sample was not screened in the field, but was transported intact to the University of Oregon laboratory. In the lab, this sample was screened over ¼ inch mesh and bones larger than ¼ inch were identified, including salmon (see Table 1). Since Moss observed many bones falling through the ¼ inch

screen, this finer material was scanned using a magnifier to identify herring bones, as presented in the middle columns of Table 4.1. To facilitate sorting, this material was screened over 2 mm mesh, but even then, herring vertebrae were lost through the screen. Due to the high density of bones still remaining in the fine matrix, Moss spent an additional 4 hours picking small identifiable bones from the 200 ml subsample until she exceeded the number of herring vertebrae needed to provide a round number for bone density. As shown in the third set of columns in Table 1, this intensive sorting resulted in both salmon and herring remains. From the 303 herring vertebrae pulled from the 200 ml subsample, Moss estimated a minimum density of 150 herring vertebrae per 100 ml of fine matrix.

This is a remarkably high density, and a minimum number of six individual herring are represented. Because so many cranial bones were found, this may represent a place where all parts of the herring skeleton were deposited— this may be from processing fresh herring for immediate consumption, from the disposal of bones from rendering oil, or a result of another activity. The concentration at 49-PET-067 may not be typical; without more sampling from the site, we cannot know. The study does highlight the localized nature of fish bone distribution in archaeological sites (see also Partlow 2006) and the need to develop sampling methods that adequately capture this variation. This exercise demonstrates not only that sole reliance on 1/4 inch mesh screens during excavation biases the recovery of herring bones, but that herring were much more abundant in the 49-PET-067 assemblage than suggested by even the 0.132 inch samples (see also Cannon 2000). Based on a range of seasonal indicators (Moss 2008b), site 49-PET-067 is thought to have been occupied nearly year-round during at least some of its ~2000 year history of occupation.

Table 4.1. Faunal Frequency (NISP) from analysis of 250 ml Bulk Sample from 49-PET-067, Unit N 201/E 182 (Level 4D). “Vert” refers to vertebrae and vertebral fragments; “cran” refers to cranial, pectoral, and pelvic elements.

TAXON	>1/4 in.			<1/4 in. scanned			<1/4 in. 200 ml subsample		
	total	vert	cran	total	vert	cran	total	vert	cran
Pacific Herring				190	167	23	152	136	5
Salmonid	73	58	15				11	9	2
Unidentified Fish	20								
Unidentified Mammal	2								

Gumboot Midden (49-PET-401):

Gumboot Midden is located near the head of Little Totem Bay at the south end of Kupreanof Island, along the shores of Sumner Strait. The site occurs near the boundary of Wrangell, Kake, and Klawock territories. Via water travel, the site is closest to the town of Wrangell located ~65 km to the east, although the distance north to Kake is not substantially further. The site is located only 125 m away from a small salmon stream at the head of Little Totem Bay (Smith 1996:93). Systematic probing resulted in the identification of shell midden over a 70 m<sup>2</sup> area atop a 10 m high bluff above a pebble-cobble beach. A 1 m x 1 m test unit was excavated, and a 10 cm x 10 cm column sample taken from one of its walls. The main cultural component, a dense shell stratum, dates to 730-590 cal BP. From the column sample in which material greater than 1/8 inch was analyzed, one herring bone was identified among 21 fish bones (Smith 1996:101). It is not clear from data presentation, however, whether all fish remains were identified or simply the herring and salmon, precluding using the records in quantitative analysis. Of the shell, the most abundant taxa (by weight) were butter clams (32%), chitons (29%), blue mussel (27%), and littleneck clams (6%). The relatively high proportion of chitons—known locally as gumboots—accounts for the site’s name, Gumboot Midden.

Coffman Cove Ferry Terminal Site (49-PET-556):

Site 49-PET-556 is located just 600 m away from the Coffman Cove Site described above. Site 49-PET-556 was discovered in 2005 during construction of the interisland ferry terminal, hence its name. In September 2006, Northern Land Use Research archaeologists excavated six 1 m x 1 m units at the site. The faunal analyses involved study of bones recovered: 1) during wet-screening of fill through ¼ inch mesh, and 2) in 27 bulk samples (Moss 2008c). The site deposits were dated to 3010-2130 cal BP and for quantitative analysis, divided into two components based on age-depth relationships (3010-2510 cal BP and 2330-2130 cal BP). No radiocarbon ages were obtained for the uppermost two levels of the deposit (Reger et al. 2007).

Of 2435 fish bones in the ¼ inch samples, 54% are Pacific cod, followed by rockfish (18%), sculpin (9%), salmon (5%), and lingcod (5%). Herring and halibut contribute about 3% each. The waters off Coffman Cove are thought to be an excellent place to fish for cod as they move up Clarence Strait towards Duncan Canal (Moss n.d.). Other major vertebrates found in the ¼ inch samples were deer and dog, but mink (*Mustela vison*) was also identified. From the bulk samples screened over 0.132 inch mesh, of 233 fish bones, 65% were herring, with cod (14%) and sculpin (10%) also relatively abundant. Like the Coffman Cove Site (49-PET-067), this example helps illustrate the degree to which screen size affects the relative abundance of species found in archaeological sites. In the Ferry Terminal Site samples screened in the field with ¼ inch mesh, only 3% of the fish bones were herring, but with finer mesh, the proportion of herring increased to 65%. This suggests that the abundance of herring at both Coffman Coves sites has been under-estimated.

Also from the bulk samples, the most common shellfish were butter clams (45-55%) and littleneck clams (28-37%). Overall, 49-PET-556 is thought to have been a site where primary occupation occurred in the spring, based on the abundance of Pacific cod;

see Moss (n.d.) for a more detailed argument. Like at the Leask site, a substantial number of herring co-occur with cod.

*Kéex' Kwáan: Kake*

The four sites listed here under Kake are all located on Kuiu Island. Although Kuiu Island was encompassed within Kake territory by Goldschmidt and Haas (1998 [1946]), earlier ethnographic works from the 1880s and 1890s (e.g., Emmons and de Laguna 1991; Krause 1979) identify the “Kuyu” or “Kuju” as a separate *kwáan*. Goldschmidt and Haas found that this background was still remembered in the mid-20<sup>th</sup> century. They wrote,

Testimony received in the field indicates that there was once a village on Tebenkof Bay which was the home of the Kuiu people. The population was decimated by an epidemic of smallpox and the remaining people moved across Kuiu Island from Tebenkof Bay. According to present accounts, some of the Kuiu people moved to Klawock and others moved to Kake. It is therefore not surprising that both the Kake and Klawock communities consider the Tebenkof area their own territory (Goldschmidt and Haas 1998:91).

Tebenkof Bay is the largest embayment on the west side of Kuiu Island. Each of the sites listed here are located in Tebenkof Bay and were investigated by Maschner in his dissertation (1992). The west side of Kuiu lies along a waterway that is a convergence of Chatham Strait and Frederick Sound. West Kuiu is somewhat protected by Baranof Island situated to the west, across this 12-24 km wide channel. Kake is located about 80 km north-northeast from Tebenkof Bay via water route.

Maschner labeled each of the four sites as a “house depression village” and conducted substantial excavations. Fish bones were identified in materials greater than

1/8 inch, and shellfish were identified in materials greater than 1/4 inch. Maschner (1992:316) took and analyzed some number of samples screened over 1/16 inch mesh, and notes, “a good portion of the herring vertebra [sic] from some units is found only in these samples,” but where these samples originated and the numbers of herring recovered are not reported systematically.<sup>15</sup> Also, it appears that Maschner’s records systematically under-represent multiple bottom-dwelling fishes (rockfish, greenling, sole, and others). Although we include Maschner’s records in our quantitative analysis, conclusions drawn from them remain tentative, given various reporting questions.

Elena Bay Village (49-XPA-029):

Elena Bay Village is centered within Tebenkof Bay along a west-facing shoreline with good views of the bay. The beach is a mix of gravel and sand and rocky intertidal. Seven housepits were identified and seven units (presumably 1 m x 1 m) were excavated within and outside the housepits. Two components were defined: one dated to 1550-1170 cal BP and the other to 300-100 cal BP.

In the older component, of 3553 fish bones, 65% were herring, followed by 27% salmon and 7% Pacific cod (Maschner 1992:318). Of the shellfish, 59% were butter clams, followed by littleneck clams (14%), and blue mussels (1%). In the more recent component, of 7359 fish bones, 82% were salmon, followed by herring (17%) and cod

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<sup>15</sup> In Maschner (1992:318-320), basic fish data are presented in Tables 8.10, 8.11, and 8.12. Table 8.10 is titled “Counts and Weights of Fish Analyzed.” Table 8.11 is “Total Fish Bone Counts and Weights for 1/4” Samples,” and Table 8.12 is for “...1/8” Samples Normalized to 100% of Total.” Without knowing what “normalized” means, we do not know how the numbers in these tables were derived. We computed the number of bones recovered in 1/8 inch mesh by subtracting the figures in Table 8.11 from those in Table 8.10 (although these are the same figures as in Table 8.12 where NISPs are presented to the hundredth decimal place). Another uncertainty is whether or not only fish vertebrae were identified. Many or most of the fish remains were apparently identified by Rasmussen (1993) who stated that she identified vertebrae only. Maschner (1992:304-305) indicates that analysis of the fish was incomplete, and indicates that “rockfish, greenling, sole, and other bottom-dwelling species have not been completely identified....” Maschner (1992:304) and (1997:89) present different figures for the number of bones identified, 79,685 and over 85,000 fish bones, respectively. Maschner (1992:305) states that salmon, cod, halibut, and herring make up 90% of the sample, whereas Maschner (1997:89) states that these taxa make up 98%. Maschner (1997:90) states that over 95% of the identifiable non-vertebral fish bones are Pacific cod, indicating that non-vertebral elements were identified. We cannot assess how reliable any of these figures are if the identifications remain incomplete.

(1%). Of the shellfish, 69% were butter clams, followed by 4% littleneck clams. The predominance of herring in the earlier component suggests some specialization on herring during this time, although this was not noted by Maschner. Maschner (1992:337-338) interpreted the shift to salmon in the later component as evidence of “over-exploitation” along with the “onslaught of the Little Ice Age” and “intensification of conflict,” but favors the latter (1997). He offers that increasing conflict resulted in decreased open water fishing and sea mammal hunting and a turn to less risky and localized salmon harvesting. While his hypotheses are intriguing they have not been fully tested.

Step Island Village (49-XPA-039):

Step Island Village is positioned along a small cove on the west side of Step Island in the middle of Tebenkof Bay. This site is located about 3 km southwest of Elena Bay Village along a steep pebble beach. Six house depressions were found and nine units were excavated. Maschner identified four pre-contact components dated to 4600-4290 cal BP, 2950-2700 cal BP, 2000-1400 cal BP, and 1180-730 cal BP.

The 4600-4290 cal BP component yielded 2187 fish bones, of which 44% were herring, 37% were cod, and 19% were salmon. The 2950-2700 cal BP component yielded 1772 fish bones, with 65% cod and 33% herring. The 2000-1400 cal BP component yielded 4698 fish bones; 86% were herring, 10% were cod and 3% were salmon. The 1180-730 cal BP component yielded 3061 fish bones, with 71% herring, 19% cod, and 9% salmon (Maschner 1992:318). These numbers suggest that over a ~4000 year time period, herring and cod were the primary taxa taken from this site. The bulk of the shellfish represented in the samples of all four components are butter clams (53-79%) and littleneck clams (11-19%; Maschner 1992:324). Step Island Village was apparently occupied prior to the “radical change” in subsistence that occurred with a shift to salmon

at 700 BP (Maschner 1992:337). Maschner (1992:199) considered this site to be “the most heavily and consistently used location in the project area.”

49-XPA-106:

This unnamed site is located along a small cove northeast of Gap Point on the northwest shore of Tebenkof Bay. It is situated about 3 km across the bay from Elena Bay Village along a gravel and pebble beach. The site contains five house depressions and five units were excavated within and outside these depressions. A single component was dated 800-630 cal BP. The site yielded a considerably smaller faunal sample than that of either Elena Bay or Step Island villages. Of 515 fish bones, 92% were salmon, with less than 4% each of herring and cod. The shellfish assemblage is similar to that of the previously described Tebenkof sites, with butter clams making up 66% of the shell weight and littleneck clams, 20%.

49-XPA-112:

This unnamed site is located only 1.5 km north of site 49-XPA-106, along the same shoreline. The site is the most protected of the four Tebenkof sites described here, and is situated just over 3 km northwest of Elena Bay Village, along a gravel beach intermixed with rocky intertidal habitat. The site is adjacent to a small stream and contains three housepits in and around which four units were excavated. The midden deposits at the site were described as “more substantial” than those at 49-XPA-106 (Maschner 1992:200). The site is dated to 1270- 620 cal BP, and yielded a fish assemblage about the same size as that from 49-XPA-106. Of 548 fish bones, 98% were salmon, with only 8 herring bones present. The shellfish assemblage is made up of 65% butter clams, 14% littleneck clams, and a greater percentage of chitons (8%) than at the other Tebenkof sites. The high percentages of salmon bones found at both 49-XPA-106 and 49-XPA-112 are taken to support Maschner’s notion of a “radical” shift toward salmon intensification, although one date from 49-XPA-112 predates his 700 BP

threshold for this change. It would seem equally possible that the salmon bones at these two sites represent fish taken from the streams in close proximity to the two sites, whereas Step Island and Elena Bay villages are located farther from the mouths of salmon streams. Both the Step Island and Elena Bay sites are located closer to the center of the bay in locations where herring might mass during spring spawning. Step Island Village displays the co-occurrence of cod and herring similar to what has been noted for the Leask and the Coffman Cove Ferry Terminal sites. Moser (1899:123) noted that herring were very numerous “on the northern shore of Kuiu Island.”

*Xutsnoowú Kwáan: Angoon*

Hidden Falls (49-SIT-119):

Hidden falls is located on the northeast side of Baranof Island across Chatham Strait about 35 km from Angoon. Hidden Falls is about the same aerial distance from Sitka, located 35 km to the southeast, but travel to Hidden Falls from Sitka via water is a 120 km journey. The site is located at the head of the small Kasnyku Bay near the outlet of Hidden Falls Lake. It is situated on a low saddle of a rocky peninsula that extends north into the bay, about 8 m asl (Davis 1989:2-3). A saltwater lagoon is found to the west and the semi-protected waters of Kasnyku Bay to the east feed into the more open Chatham Strait. The site name comes from the waterfall known as “Hidden Falls” that enters the lagoon, fed by the cirque lake, “Hidden Lake.” The Hidden Falls drainage supported a small run of 1000-2000 salmon prior to hatchery construction (Moss 1989b:109). Larger salmon runs are found in Cosmos Cove, located ~6 km to the north, where a wood stake fishing weir is dated to 3830-3630 cal BP (Moss and Erlandson 1998:186).

The Hidden Falls archaeological site was discovered during the course of hatchery construction, and as much as one-half the site was completely destroyed before

archaeological investigation occurred. The site was excavated by Forest Service archaeologists in 1978 and 1979 (Davis 1989). The remnant of the archaeological site is estimated to have covered 1740 m<sup>2</sup>, based on information described by Davis (1989:24-26). A minimum of 70 m<sup>2</sup> were excavated, and three cultural components were defined. Initially, one quadrant of each 2 m x 2 m excavation unit was water-screened through both ¼ inch and 1/16 inch mesh. Later the strategy shifted to water-screening the fill from the entire unit only through ¼ inch mesh (Davis 1989:39).

Component I is dated to ca. 9500 RYBP (Davis 1989:194), and produced a single unidentified fish bone (Moss 1989b:99-100). Component II is dated 5480-3360 cal BP. Among 209 fish bones, only 16 herring vertebrae were recovered from this component. All the herring bones derive from a single excavation unit, 98N 98W (Moss 1989b). This may have been one of the units in which 1/16 inch mesh screen was used, although fine mesh screening had been discontinued by the end of July, 1978 (Davis 1989:39). Most of the fish bones recovered from Component II were salmon (77%), but the sample is quite small.

Component III is dated 3270-870 cal BP. Among the 9679 fish bones, 95 herring vertebrae were recovered from 10 of the 30 excavation units in which fish bones were found. Most Component III fish bones were Pacific cod (49%) and salmon (40%), with rockfish and flatfish and trace taxa making up the remainder (Moss 1989b).

In both Components II and III, deer, domestic dog, unidentified whale, and unidentified bird bone were also found. In addition, harbor seal, land otter (*Lontra canadensis*), and beaver were found in Component III. Two column samples from Component III were analyzed to assess the shellfish taxa represented. The most abundant taxa in both columns were blue mussel (54%), littleneck clams (15-20%), and butter clams (15-20%). All other taxa made up less than 3% of the shell weight (Erlandson 1989).

At the time of the site's original reporting, Moss (1989b) suggested that occupation during Component III occurred during the winter and early spring when people at the site relied upon stored salmon, fished for Pacific cod, and collected shellfish, based on ethnographic patterns of seasonal resource procurement. At the time, the smaller faunal assemblage in Component II was thought to relate to the low density of shell therein, when compared to Component III. Because more units of the upper Component III were excavated prior to the excavation of the deeper Component II, they are more likely to have undergone fine mesh screening. Certainly, the abundance of herring at Hidden Falls is under-estimated because of the inconsistent use of fine-screening. Beyond this, it would be hazardous to draw further inferences from the numbers of herring bones recovered from Hidden Falls. Unfortunately, because the site records do not specify which recovery method (1/4 inch, 1/16 inch) was used to generate faunal tables, it is not possible to use the records in quantitative analysis.

Killisnoo Picnicground Midden (49-SIT-124):

The Killisnoo Picnicground Midden is located on Admiralty Island, about 5 km south of Angoon and about 400 m northeast of the Alaska State Ferry terminal. The site is situated on the west bank of the entrance to a saltwater lagoon at the head of Killisnoo Harbor. Killisnoo Island partially protects the harbor's coastline from the waters of Chatham Strait. The site lies adjacent to a former Forest Service picnic ground, hence its name. The property is now owned by Kootznoowoo, as it was part of their land selection under the Alaska Native Claims Settlement Act (ANCSA). A short access road leading from the main road between the city of Angoon and the ferry terminal leads to the site. Portions of 49-SIT-124 were damaged by construction of this spur road (sometime before 1967), by grading and gravel removal (between 1970 and 1980), storm damage in 1984, and continuing erosion along existing cut banks. The site extended for 220 m along the shoreline in a curvilinear band, as much as 15 m wide at the time of

investigations in 1985 (Moss 1989a; 2007a). The site is not located near a salmon stream.

In the early 1980s, some Angoon residents still referred to this general area as “Japantown” or “Little Tokyo,” because of the “Japanese cannery workers” who were said to have lived in the vicinity. Whether these people had worked at the nearby facility on Killisnoo Island or at the more distant salmon cannery at Hood Bay (or both) is not clear. The facility on Killisnoo Island was first established as a herring reduction plant in 1878 and a few years later it served as a whaling station. By 1890, the plant focused on the manufacture of herring oil and guano and the production of salted herring (de Laguna 1960:174-175). The Native settlement on Killisnoo Island was destroyed by fire in 1928 and the herring plant closed in 1931.

In 1985, two profiles were cleared from 49-SIT-124, and from each of these, a column sample was taken. Bulk samples from these columns were removed in 10 cm arbitrary levels. Methods used to process and analyze the bulk samples from Killisnoo Picnicground and those from 49-SIT-132, 171, 244, 259, 299, and 304 (see below) are described in detail in Moss (1989a:132-147). For our purposes here, all bone found in mesh sizes larger than 2 mm was analyzed. In addition, three larger excavation units (0.5 m x 1 m) were excavated at Killisnoo Picnicground. All matrix from these units was screened over 1/8 inch mesh.

The pre-contact occupation of the Killisnoo Picnicground Midden has been dated to 1730-850 cal BP and considered a single component (Moss 1989a; Moss et al. 1989). Of the 1872 fish bones, 207 (11%) are herring. Most of the fish bones recovered from the site are salmon (71%), followed by herring, Pacific cod (10%), rockfish (3%), and other trace taxa (Moss 2007a). Most of the herring (76%) were recovered from Column 2. The uneven distribution of herring within the deposit is illustrated by a comparison between the two column samples. While herring make up only 4% of the NISP in Column 1, they

account for 23% in Column 2. Very few herring were recovered from the excavation units where only 1/8 inch screens were used.

Sea otter are represented and low numbers of dog, harbor seal, duck, Canada goose (*Branta canadensis*), gull (*Larus* spp.), deer, land otter, beaver, and mouse (*Peromyscus keeni*) were found (Moss 2007a). The most abundant shellfish remains from the column samples were butter clams (53-55%), blue mussels (15-22%), and littleneck clams (10-11%), although 24 other shellfish taxa were identified (Moss 1989a:251-252). The shellfish habitats in the site vicinity are some of the most productive in the Angoon area, consisting of extensive gravel flats adjacent to and south of the site, a tidal lagoon to the northeast, and a rocky intertidal zone across the lagoon outlet (Moss 1989a:253-256).

The site was classified as a village in 1989, primarily based on the linear extent of the midden along the shoreline and ethnographic analogy. Like many known archaeological sites, its use during the 20<sup>th</sup> century and proximity to a population center have made the Killisnoo Picnicground Midden vulnerable to disturbance.

Yaay Shanoow (49-SIT-132):

Yaay Shanoow (*Yáay Shanoowú*) is located on top of and alongside a headland known as Pillsbury Point. The point is situated at the head of Stillwater Anchorage and along the entrance to Steamer Passage, about 3 km northeast of Angoon on Admiralty Island. Yaay Shanoow, in addition to sites 49-SIT-244, 299, and 304 discussed below, are located within a complex system of waterways and small islands east of Angoon that drains three major estuaries: Mitchell Bay, Kanalku Bay, and Favorite Bay. Salmon streams enter each of these bays, and salmon ascending to the head of Mitchell Bay are most likely to pass by Yaay Shanoow. Because of its location along narrow channels in an area of strong tides, control of this location was undoubtedly of strategic importance, and access to the site would be dependent on favorable stages of the tide.

The site's name "Yáay Shanoowú" means "Whale's Head Fort," although the site is also known locally as "Shark's Head Fort." These names refer to the shape of the sandstone at the base of the headland which has been weathered to form a shark's or whale's head. The suffix "noow" indicates a fort site, and in this case the fort was affiliated with the Wooshkeetaan clan. The site was first identified in 1949 by de Laguna who later excavated here (de Laguna 1960). Shell midden was found at the base and atop the headland. De Laguna dug a single test pit at the site, and although screens apparently were not used, some bones of salmon, halibut, and "rockcod," were found (de Laguna 1960:97). In her narrative, de Laguna (1960:97) also reports 106 sea otter bones, 18 seal bones, 6 bear bones, 3 deer bones, 5 eagle claws, 2 beaver bones, 2 porcupine bones, and fragments of whale or sea lion bone. De Laguna characterized the site as a sea otter hunting camp. The numbers I compiled from the Lowie Museum catalog at the University of California, Berkeley, however, differ a little from these: 103 sea otter, 15 seal, 5 brown bear, 3 deer, 2 porpoise, 1 beaver and 1 marmot (Moss 1989a:207). Since neither porcupine (*Erethizon dorsatum*) nor marmot (*Marmota caligata*) inhabited Admiralty Island during the time the site was occupied, these identifications raise questions that cannot be answered here (MacDonald and Cook 1996:577, 580-581). We cannot make too much of these numbers because it is unclear how the animal bones were collected.

In 1985, one deep column sample (with nine levels) was recovered from the site (Moss 1989a). Yaay Shanoow is considered a single component site, as the age of the lowest of three radiocarbon samples overlaps with that of the uppermost; the dates range from 970 to 700 cal BP (Moss 1989a). Of 356 fish bones, 41% are herring. Most of the rest are salmon (57%). Other vertebrate fauna represented in the column sample include sea otter and beaver. The most abundant shellfish remains recovered in the column sample were butter clams (50%), blue mussels (10%), chitons (10%), cockles

(*Clinocardium nuttallii*; 8%), green sea urchins (*Strongylocentrotus droebachiensis*; 7%), and *Mya* (6%). The rocky intertidal platform that extends south and east of the site is rich in mussels, chitons, barnacles, and sea urchins, and good butter clam beds are located within 650 m of the site (Moss 1989a:209). The heavy kelpbeds offshore would seem to have provided ideal sea otter habitat.

Despite the ethnographic evidence that the site was a fort, Moss (1989a:211) suggested that site structure and content suggested more generalized activities. Yaay Shanoow was thought to have a function complementary to that at Daax Haat Kanadaa (49-SIT-244; see below). Herring were relatively abundant in the column sample, and are known to school in Kootznahoo Inlet (Moser 1899:123), adjacent to the site.

Marten's Fort (49-SIT-171):

Marten's Fort is located on the southwest shore of Hood Bay, the first major embayment south of Angoon on Admiralty Island. The site is situated on a rocky promontory with a commanding view, and was first recorded by de Laguna (1960:53). The site's Tlingit name, *K'óox Noowú*, contains the suffix meaning fort (nu or noow). The site is affiliated with the Dakl'aweidi clan. Shell midden is found at the base of the headland, along its slope, and atop its summit as it is at Yaay Shanoow (see above) and Daax Haat Kanada (see below). In the 1980s, the remains of a stranded floating fish trap were recorded on the beach immediately east of the site. This trap was probably associated with the Hood Bay Cannery that operated in the area between 1918 and 1961 (Mobley 1999). Several salmon streams with sizeable runs occur at the head of Hood Bay in both North Arm and South Arm.

The site is dated to 1060-830 cal BP and is treated as a single component. Of 384 fish bones, most are salmon (96%), although herring were also found (4%; Moss 1989a:221). The only mammal represented in the small samples was a vole (*Microtus longicaudus*). The most abundant shellfish remains recovered in the column samples

were butter clams (46%), littleneck clams (21%), gaper clams (*Tresus capax*; 13%), and cockles (5%). The shellfish were probably gathered from the rocky substrates intermixed with muddy sand and gravels in the site vicinity (Moss 1989a:219). Like Yaay Shanoow, fort site occupation is indistinguishable from that of more generalized use.

Daax Haat Kanadaa (49-SIT-244):

Daax Haat Kanadaa (*Daaxhaatkanadaa*, “Where the Tide Flows Around [the Island]”) is located on a small, steep-sided island (110 m x 45 m) at the northeast end of Stillwater Anchorage. It is located just 250 m south of and across the channel from Yaay Shanoow, and less than 3 km from Angoon. Salmon en route to Mitchell Bay most likely travel past this site. The site’s name translates to “where the tide passes back and forth” (de Laguna 1960:79). The tide rushes around the island, making it very difficult to access when the tide is running in or out. Slack tide is the easiest time to land on the island, although a cobblestone causeway built by site residents (9 m long and 5 m wide) connects the island of Daax Haat Kanadaa to the larger island to the south known as Channel Point Island. This causeway is only exposed at low tide and provides access to freshwater on the larger island. The site’s location, its strategic position with good views, and stories of Deisheetaan clan battles, all support the site’s identification as a fort.

Like Yaay Shanoow, Daax Haat Kanadaa was identified in 1949 by de Laguna (1960) who excavated here. Shell midden was scattered across the island and de Laguna focused her excavations where it was concentrated, excavating 88 m<sup>2</sup> in two areas. She recovered a large artifact assemblage, although faunal remains were not systematically collected. Of 209 fish bones, 91% were salmon, but halibut, rockfish, and buffalo sculpin (*Enophrys bison*) were also identified (Follett 1982, pers. comm. to Moss). The numbers of other vertebrates compiled from the Lowie Museum catalog at the University of California include: 324 sea otter, 148 seal, 24 beaver, 21 porpoise, 16 deer, 11 brown bear,

9 Steller sea lion, 9 marmot, 9 whale, 8 dog, 7 eagle, and 3 land otter (Moss 1989a:183). Again, the marmot identifications are questionable (MacDonald and Cook 1996:577).

In 1985, three column samples were taken (Moss 1989a). Daax Haat Kanadaa was considered a single component site, dated to 1000-220 cal BP (Moss 1989a). Of 1731 fish bones, most are herring (55%) and salmon (44%). Small numbers of sea otter, dog, beaver, seal, deer, mustelid (*Mustela* spp.), duck, and mouse were found. The most abundant shellfish remains from the column samples were butter clams (41%), blue mussels (28%), and cockles (20%).

Like the nearby site of Yaay Shanoow, although Daax Haat Kanadaa is known as a fort site, a wide range of activities were staged from here. Sea otters are the most common mammal at both sites, and most likely taken from the extensive kelpbeds in the vicinity. Herring and salmon are abundant in the column samples, and occur in the local waters. Mussels are more common at Daax Haat Kanadaa than they are at Yaay Shanoow; during site investigations, we noted that the causeway connecting the site to Channel Point Island is covered in mussels. Fort-related activities are not easily distinguished from more generalized activities at either site.

Keishish Aani (49-SIT-259):

Keishish Aani (*Keishish Aani*, “Alder Town”) is located on the south side of and near the entrance to Hood Bay, the first major embayment located south of Angoon on southwest Admiralty Island. The site consists of a 350 m long curvilinear shell midden along the north shore of Alderwood Cove extending east to a rocky headland. The headland was identified as a fort site because of its elevated position and commanding view of the entrance to Hood Bay. The curvilinear band of shell midden was classified as a village site, because it is located along a steep gravel beach well-suited to landing canoes (Moss 1989a). The site name refers to the extensive stand of alder trees growing above the beach, which may be linked to a place mentioned in passing by Olson

(1967:76) known as Alder Town. The site is located ~15 km from the several salmon streams at the head of Hood Bay, in North and South arms.

From the fort landform, a date of 880-720 cal BP was obtained from a column sample. This sample yielded only 32 bones, most of which were unidentifiable fish. Single bones of salmon, sculpin, and rockfish and two land otter bones were recovered. The most abundant shellfish remains were butter clams (44%), littleneck clams (30%), gaper clams (8%), and blue mussels (7%). These shellfish were likely gathered on the beach at the base of the headland.

From the terrace immediately above the beach (the “village”), a column sample yielded dates indicating a single component dated to 1680-1170 cal BP. The seven levels of this sample yielded very little bone; of 65 fish bones, most are salmon (71%), although herring are present (n=2), along with gadid (n=6), greenling (n=5), and a few others. No mammals were identified to the level of family. The shell assemblage is similar to that of the fort, with butter clams (43%) the most abundant taxon, followed by littleneck clams (27%), blue mussels (11%), and gaper clams (6%). The faunal remains from both parts of Keishish aani provide little direct support for the idea of fort and village occupation, respectively.

Anteyuq (49-SIT-299):

Anteyuq (*Aandaayaagú*, “Rowboat”) is located on the north side of Sullivan Island less than 2 km east of Angoon. It is positioned along the middle channel of Kootznahoo Inlet near the entrance to Favorite Bay which lies to the south. From this position, salmon traveling to streams at the heads of Favorite, Kanalku, and Michell bays may pass by this strategic location. The channel here is not as constricted as at Yaay Shanoow and Daax Haat Kanadaa, so the site is more easily accessible to Angoon than those locales.

The site was first described by de Laguna (1960:45-46). The archaeological deposit is situated on a rocky knoll near the north end of the island and slopes down to a long flat below. Discontinuous patches of shell midden occur over a 300 m long area parallel to the shore. Anteyuq is located just 200 m north of the historic village at Sullivan Point (49-SIT-295); the two sites are separated by a stretch of steep rocky shoreline. The site is named for a shallow lagoon behind Sullivan Island called “Anteyuq.” Because of historic smokehouses and cache pits used at Anteyuq into the 20<sup>th</sup> century, it was initially classified as a fish camp (Moss 1989a).

From two column samples, four radiocarbon samples indicate that the buried deposits show use from 1530 to 590 cal BP. Of 1109 fish bones, most were salmon (97%), but herring were present (n=13, 1%). Sea otter were fairly abundant, considering the nature of column samples, and seal and beaver were also represented. The abundance of sea otter is similar to that found at nearby Yaay Shanoow and Daax Haat Kanadaa, located 1.3 and 1.6 km away, respectively. Clearly Kootznahoo Inlet was an important sea otter hunting location. The salmon bones from the site included more non-vertebral elements than any of the sites investigated as part of Moss’s dissertation. The skeletal element representation of salmon indicated whole fish were processed at the site, lending support to its identification as a salmon fishing camp, although site activities were by no means limited to fishing.

The most abundant shellfish remains were butter clams (49%), blue mussels (19%), horse mussels (*Volsella modiolus*; 11%), and littleneck clams (8%).<sup>16</sup> This is the only site in the Angoon area where horse mussels were found in substantial quantities. These shellfish occur in the immediate site vicinity where both rocky intertidal and coarse sandy gravel substrates are found (Moss 1989a:329).

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<sup>16</sup> The shellfish abundances in each of the column samples differed somewhat; I have taken a simple average of the percentages of site totals.

Garnes Point (49-SIT-304):

Garnes Point is located along the west shore of Favorite Bay, 1.3 km south of the center of Angoon “on the inside.” Garnes Point is only 700 m west-southwest of the ethnohistoric village at Sullivan Point (49-SIT-295, described above) across the channel that leads to the head of Favorite Bay. In the 1880s, the Northwest Trading Company was whaling and processing the oil at the factory at Killisnoo. After an 1882 whaling accident in which a shaman was killed, the Angoon Tlingit held two white men hostage in “the cove above” Garnes Point (de Laguna 1960:171). Tensions escalated and the U.S. Navy bombarded Angoon destroying almost all the houses, scores of canoes, and the winter food supply. Favorite Bay is named for the company boat, “Favorite,” that took part in the 1882 destruction of Angoon. De Laguna (1960:37, 46) indicates a location south of Garnes Point, as “Fisherman’s Town,” said to be the place where many Tlingit were staying when Angoon was destroyed. Other accounts indicate that at the time of Angoon’s destruction in late October, 1882, people were in Favorite Bay getting and processing herring (de Laguna 1960:168, 170).

In 1985, shell midden was found in a seacliff exposure that extended for 40 m along the south side of Garnes Point. With permission of the private landowner, a column sample was taken and yielded a date of 1280-1140 cal BP. Two glass seed beads indicate occupation during the 19<sup>th</sup> century as well (Moss 1989a:277-278). Of 919 fish bones, almost all were herring (99.7%), with a few salmon bones also present. Single bones representing a duck and a frog (*Rana* spp.) were also found. The shellfish assemblage is substantially different than others near Angoon because cockles (51%) are the most abundant taxon. Other major taxa include butter clams (13%), green sea urchins (12%), blue mussels (11%), and chitons (6%). Both the vertebrate and invertebrate assemblages suggest a distinctive site function.

In 1987, additional cultural materials, included human remains of at least two individuals, were discovered at Garnes Point during construction of the seaplane float. State archaeologists came to the scene and excavated a test pit, but no report of their findings has ever been published. The full extent of the site will never be known because much of the area remains in private ownership and construction has destroyed an unknown amount. The occurrence of human burials at the site suggests a village; whether or not the herring and cockle dominated assemblage from Garnes Point represents the “Fisherman’s Town” mentioned by de Laguna may never be known.

*Sheet’ká Kwáan: Sitka*

Jamestown Bay Midden (49-SIT-228):

Jamestown Bay Midden is located along Sitka Sound on the west coast of Baranof Island. The site is situated about 2.5 km east of Castle Hill in downtown Sitka. Even though west Baranof faces the open ocean, within Sitka Sound the site area is well-protected. The archaeological deposit occurs on a rocky knoll (which measures 25 m x 30 m on top), located on a point of land on the north shore of Jamestown Bay. Erlandson and Moss recorded the site in 1983 and noted that its setting was typical of Tlingit forts (Erlandson et al. 1990). With permission from the landowner, a single bulk sample (4.3 liters) was removed from a cut bank and dated to 780-540 cal BP. Of the 199 fish bones identified in the 2 mm mesh sample, 57% were herring and 43% were salmon. Because remains of other fish taxa were not analyzed, the site assemblage is not included in quantitative analysis. The most common shellfish were butter clams (37%), blue mussel (23%), littleneck clams (7%), and undifferentiated clam (25%). Although the site is a typical fort landform, at the time, we knew of no place name or other ethnographic data that might corroborate this hypothesized function. In 2003, Mobley re-visited the site and obtained information from the landowner suggesting the site retained a 2 feet thick

shell midden deposit covered by 3 feet of over-burden (Mobley 2003:19). Mobley (2003:17) also stated that Thornton had recorded the name of Dukcha Noow, or “Facing Out To Sea Fort,” which Mobley suggested could be the Jamestown Bay Midden.<sup>17</sup> The site’s original extent is unknown as it has probably been reduced by both house and road construction. More investigation would be needed to better evaluate site use. Remarkably, this is one of very few pre-contact sites that has seen any level of archaeological investigation in Sitka.<sup>18</sup> Because Sitka Sound herring fisheries play such a key role in the contemporary economy of Southeast Alaska, the Sitka area clearly deserves systematic archaeological investigation in the future.

*Áak’w Kwáan and T’aaku Kwáan: Juneau/Douglas*

Despite Juneau’s status as the largest city in Southeast Alaska, and the capital city of the state of Alaska, very few sites located within Auk and Taku kwáan territories have been tested. Both Auk and Taku territories are due substantial archaeological investigation. The North Point site, while located within Taku territory according to Goldschmidt and Haas (1998:88-89), is very close to the boundary with Kake territory.

North Point (49-SUM-025):

The North Point site is located well within the protected bay of Port Houghton on the mainland of Southeast Alaska. Port Houghton is 130 km south of Juneau and 55 km northeast of Kake; it empties into Stephens Passage not far from its confluence with Frederick Sound. The site is located near a rocky headland on the south shore of Port Houghton, along a small, north-facing cove, where Port Houghton narrows to form the

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<sup>17</sup> Mobley cites Thornton (1998:33-34) for the source of this place name, but does not include Thornton (1998) in his list of references so we cannot include it here. Thornton (personal communication) reports that this name was not confirmed by contemporary speakers; however, another name for this settlement that was confirmed is Shaaseiyí Aan (Village or Land beneath the Mountain).

<sup>18</sup> The best locally known excavation of a pre-contact archaeological site along the road system of Sitka is probably the Starrigavan Site (49-SIT-229). Starrigavan was subject to substantial excavations in both 1984 and 1991 (Davis 1985a; Campen et al. 1992). Herring bones were undoubtedly encountered, but unfortunately, recovery and analytical methods and the resulting faunal assemblages were not fully analyzed or reported.

entrance of North Arm. Sandborn Canal is located about 4 km to the west. Today, Sandborn Creek is well known for its large run of pink salmon (*Oncorhynchus gorbuscha*), but creeks at the head of Port Houghton also support salmon. Because of its location on the mainland, this area provides habitat for brown and black bears. Both mountain goats and wolverines also occur, animals generally not present on the islands of the Alexander Archipelago (prior to historic times). The sheltered beach at the North Point site is a mix of gravels and cobbles with bedrock outcrops, and the cultural deposits (including stone tools) were identified in the intertidal zone by Northern Land Use Research archaeologists (Bowers et al. 1996).

The intertidal shell midden at North Point has been dated to 2770-1990 cal BP, with deposits above the midden dated to 1900-150 cal BP. Faunal remains were analyzed from five 1 m x 1 m units excavated into the midden (Bowers and Moss 2001). Of 2415 fish bones recovered in ¼ inch screens, 87% were Pacific cod, followed by rockfish (6%), salmon (6%) and other fish in trace quantities, including herring, represented by 6 bones. Shellfish remains were not systematically recovered or analyzed. From a single bulk sample, 100 ml of matrix retained in the 2 mm mesh screen was analyzed. Of 358 bones sorted out, most were too fragmentary to identify, but 36 herring elements were found (Bowers and Moss 2001:174, note 5). This suggests that herring were much more abundant in the North Point shell midden than suggested by their low numbers recovered in the ¼ inch screens.

Although the numbers are small, a wide range of mammals (deer, harbor seal, mountain goat [*Oreamnos americanus*], porcupine, hare [*Lepus americanus*], beaver, mink, land otter, wolverine [*Gulo gulo*], and dog) and birds (loon [*Gavia immer*], murre [*Uria aalge*], gull, cormorant, grebe [*Aechmophorus occidentalis*], and ducks) are represented among the faunal remains. North Point residents appear to have focused on cod fishing, but they also used resources from high elevation alpine areas, forested

shoreline, and intertidal zone (Bowers and Moss 2001:173). The abundance of cod led to the inference that the site was occupied in late winter to early spring (Bowers and Moss 2001:169-170). Although North Point is the only site on the mainland that has produced herring, no other mainland site contents were screened with fine mesh, so the scarcity of records probably reflects sampling bias.

#### *Xunaa Káawu: Hoonah*

Within Huna Tlingit territory, no sites have been tested with methods adequate to recover herring bones. Other than Ackerman's work in the 1960s (Ackerman 1965, 1968, Ackerman et al. 1979), little testing of sites has occurred here (with the exception of Bergey 1982; Kelly et al. 1994; Wessen et al. 1993). Huna territory is in desperate need of more archaeological investigation with fine screen recovery methods.

#### Analysis of Spatial and Temporal Trends

##### *Broad Patterns: Temporal and Spatial Distribution of Herring Occurrence*

As shown in Figure 4.5 and discussed previously, the spatial distribution of sites with herring across Southeast Alaska is extremely uneven. Herring records are absent in the northern third of the region and large gaps occur between clusters of sites near Angoon and in Tebenkof Bay where concentrated field work has taken place. Since herring were recovered from most tested sites, this spatial patterning mainly reflects location of archaeological projects, rather than something distinctive about past herring distribution or human use patterns.

To highlight the temporal distribution of herring occurrence across all project sites, we plotted the midpoints of the calibrated age ranges from the 36 components within the 26 sites with herring (Figure 4.6). The plot shows the very early occurrence of herring at Chuck Lake (49-CRG-237), a several thousand year gap in records, then an

increase between 4500 and 4000 cal BP, based on herring in early components at Coffman Cove (49-PET-067), Hidden Falls (49-SIT-119), Step Island Village in Tebenkof Bay (49-XPA-039), and North Point (49-SUM-025). After 1500 cal BP, frequency climbs to the highest levels of the Holocene before dropping to just one occurrence after 500 cal BP, at Cape Addington (49-CRG-188). As noted above, herring were recorded in 75% of the sites that were sampled with at least 1/8 inch mesh. Thus the frequency distribution would likely be similar to one generated for the overall frequency of ages from archaeological sites (not just the sites with herring). While such a plot has not been generated for Southeast Alaska, Ames and Maschner (1999:54) present two curves for the Northwest Coast, one for a northern sub-area and another for a southern sub-area.<sup>19</sup> These curves show a broadly similar pattern, in which early sites are few, but the numbers of sites increase in time. Plots such as these provide a crude proxy for trends in human demography—with low values in the early Holocene reflecting low human populations and higher values in the later Holocene indicating higher populations. The scarcity of occurrences of herring after 500 cal BP is noteworthy. The low frequency might represent changes during the historic period, including site abandonment due to population loss from epidemic disease and movements to centers of trade or viable population aggregates. It might also reflect the archaeological practice of dating early occupations levels and not terminal occupations at sites, assuming continuity with the historic period (Moss 2004b:182). Whatever the reason, the practical constraint for the Herring Synthesis Project is that we lack archaeological records that overlap in time with oral historical records obtained through study of LTK.

### *Proportional Representation of Herring and other Fishes*

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<sup>19</sup> Ames and Maschner do not include information on the geographic boundaries of the sub-areas or the dates used to generate the two curves.

This section summarizes frequency of herring and other fish taxa using bone counts (NISP) from Southeast Alaskan sites or within-site components when possible. Before presenting results, it is important to consider the main factors that affect taxonomic abundances from archaeological sites, and in turn interpretations of past human use of fish, and ways we addressed these factors in our analysis (Table 2). The local environment, such as proximity of salmon streams and local marine conditions (geomorphology, substrate, depth, ocean currents) obviously constrains resource productivity and the types and abundance of various fish species. In addition, past change in local environments resulting from tectonic events, postglacial sea-level rise, and climate for example, could cause subtle or dramatic changes in locally available fish. The preliminary nature of our study did not allow for analysis of local environmental conditions of sites, and because so few paleoenvironmental reconstructions for Southeast Alaska have been attempted, we can't readily assess how changing conditions altered marine and salmon stream conditions. Our presumption is that much of the geographic variation in fish use seen across sites in Southeast Alaska results from local environmental variation. The best way to detect temporal change in fisheries focuses on records from sequences in particular sites or local areas, and in this way, control for gross environmental differences. We do this when our records allow. Also, we assigned sites to a simple classification based on exposure to wave action (protected, semi-protected, and exposed) to see whether fish use varied based on this coarse-grained environmental variable.

Whether sites were occupied seasonally or year-round, were special-use sites or residential villages, greatly affects the types and abundance of fishes used (Table 4.2). While only limited settlement pattern studies have been conducted in Southeast Alaska, Maschner (1997), drawing on his own work at Tebenkof Bay and others' research in northern British Columbia, identifies major changes in settlement patterns over the past

4500 years. Around 2000 years ago, he believes that people began to occupy more substantial residential villages and the cultural system shows characteristics of social ranking and other markers of the “Northwest Coast Pattern,” (i.e., lifeways observed at the time of European contact, see Matson and Coupland 1995:5-6) . Unfortunately, most sites in Southeast Alaska, including those in our study, have not been sufficiently sampled or analyzed to determine their placement within settlement systems. Therefore, we were unable to control for the variable of site function in accounting for the fish record.

Table 4.2. Main factors that affect faunal abundance and frequency

<b>Factor</b>	<b>Ways to Control</b>	<b>Addressed in this Study</b>
Local environmental variation as it affects resource abundance Paleoenvironmental change affects resource abundance	Better understand environmental context of archaeological sites using contemporary, historic and paleoenvironmental records; Palynology, geochemistry of shellfish and bone	Assigned sites to simple classification based on degree of exposure. Examined long-term trends in multi-component sites or site groups confined to limited area
Human settlement and landuse; seasonality and site function	Examine range of artifacts and facilities from site and assign to settlement class, e.g., village vs. specialized use; estimate season of site occupation using faunal remains and other artifact classes	Unable to address. Inconsistent information from site reports; many sites insufficiently sampled to estimate season of use, and place of site in overall settlement pattern
Preservation conditions	Presence of shell promotes bone preservation	All sites included in study contained some shellfish, so limited impact on site records
Archaeological sample representativeness	Probabilistic sampling methods, sampling to redundancy in field sampling and laboratory analysis of faunal remains; excavation of larger volumes. Use nested screens to estimate recovery bias for various faunal classes and allow for greater comparability of records	Unable to estimate and control for field sample variation and absolute difference in volume excavated, given reporting methods. Assessed sample size effects for proportional representation of fish taxa. Compared faunal records obtained using different mesh size

Yet another factor that obviously affects the faunal record is preservation conditions (Table 4.2). The presence of shell in archaeological sites is known to promote bone preservation. Since shell was present in all of the sites we included in our quantitative analysis, at least general preservation conditions are consistent and therefore not responsible for differences in faunal records we see across sites.

Finally, archaeological sampling, including volume of excavated material, number and distribution of test units, and mesh size used, greatly affects faunal representation (Table 4.2) (e.g., Grayson 1984). The variability in a site's deposits (the duration of occupation, its size and range of human activities carried out) adds complexity to sampling and our ability to obtain representative samples of faunal remains. Such issues are a challenge to archaeology everywhere (e.g., Lyman 1991). In Southeast Alaska, the apparent goal of most archaeological sampling has been to obtain a general understanding of site characteristics, to place sites in a culture historical sequence, and consider their eligibility to the National Register of Historic Places. For many investigations, the goal has not been to obtain samples for subsistence reconstruction or understand resource use in the context of overall settlement systems (see Moss 2004b). The scale of testing ranges from a few shovel probes to multiple column samples, to extensive block excavation. In many cases, the actual volume sampled is unclear, making it difficult to assess the impact of even sample volume on faunal representation. As has been discussed above, mesh size used during testing also greatly affects taxonomic representation, especially of fish and recovery of remains from small-bodied herring. We addressed some of the sampling issues in this way. We excluded site assemblages with <50 NISP from analysis and then used Spearman Rank Order correlation (Zar 1974), following Grayson (1984), to assess whether samples larger than 50 NISP were adequate. To control for screen size effects, we have separated our

results into mesh size sample groups: >1/4 inch mesh, >1/8 inch mesh, and >2 mm mesh. Finally we only included samples in the study when recovery and analytic methods were sufficiently explicit.

Our chief method of illustrating variation in fish frequency across the study area uses simple pie charts that show the proportional representation of the main taxa in project sites (herring, Pacific cod, salmon, “other” fish-- mainly rockfish, greenling, sculpin, and halibut). We recognize limitations of the closed array, that proportional representation of one taxon is dependent on percent change in other taxa (i.e., an increase in Taxon A may reflect an actual increase in use of the fish, or simply a decline in use of other taxa). We use this analytical approach more to suggest trends and direct future research, rather than to provide definitive statements about past use patterns. We further examined temporal trends by plotting proportional representation of the main taxa in each component by midpoint of calibrated age range. A summary of all the faunal records included in analysis will be made available on-line.

First, we examine sites where sampling methods are adequate to recover herring bones (1/8 inch and 2 mm mesh). Then we proceed to examine fish assemblages recovered with 1/4 inch mesh, even though herring proportions are grossly under-represented in these samples.

#### 1/8 inch Mesh Samples:

Faunal assemblages from 10 sites and 15 components were included in the initial review.<sup>20</sup> Analysis showed a significant correlation between sample size and percent herring ( $r_s = .582$ ,  $.05 > p > .02$ ); when the three components with sample sizes <100 NISP were removed (two components of 49-CRG-088; 49-DIX-046), the correlation was reduced and no longer significant ( $r_s = .283$ ,  $p > .2$ ).

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<sup>20</sup> Samples from 49-PET-067 that were screened using .132 inch mesh were included with the 1/8 inch (.125 inch) samples.

Figure 4.7 plots the proportional representation of herring, salmon, cod, and “other” by site location; the midpoint of the calibrated age range listed next to the pie chart provides an age estimate. Four single components from four sites and eight components from four sites in the Tebenkof Bay area are displayed. Herring, salmon, and Pacific cod are the primary taxa represented, with only modest representation of “other” fish (mainly non-schooling bottom fishes) in any component. As noted previously, Tebenkof Bay fish remains in the “other” category have not been fully analyzed, which accounts in part for their low frequency in these sites. On the other hand, the four components which have been fully studied also show relatively low frequency of bottom fish (<20%), which suggests this group of fishes was never as important as herring, cod, and salmon.

A wide range of variation is shown with the single component records. Three components suggest prominence of a single and different taxon: 49-PET-067, salmon, 49-PET-556, herring, 49-KET-229, cod; the fourth record from 49-SIT-124 shows more balanced representation of cod and salmon. Herring is well-represented at all of these sites except 49-SIT-124, however, herring representation in the 2 mm mesh samples from this site is much higher (see Figure 4.11). The Coffman Cove sites (49-PET-067, 49-PET-556) provide an opportunity to examine temporal change in fish use at one location. The ~3700 cal BP component is dominated by salmon, and to a lesser extent herring, and “other” fish, while the ~2700 cal BP component exhibits extremely high herring frequency and a relative decline in salmon.<sup>21</sup> We will return to these site records when presenting the ¼ inch samples that also show a striking shift in fish representation before and after 3000 cal BP.

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<sup>21</sup> The number of bulk samples representing the earlier time period at 49-PET-067 is quite limited compared to the number of bulk samples from 49-PET-556, so we offer this as a trend to be tested with future work.

The eight components from the four Tebenkof Bay sites (arranged in chronological order by midpoints of calibrated age ranges) provide a record of fish use spanning the last 4000 years cal BP, and show several trends (Figure 4.7). Early records show a prominence of herring, cod, or both, and later components show an increase in salmon and relative decline in herring and cod. The trend of increasing representation of salmon is high and significant at the .10 level ( $r_s = .714$ ,  $.10 > p > .05$ ) and is not related to sample size ( $r_s = -.309$ ,  $p > .50$ ). The trend for decreasing frequency of herring is not as strong and not significant ( $r_s = .523$ ,  $p > .20$ ). Maschner (1992, 1997) has highlighted these trends previously and outlined three hypotheses to account for the increase in salmon use. First, he suggests increasing conflict among social groups made crews fishing in open-water vulnerable to attack. People turned to harvesting salmon on rivers, which involved reduced threat.<sup>22</sup> Second, he offers that over-exploitation of cod/herring reduced prey populations to such an extent that people had to turn to salmon. Finally he suggests changing settlement patterns, particularly a shift from seasonal mobility to more residential stability meant that a greater number of salmon remains resulting from summer salmon fishing would end up in village locations. Maschner (1997:91) also suggests that “full sedentism” is characteristic of villages after AD 1300. Maschner prefers the first hypothesis, drawing on warfare/conflict, but we suggest that much more additional work is needed to determine cause. Moreover, the actual changes in the fishery and timing of changes need to be better articulated, to develop hypotheses appropriate to the pattern of interest. For example, cod show the greatest decline after 2700 cal BP, and herring show the greatest decline after 1000 cal BP. Any explanation for shifts in fisheries needs to consider the phasing of these changes.

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<sup>22</sup> The basis for interpreting an increase in warfare comes from sites interpreted as forts (Moss and Erlandson 1992), however, not from the contents of the housepit depression villages examined in Maschner’s study.

An additional way to examine temporal trends in fisheries joins all the 1/8 inch samples and plots percentage frequency of herring, cod, and salmon over time (Figures 4.8, 4.9, 4.10). Slight downward trends are indicated in the herring and cod records (Figures 4.4.8, 9; for herring:  $r = .211$ ,  $p = .509$ ; for cod:  $r = .348$ ,  $p = .268$ ) but neither trend is significant. Since most site locations are classified as “semi-protected,” degree of site exposure does not account for any trends. As noted above for the Tebenkof Bay sites, there is a trend for increasing salmon representation over time when all records are considered together (Figure 4.10), but the relationship is not significant ( $r = .435$ ,  $p = .157$ ). The range of values for most time periods for herring, cod, and salmon suggests fish use is likely tied to very local conditions of availability and site seasonality or function, rather than to any general region-wide subsistence pattern.

#### 2 mm Mesh Samples:

All of the 2 mm mesh samples are from the Angoon area and were obtained as part of Moss's (1989a) dissertation. There was no relationship between sample size and percent herring ( $r_s = .119$ ,  $p > .50$ ) or salmon ( $r_s = .072$ ,  $p > .50$ ) and thus all site records were included in analysis. The eight single component sites represent a time period from ~1400 to ~600 cal years BP. As shown in Figure 4.11, salmon and herring are the primary fish for all sites. “Other” fish (in these sites mainly rockfish, sculpin, and greenling) represent a very small fraction (less than 5%) at all but one site (49-SIT-259), and cod is almost as scarce. At five sites, salmon absolutely dominates (>70% NISP); at one site herring absolutely dominates (99%) and at only two sites are salmon and herring similarly represented. Together these records support the idea that fishing activities tended to target specific fish.

To examine temporal trends, we plotted the percent herring and percent salmon for each site, using the midpoints of calibrated age ranges for age assignment. As shown in Figures 4.12, there is a very slight but insignificant trend in increased herring over

time ( $r=.147$ ,  $p = .157$ ) and no trend at all for salmon ( $r=.000$ ,  $p = 1.00$ ; Figure 4.13). In comparing the records from Tebenkof Bay to those from Angoon, Maschner (1997:93) asserted that Moss's research had also documented the increasing role of salmon in the late Holocene. However, analysis of Angoon fish records does not support this claim.

#### 1 /4 inch Mesh Samples:

A number of sites were only tested with 1/4 inch mesh, or substantial volumes of matrix were screened with 1/4 inch mesh, which, as previously explained, has been shown to greatly bias against herring recovery. Thus we do not use this set of records to examine herring representation. On the other hand, the relatively large size of other prominent fish taxa in Southeast Alaskan sites means that 1/4 inch mesh is sufficient for recovering their remains, so we examine their variation in representation.

The comparisons focus on 18 components from 11 sites. We included Chuck Lake (49-CRG-237) in this overview, because of its great age and potential insight into the earliest fisheries of Southeast Alaska, even though reporting is unclear about mesh size used. Spearman Rank Order correlation tests to evaluate sample size effects were low and not significant (salmon:  $r_s = .226$ ,  $p > .20$ ; cod:  $r_s = .159$ ,  $p > .50$ ), so all components were included in the comparison.

Figure 4.14 plots the proportional representation of salmon, cod, and "other" by location and highlights major geographic variability in fish use and, except for one locale (Coffman Cove), few temporal trends. As noted previously for other mesh samples, most components indicate relatively specialized fish use; the 1/4 inch samples emphasize the use of large schooling fishes: salmon or Pacific cod. We define specialized use when components are represented by >50% of one taxon. Eight components are represented by >50% cod; 5 components show >50% salmon (Figure 4.14). Only five of the 18 component assemblages are *not* dominated by cod or salmon. Four of these components are located in one area: the southern outer coast. Records from 49-DIX-046 and 49-

DIX-053 are unique among all components (including those sampled using other mesh sizes) in being completely dominated by “other” taxa, mainly bottom fishes (rockfish, greenling) with a low frequency of the intertidal prickleback (*Stichaeidae*) at 49-DIX-053. The two Cape Addington components (49-CRG-188) include 10-35% salmon and cod, but frequency of halibut is greater. Such high halibut abundance is unique across all Southeast Alaskan components.

Most of the remaining sites are either cod or salmon-dominated and most extremely so (Figure 4.14). Thus the four sites reported by Greiser on Prince of Wales Island suggest highly targeted salmon or cod fisheries (see “Control Lake Sites” in Figure 4.14). The three oldest components at Coffman Cove (49-PET-067) show the focused use of salmon, while the three components at North Point (49-SUM-025) show dominance of cod. The earliest site in Southeast Alaska in our sample, Chuck Lake (49-CRG-027), also highlights the use of cod, though “other” taxa (in this case, rockfish, sculpin, greenling) comprise a sizeable fraction of the collection.

Two sets of records provide a substantial temporal sequence and thus an opportunity to track change in the fishery at one location. The North Point site (49-SUM-025), which spans the time period between ~4000 and 1000 cal BP, shows a remarkably consistent record of cod dominance, with only slight variation in representation of salmon and “other” fish over time (Figure 4.14). On the other hand, the sequence from the Coffman Cove sites (49-PET-067, 49-PET-556) suggests intriguing changes after 3000 yrs ago. The sites are located less than 1 km apart and taken together, their deposits span the time period between ~4000 and ~2000 cal BP. The oldest three components dating before 3000 cal BP show a focus on salmon, while the three components dating after 3000 cal BP show a much higher frequency of cod and “other” fish (bottom fish including rockfish, sculpin, greenling; Figure 4.14). The fish record from the 1/8 inch mesh samples (see Figure 4.7) modifies this picture somewhat—by

highlighting the importance of herring before and especially after 3000 cal BP. However, both the ¼ inch and 1/8 inch samples indicate the decline in salmon and increase in cod across this 3000 cal BP time marker, which suggests the trend is not simply due to sampling method.

We also plotted the percent frequency of salmon, cod, and halibut from components by age to detect any region-wide temporal trends that transcend geographic variability. As shown in Figures 4.15 and 4.16, there are no linear trends in use of salmon (salmon:  $r = .023$ ,  $p = .929$ ) or cod (cod:  $r = .101$ ,  $p = .268$ ). Since halibut is only prominent in the Cape Addington components (49-CRG-188), the modest linear trend (Figure 4.17,  $r = .435$ ,  $p = .157$ ), is only reflecting the late age of records from this site.

#### *Summary of Spatial and Temporal Trends*

Overall, site records emphasize use of three main fish: herring, cod, and salmon. Non-schooling bottom fishes (rockfish, greenling, sculpin, and halibut) are prominent mainly in sites located on the southern outer coast of Southeast Alaska.

Herring remains are present in 75% of sites sampled using 2 mm and 1/8 inch mesh, indicating they were a consistent part of subsistence throughout human occupation of Southeast Alaska. For three areas with records spanning multiple time periods, we can describe local patterns in use. For the Angoon area, there are no discernible time trends for the ~1400 to 600 cal BP occupation sequence; herring abundance varies from 100% (49-SIT-304) to 0% (49-SIT-130), to sites with varying herring representation. On the other hand, herring representation in the Tebenkof Bay components, spanning the last 4000 cal BP period shows a slight but not statistically significant decline over time (especially after 1000 cal BP); salmon representation shows an increase. In the Coffman Cove sites (49-PET-067, 49-PET-556), an increase in herring (and cod, and decline in salmon) is indicated after 3000 cal BP. Clearly more

work is needed to identify the factors responsible for these patterns, which include variation in site occupation season or function or local environmental change. All of these could have affected resource abundance, accessibility, and ultimately selection of some resources over others. To verify that the noted trends reflect actual subsistence patterns rather than sampling bias, additional samples from the tested sites (or additional sites in the regions of interest) need to be studied.

### ***Summary***

Our project is the first attempt to synthesize all the faunal records from Southeast Alaska. Our present effort is more descriptive than explanatory, given various factors that we were unable to control for. We found numerous gaps in the record across both time and space. Although Chuck Lake (49-CRG-237) demonstrates that the use of herring has an antiquity going back to 9310-7930 cal BP, this is the only record of herring until about 4500 cal BP. The temporal gap between ~8000 and ~4500 cal BP reflects the scarcity of archaeological sites from this time period, not necessarily the absence of herring. After 4500 cal BP, the number of tested sites increases, but as mentioned earlier, few fish assemblages are more recent than 500 cal BP. The temporal gap between the most recent archaeological sites and the historic period might indicate de-population due to epidemic disease or movements of surviving groups. It may also reflect the archaeological practice of dating early, but not the most recent occupation levels at sites, assuming continuity with the historic period (Moss 2004b:182). Furthermore, as archaeologists, we have sometimes assumed that the historic period is better known ethnographically than it could be through study of the archaeological record, missing the opportunity to see how archaeology can inform our understanding of how broad patterns are played out on the ground in distinctive geographic and cultural settings.

Similarly, the spatial patterning we see mainly reflects location of archaeological projects, rather than something distinctive about past herring distribution or human use patterns. The sites with herring are summarized by community/kwáan in Table 4.3. Relatively few archaeological investigations have occurred within the territories of the Yakutat, Chilkat, Chilkoot, and Huna kwáan territories located in the northern part of Southeast Alaska. Likewise, very few sites have been tested with methods adequate to recover herring in Sitka, Auk, and Taku kwáan territories. Another general trend is that more sites have been tested on the islands of the Alexander Archipelago than the mainland of Southeast Alaska.

Table 4.3. Archaeological sites with herring remains, by community.

Community	Number of Sites	Site Name (AHRS No)
Ketchikan/Saxman	1	Leask (KET-229)
Hydaburg/Craig/Klawock	8	Obsidian Cove (CRG-088), Cape Addington (CRG-188), Chuck Lake (CRG-237), CRG-408, 409, 412, Craig Administrative Site (CRG-443), Kit'n'Kaboodle (DIX-046)
Wrangell/Petersburg	3	Coffman Cove Site (PET-067), Gumboot Midden (PET-401), Coffman Cove Ferry Terminal (PET-556)
Kake	4	Elena Bay (XPA-029), Step Island (XPA-039), XPA-106, 112
Angoon	8	Hidden Falls (SIT-119), Killisnoo Picnicground (SIT-124), Yaay Shanoow (SIT-132), Marten's Fort (SIT-171), Daax Haat Kanadaa (SIT-244), Keishish Aani (SIT-259), Anteyuq (SIT-299), Garnes Point (SIT-304)
Sitka	1	Jamestown Bay (SIT-228)
Juneau/Douglas	1	North Point (SUM-025)
Hoonah	0	
Klukwan	0	
Yakutat	0	

Our review shows that less than 10% of the 2846 recorded archaeological sites in Southeast Alaska have received any level of subsurface investigation. We suspect that

this proportion may be higher, that sites recorded in the AHRS database have been probed or shovel-tested over the years, but that such limited testing efforts have not been documented, or have not been documented in records accessible to us. Of the 181 sites that have undergone some subsurface excavation, faunal remains were recovered from about one-half of them. A major problem we encountered in our review of reports, however, was that excavation, recovery, identification, and analytical methods were not sufficiently documented for us to judge the results of these efforts as reliable. Further, in most cases, recovery methods did not include the use of fine mesh screens or bulk samples necessary to retrieve herring bones in numbers that reflect their actual abundance in site deposits. For the Herring Synthesis Project then, we are left with only 28 sites that were tested with methods adequate to recover herring. Of these, 21 sites yielded herring remains, and at five other sites, herring remains were identified despite recovery methods that bias against herring bone recovery.

In our review, we noted a few sites where a relatively high proportion of herring occurs with a substantial proportion of Pacific cod including the Leask Site (49-KET-229), Coffman Cove Ferry Terminal Site (49-PET-556), and Step Island Village (49-XPA-039). Herring appear to have been incidental constituents of a number of outer coast assemblages from the Prince of Wales Archipelago including Obsidian Cove (49-CRG-088), Cape Addington (49-CRG-188), and Kit'n'Kaboodle Cave (49-DIX-046). At the Coffman Cove Site (49-PET-067) and at the Killisnoo Picnicground Midden (49-SIT-124), herring remains were markedly uneven in their distribution across the shell middens. Salmon and herring occur in abundance at Yaay Shanoow (49-SIT-132) and Daax Haat Kanadaa (49-SIT-244). It is rare to find cod and salmon that occur in comparable amounts within a component, but we note this situation at Hidden Falls in Component III. In multiple components, herring represents >50% of the assemblage which clearly suggests herring procurement, processing and use was a major activity at

these locations. At only one site, Garnes Point (49-SIT-304), was the assemblage almost entirely herring, suggesting the fishery was extremely specialized at this site near Angoon.

Temporal trends can only be evaluated in three specific areas: around Angoon, at Coffman Cove, and in Tebenkof Bay. No temporal shifts were observed in the relatively recent sites around Angoon. At Coffman Cove, an earlier focus on salmon prior to 3000 cal BP gives way to heavier use of herring and cod after 3000 cal BP. In Tebenkof Bay, cod decline in abundance after 2700 cal BP, herring after 1000 cal BP, whereas salmon increase in abundance. These localized trends are not easily explained at this time. What is clear, however, is that there is no evidence for region-wide trends in fisheries in Southeast Alaska. This is partly due to limitations in the archaeological record, but nevertheless, at this time, faunal trends cannot be correlated with broader environmental or sociocultural changes.

### **Future Research – Filling in the Data Gaps**

We recommend that:

- all archaeologists working in Southeast Alaska employ 1/8 inch (or finer) mesh screens and/or recover bulk samples to facilitate sampling of herring and other small-bodied fish.
- special efforts be directed to sampling sites for herring in the vicinity of localities where herring were historically abundant, including Sitka, Craig, and Auke Bay (near Juneau).
- further work be conducted at Garnes Point to see if the dominance of herring found by Moss (1989a) is characteristic of other areas of the site. An initial step might be locating materials excavated by the State of Alaska in 1987 and examining these samples for the presence of herring.
- special efforts should also be directed to testing sites within the territories of the Huna, Klukwan, Yakutat, Auk, and Taku kwáans, where very few sites have been investigated.

- additional work is required for sites dating from all time periods, but sites older than 4500 cal BP and more recent than 500 cal BP are particularly poorly represented. Investigators studying sites dating to these time periods should be vigilant about using data recovery techniques that will insure adequate sampling of herring.



Figure 4.1 – Herring Vertebrae from 49-PET-067, Coffman Cove, Alaska. Photograph by Gyoung-Ah Lee, University of Oregon.

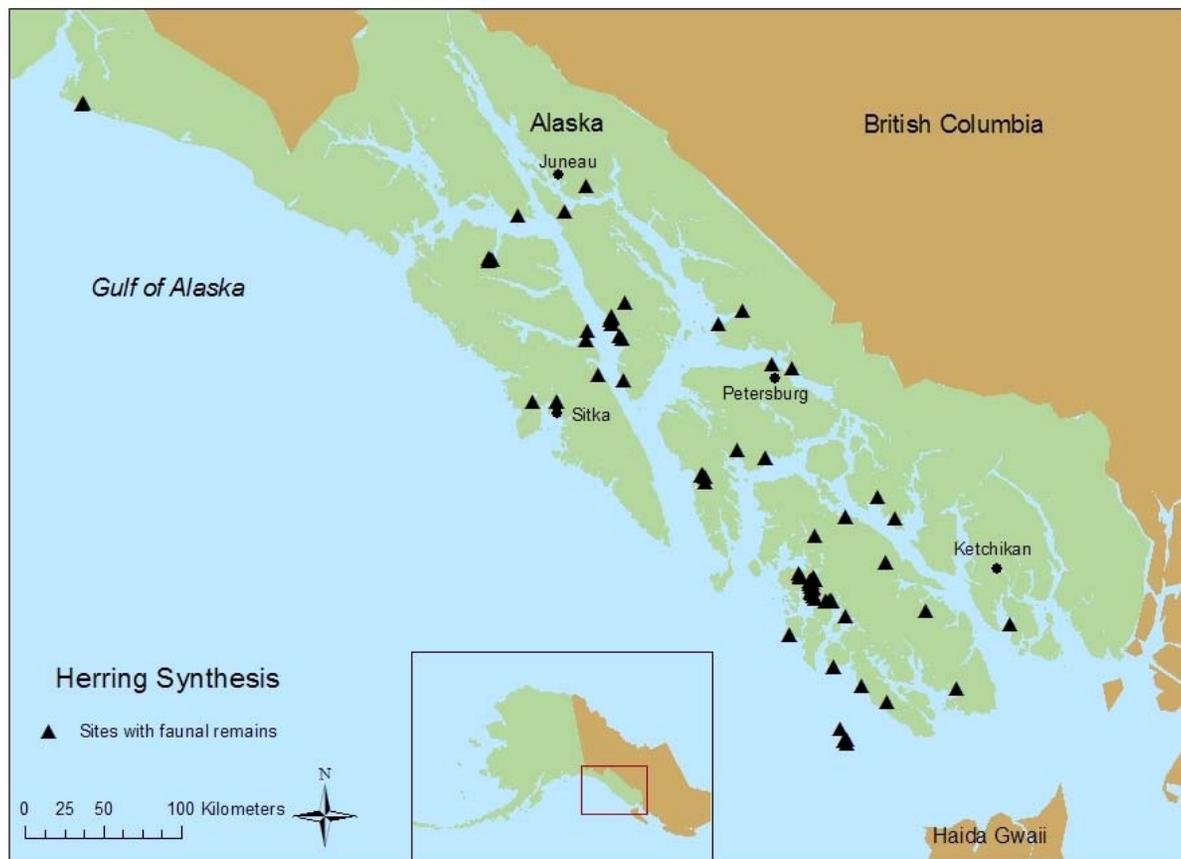


Figure 4.2 – Archaeological sites with faunal remains (n=93).

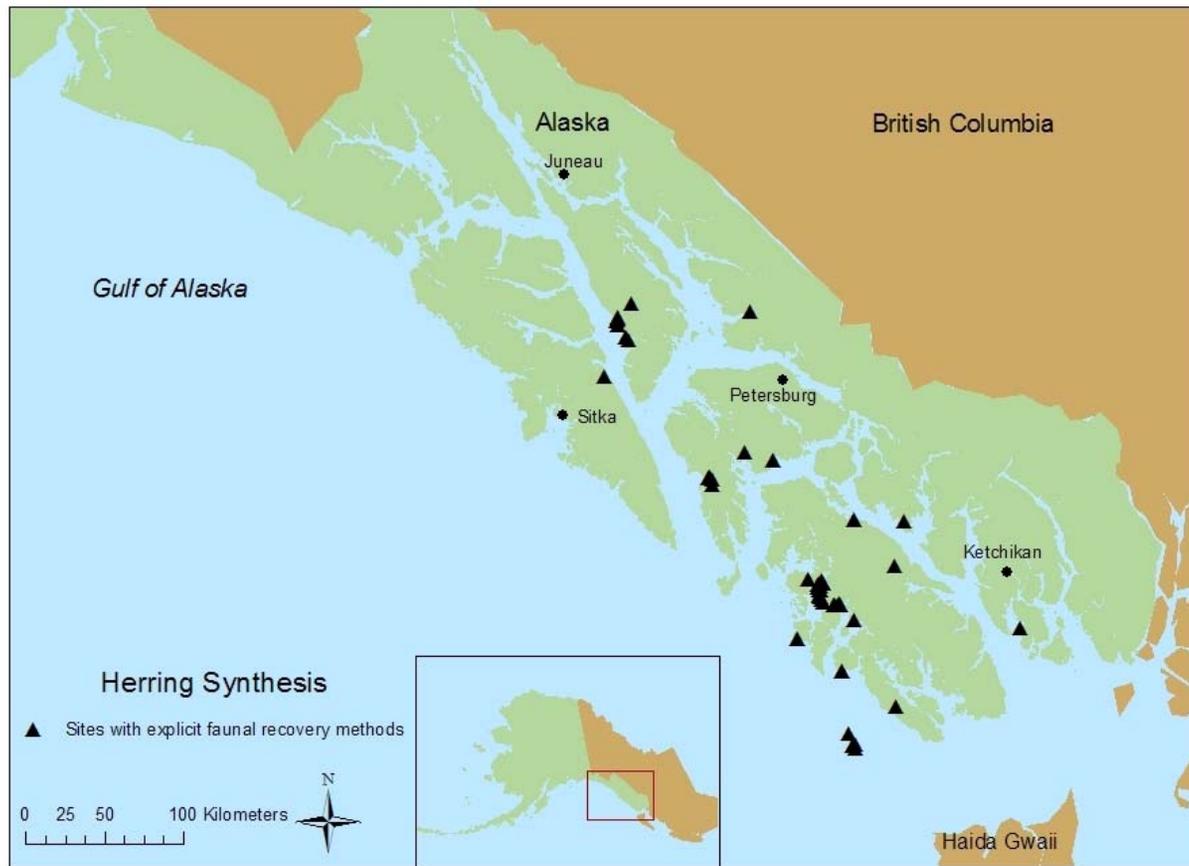


Figure 4.3 – Archaeological sites with explicit faunal recovery methods (n=64).

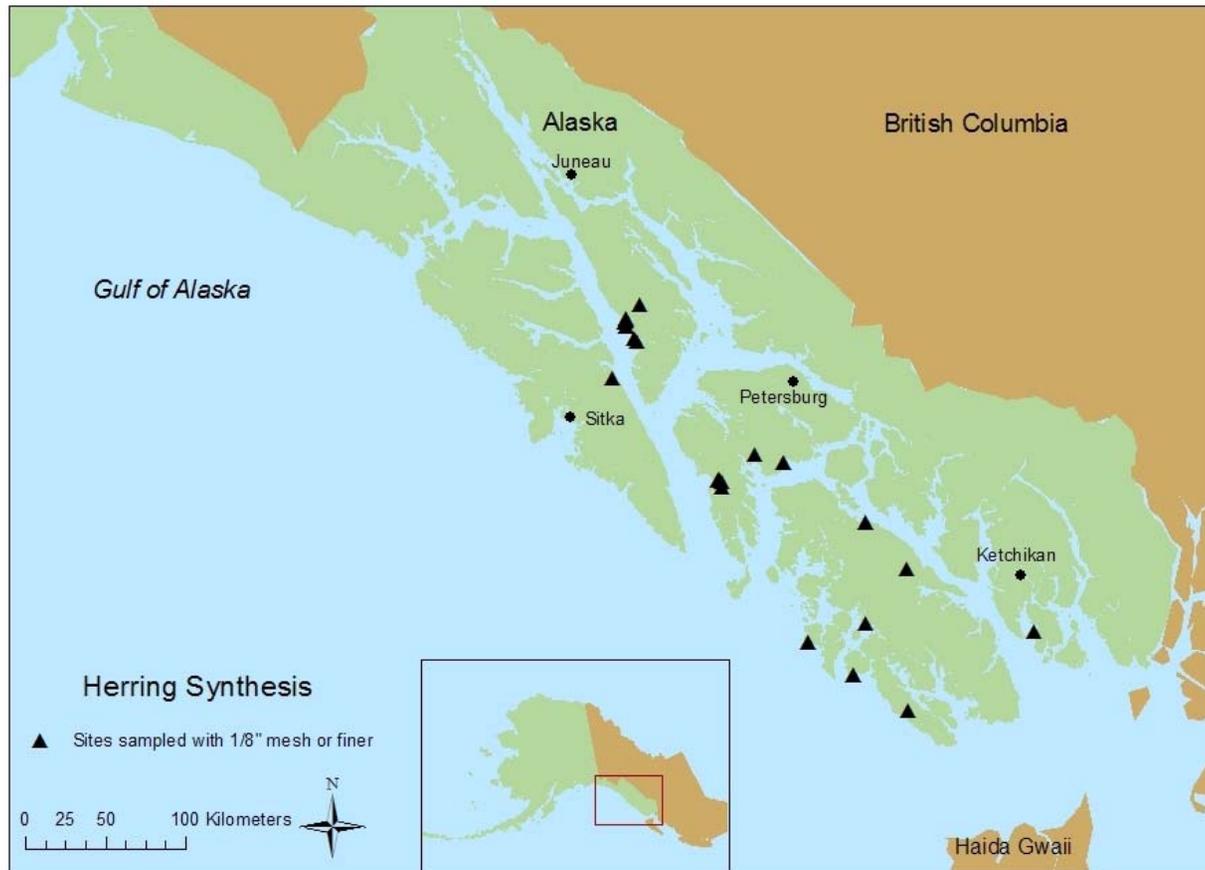


Figure 4.4 – Archaeological sites where 1/8 inch (or finer) mesh screens were used (n=28).

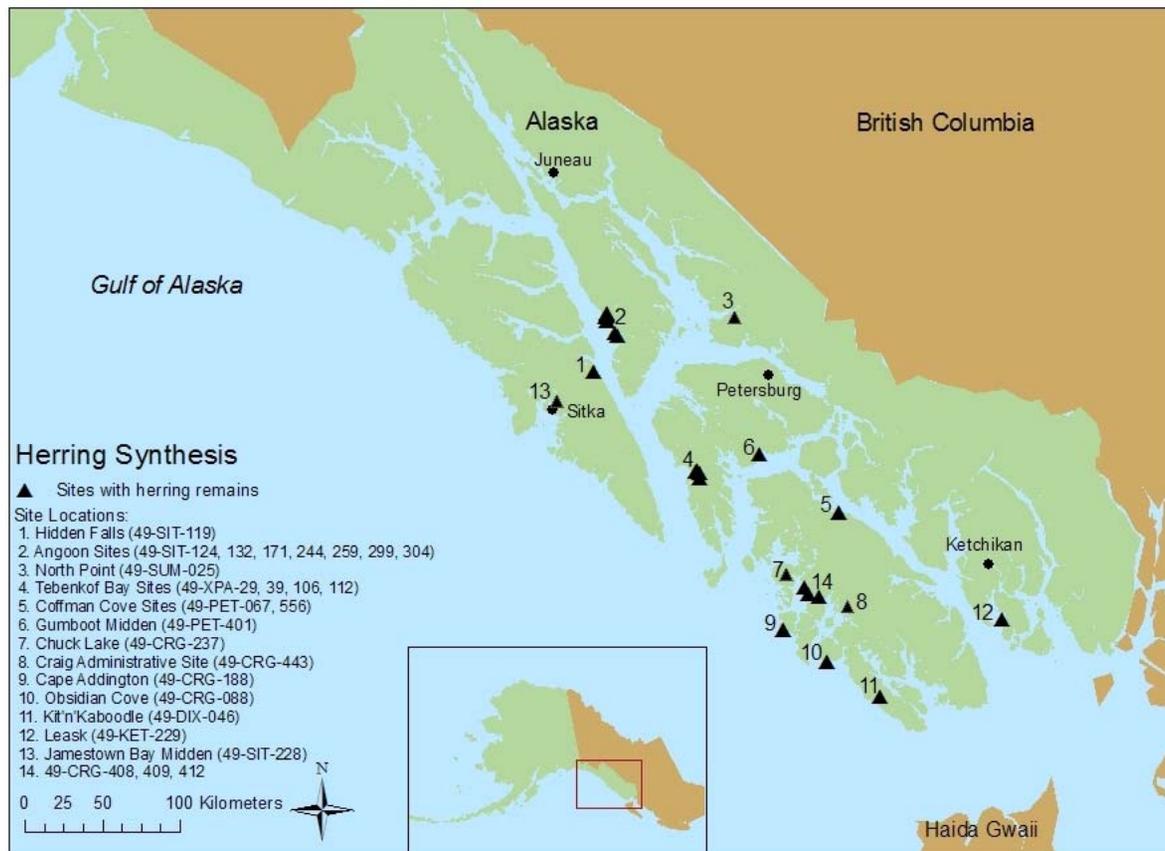


Figure 4.5 – Archaeological sites where herring bones have been identified (n=26).

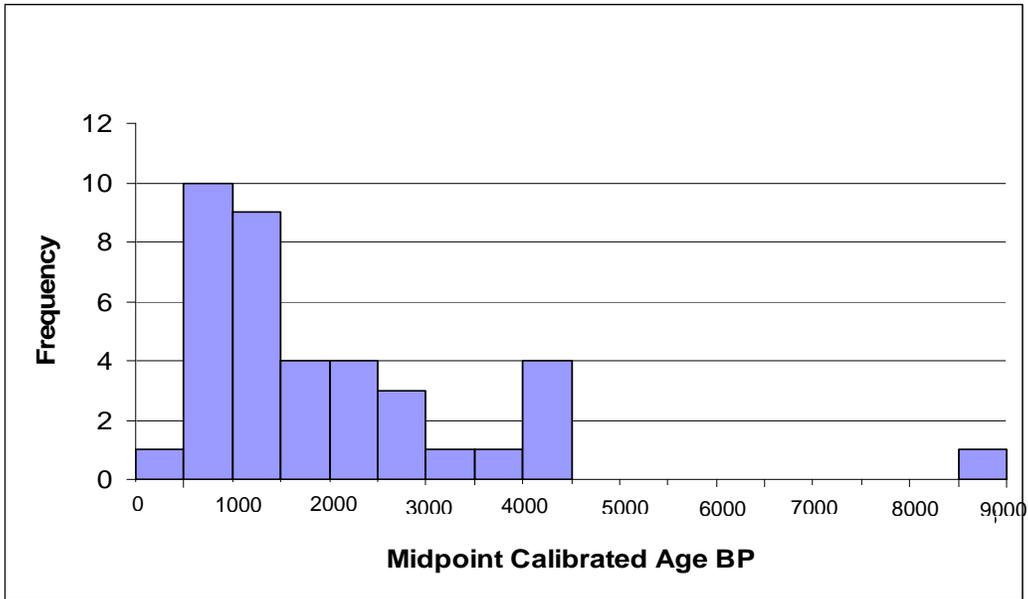


Figure 4.6. Frequency of site components with herring remains by calibrated age (see Methods and Materials for further information on calculation of age estimates)

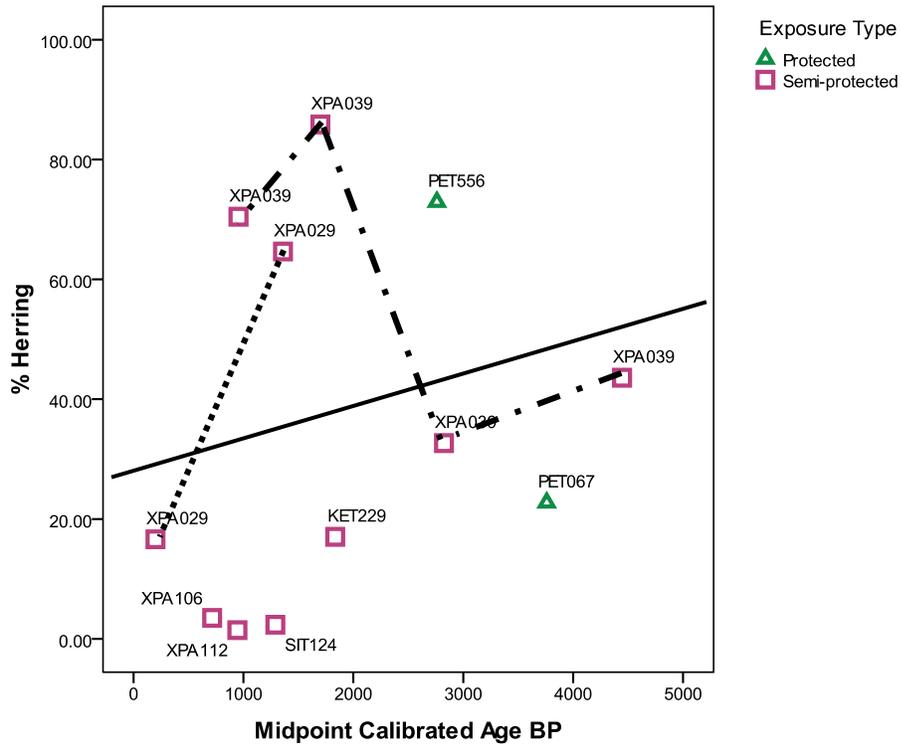


Figure 4.8. Percent Herring in 1/8" mesh samples by component. Best-fit regression line drawn through all records. Dotted lines connect fish records from multi-component sites.



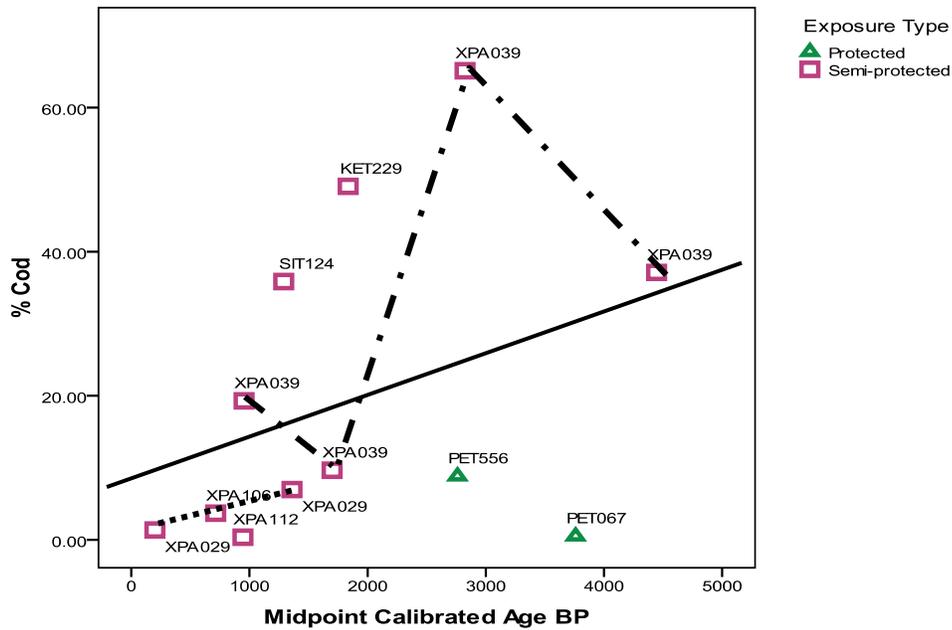


Figure 4.9. Percent Pacific cod in 1/8 inch mesh samples by component. Best-fit regression line drawn through all records. Dotted lines connect fish records from multi-component sites.

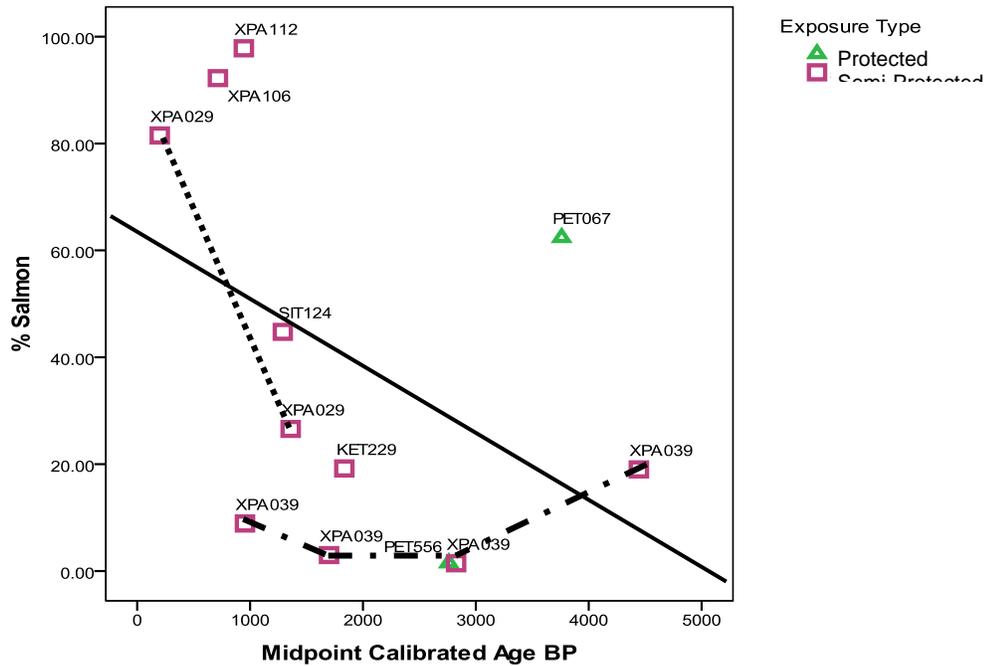


Figure 4.10. Percent salmon in 1/8 inch mesh samples by component. Best-fit regression line drawn through all records. Dotted lines connect fish records from multi-component sites.

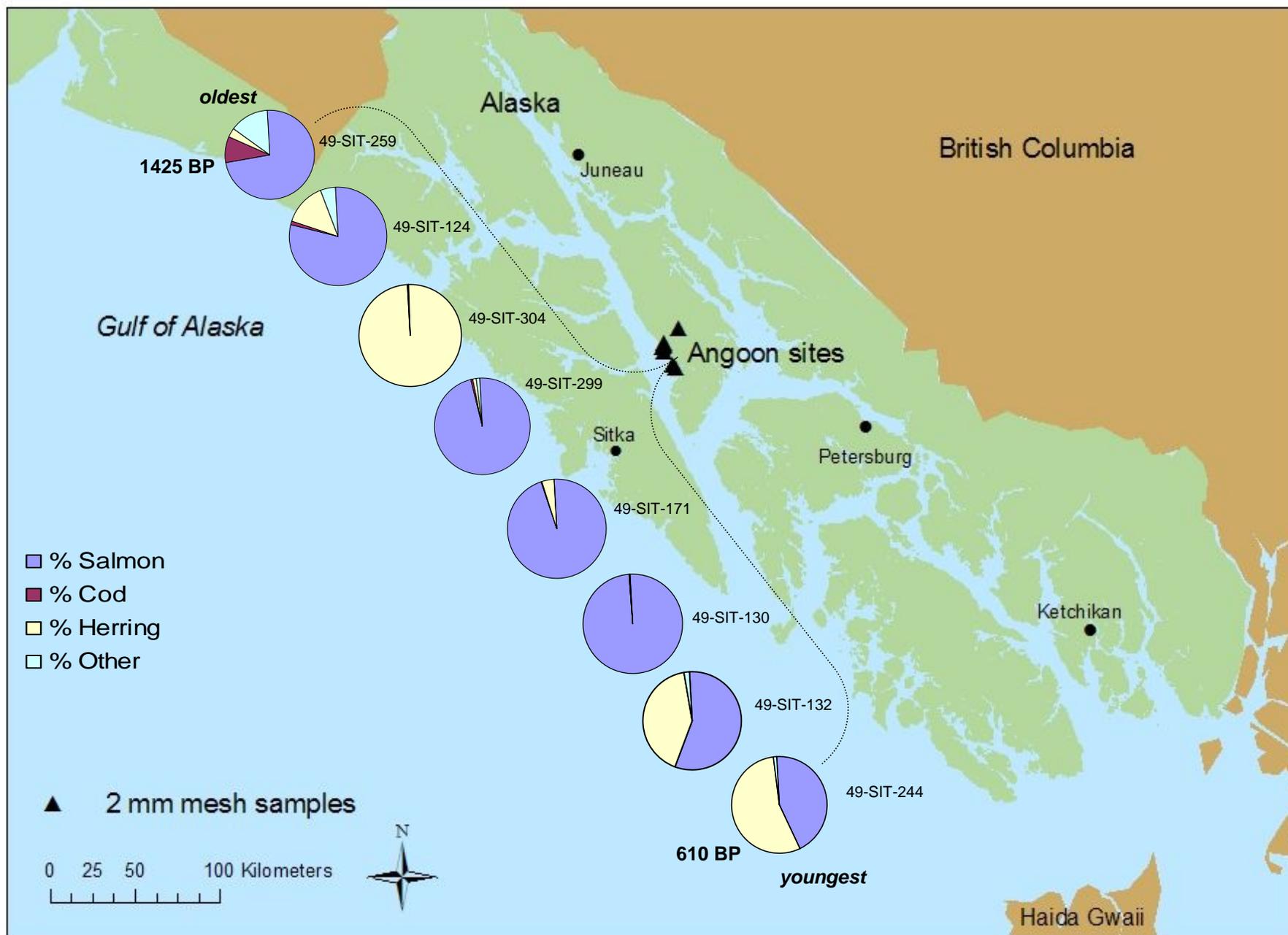


Figure 4.11. Plot showing site location and proportional representation (% NISP) of salmon, cod, herring, and “other” fish taxa by component, **2 mm mesh samples**, southeast Alaskan archaeological sites. Age listed next to pie chart is the midpoint of calibrated age range (see text for further information on derivation of age estimate and site selection).

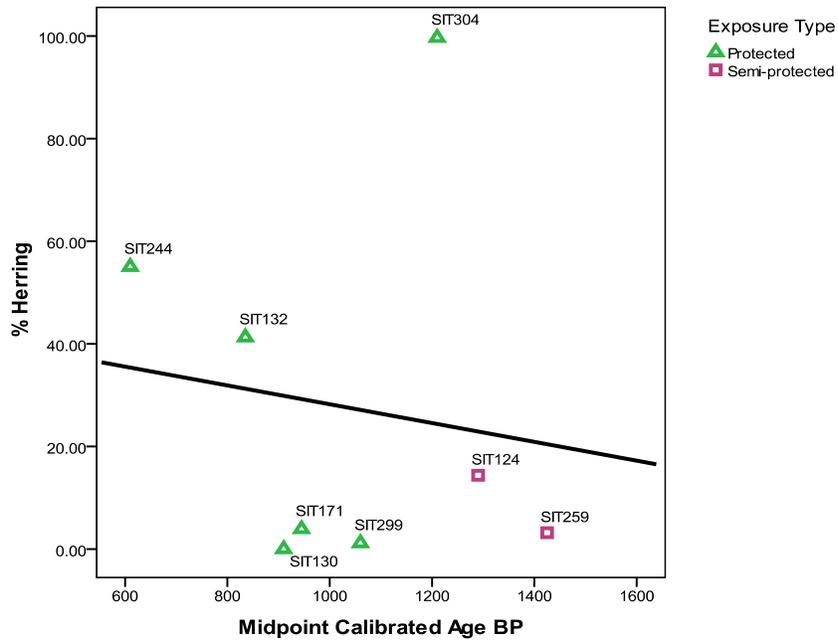


Figure 4.12. Percent herring in 2 mm mesh samples by component (all from Angoon area). Best-fit regression line drawn through all records.

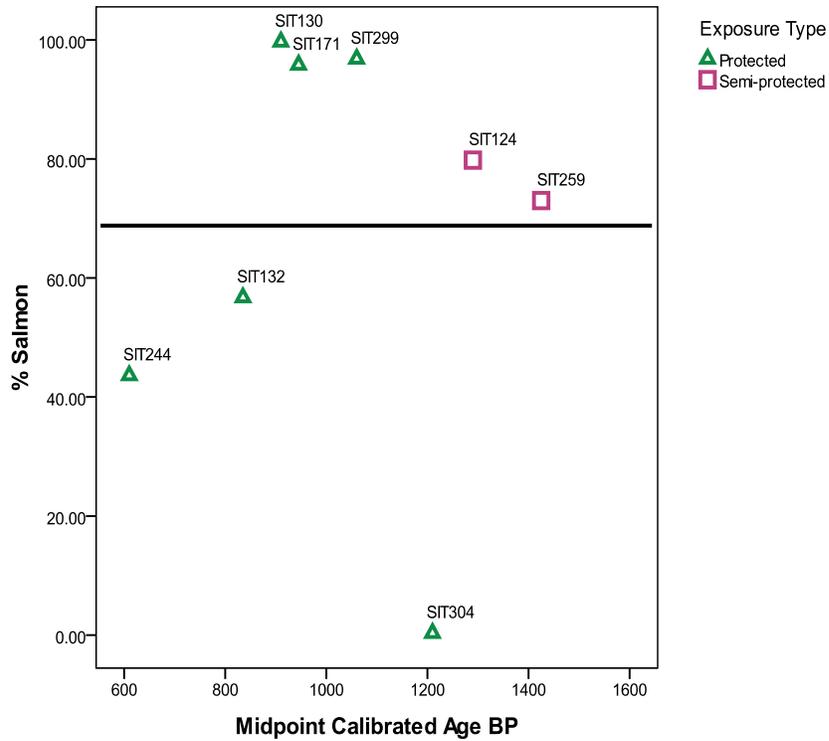


Figure 4.13. Percent salmon in 2 mm mesh samples by component (all from Angoon area). Best-fit regression line drawn through all records.

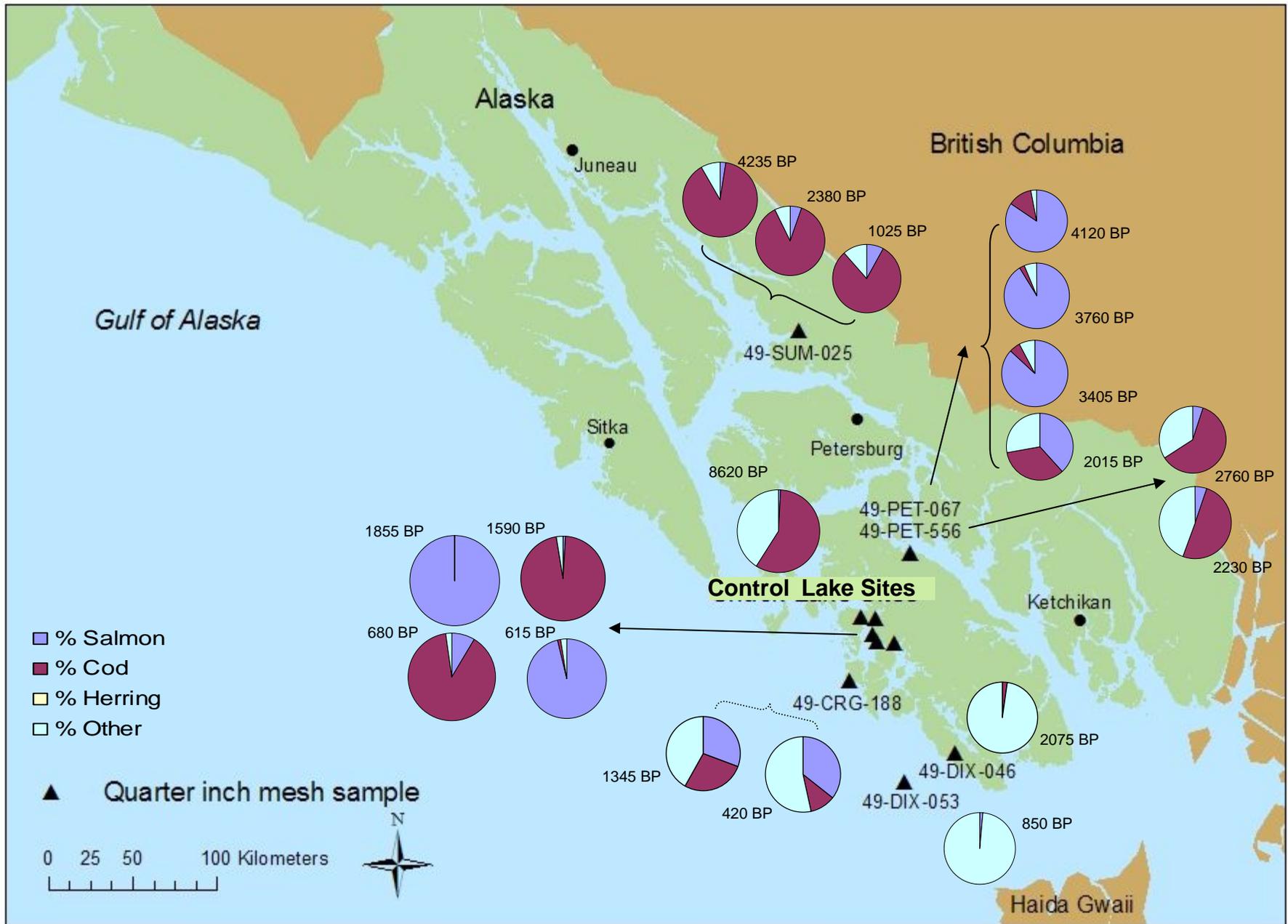


Figure 4.14. Plot showing site location and proportional representation (% NISP) of salmon, cod, and “other” fish taxa by component, **1/4 inch mesh samples**, southeast Alaskan archaeological sites. Age listed next to pie chart is the midpoint of calibrated age range (see text for further information on derivation of age estimate and site selection).

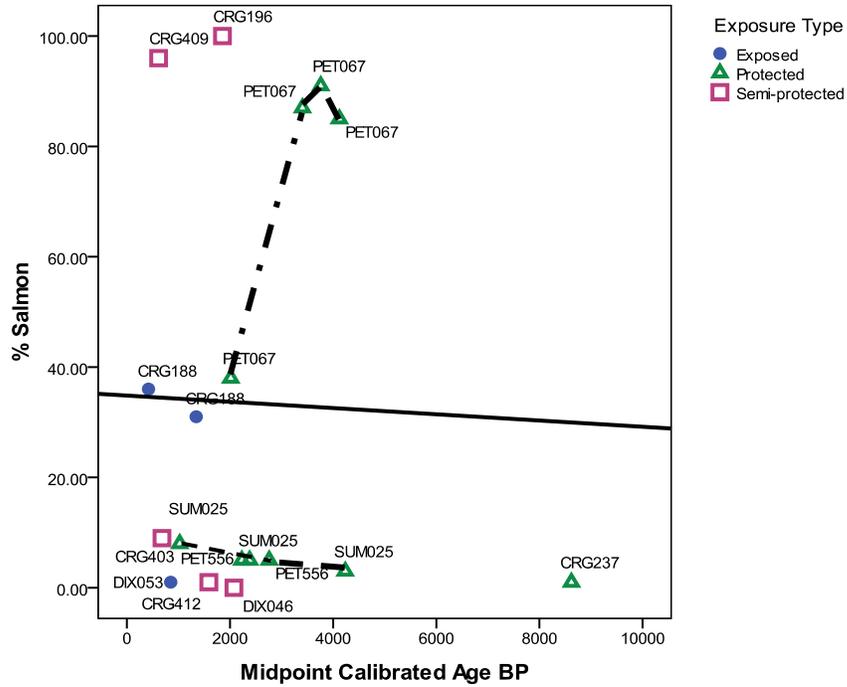


Figure 4.15. Percent salmon in 1/4 inch mesh samples by component. Best-fit regression line drawn through all records. Dotted lines connect fish records from multi-component sites.

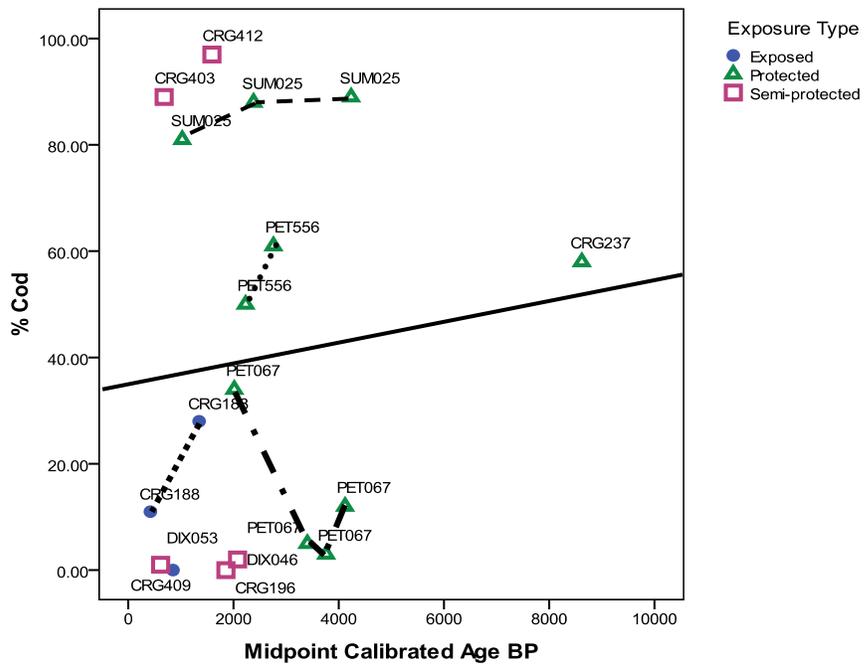


Figure 4.16. Percent Pacific cod in 1/4 inch mesh samples by component. Best-fit regression line drawn through all records. Dotted lines connect fish records from multi-component sites. 1/4 inch samples

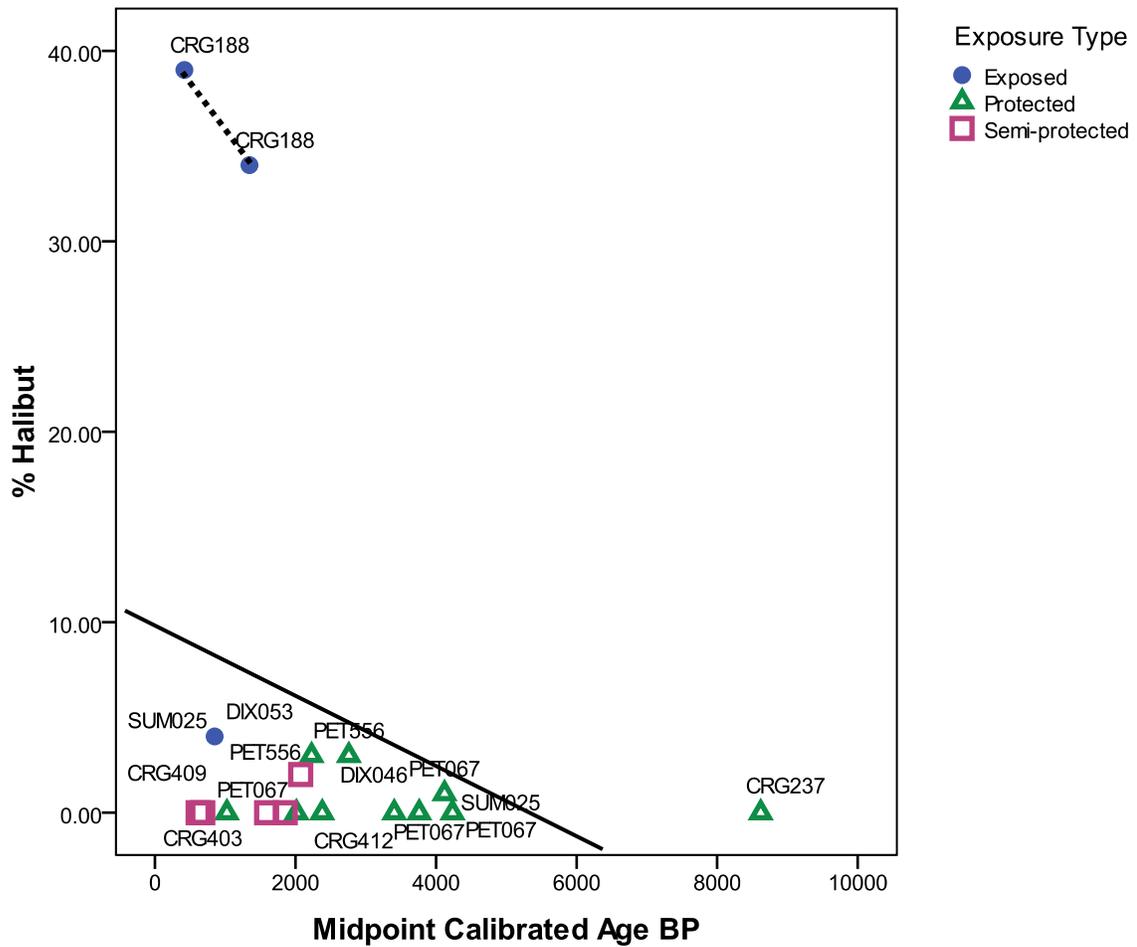


Figure 4.17. Percent halibut in 1/4 inch mesh samples by component. Best-fit regression line drawn through all records. Dotted lines connect fish records from multi-component sites.

## **V. HISTORY OF COMMERCIAL HERRING FISHERIES IN SOUTHEAST ALASKA<sup>1</sup>**

### **Introduction**

Herring have long been intertwined with the history of the people of Southeast Alaska, both in traditional cultures and after the arrival of European cultures. This report focuses on the history of commercial exploitation of Pacific herring in Southeast Alaska, with particular emphasis on the era of the herring reduction fishery (1882 - 1966).

Information about the early years of the herring fishery is, understandably, sparse. Following the purchase of Alaska from Russia in 1867, there appears to have been little interest in official fishery record-keeping until the U.S. Bureau of Commercial Fisheries began sending its research vessel “Albatross” to the inside waters of Southeast Alaska in 1887. The Alaska fisheries section of the U.S. Census of 1880 (Petroff 1884) has only cursory information about fisheries and does not mention herring; the 1890 census has somewhat more detail. Travel to Alaska became fashionable during the 1880s and travel writers such as Eliza Ruhama Scidmore (1885, 1893) provide some glimpses of herring fisheries and herring abundance during the 1880s in their travelogues, prior to the official period of government documentation. In this report, information from the earlier, more subjective, sources of information about herring fisheries and abundance will be synthesized with later, more analytical, work produced by professional biologists and fishery agencies.

### **Reconstruction of Commercial Catch**

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<sup>1</sup> Primary author: Fritz Funk, biologist, formerly with the Alaska Department of Fish and Game

Catch is the most basic aid to understanding exploited fish populations because it can be obtained reliably when other more useful information, such as abundance, is not available. Economic surveys, such as census and taxation, usually provide sufficient incentive to collect basic catch information for almost all fisheries. For Southeast Alaska herring fisheries, the published time series of catches that extend back to the 19th century are disjointed and contain a number of discrepancies. Historical catches from all published sources were reviewed to assemble one contiguous time series of historical herring catches for reduction, food, bait, and roe fisheries.

#### Sources of Harvest Information

Sources of herring catch information span state and federal (pre-statehood) agency management reports, analytical scientific publications, and the U.S. Census. Based on overall reliability, sources of catch information can be divided into two different eras: the early era dominated by the reduction fishery (1882-1966) and the era of State of Alaska management (1959-present).

#### *Reduction Fishery Harvests (1882-1966)*

For the first two decades of the commercial herring fishery in Southeast Alaska, there were no official records of catch and production required. Occasional visitors to the first herring reduction plant at Killisnoo, such as Scidmore (1885, 1893 and her section in the 1890 census given in U.S. Dept. of Interior, 1893) and Inkersley (1895) recorded catch from information given to them at the plant. More official-looking catch tabulations began to appear in Moser (1899) and from the meticulous John N. Cobb (Cobb 1906 is particularly thorough). However, these later "official" authors acquired their fisheries data decades after the initial visitors, and after a significant ownership change at the Killisnoo plant. Because of these and other possible sources of

discrepancy, all available historical records of catch from the reduction era were examined and attempts were made to reconcile disparate figures.

The research vessel Albatross of the United States Fish Commission likely collected the first “official” catch statistics for Southeast Alaska on its visit during the summer of 1897, when “All of the canneries in operation in Alaska outside of Bering Strait were visited” (Bowers 1899), resulting in the herring catches published by Moser (1899), the captain of the Albatross. Subsequent to that first cruise of the Albatross, the U.S. Bureau of Commercial Fisheries paid increasing attention to Alaska. Patterned after Cobb (1906), an annual report with an approximate title “Fisheries of Alaska” began to be published by the U.S. Bureau of Commercial Fisheries (Cobb 1907; Marsh and Cobb 1908, 1909, 1910, 1911; Evermann 1912, 1913). This report series became generally referred to as the “fish and fur seal” report series, which was the longest-running title for these reports.

In an extensive review and compilation of Alaska herring catch statistics through 1928, Rounsefell (1930) had to rely on published records for catches from the fishery prior to 1904. Rounsefell (1930) relates that Moser (1899 and 1902) and the U.S. Senate (1912) are the best sources for production records from the Killisnoo plant and that Cobb (1906) summarized all of the early records obtainable. Rounsefell's (1930) review is particularly relevant because at the time of his publication there would likely have been institutional memory about the individuals making the earlier reports and their reliability.

Beginning in 1904, the Bureau of Fisheries required every individual or company fishing in Alaska to make a sworn annual return of the total amounts and kinds of fishery products prepared, and of the amounts, kinds, and value of fishing gear, boats, and other apparatus used. Rounsefell (1930) consulted these annual sworn returns as well as the annual statistical review and monthly numbers of the trade journal “Pacific Fisherman,”

individual herring company production records, and company receipt books in his compilation of Alaska herring catch statistics. Based on this review, Rounsefell (1930) lists herring catch statistics from Southeast Alaska for 1910-1928.

Most of the records used by Rounsefell (1930, 1935) in compiling catch statistics did not list amounts of raw herring captured but were reports of the amounts of finished products prepared. Rounsefell (1930) discusses the product conversion factors used in converting processed product back to pounds of herring delivered to the plant. Rounsefell (1930) notes that at least some of the conversion factors were empirically determined, which may have created some biases. However, he felt that "such errors as may have arisen as a result are too small to have any appreciable effect on the analysis". Records of raw herring delivered to the Killisnoo reduction plant were available through 1911. From 1912 to 1928, finished product conversion factors were used to estimate raw herring delivered to the Killisnoo plant. Rounsefell (1930) attempted to account for small herring wasted during processing by various means. However, herring which may have been caught but discarded prior to delivery to the plants were apparently not estimated.

From 1929 through the close of the reduction fishery in 1966, Reid (1971) appears to be the most thorough and comprehensive source for reduction fishery harvests. Tables appended to various Alaska Department of Fish and Game (ADFG) Board of Fisheries reports also list catches from the reduction era, but the sources are not documented in the reports nor in institutional memory and there are minor deviations from those reported in Reid (1971). Because of the likelihood of typographical errors accumulating since the close of the fishery in 1966, and the lack of documentation in the Board of Fisheries reports, Reid (1971) is felt to provide the most reliable information for this period. For the herring reduction fishery, the "best blend" of herring harvests felt to be from the most reliable sources is listed in Table 5.1.

Table 5.1. Summary of Southeastern Alaska reduction fishery harvests, 1878-1966 in tons. Most reliable or “Best Blend” from sources indicated by source footnote. Also shown are number of reduction plants operating (No.), and the quota.

Year	Moser (1899) a	Cobb (1906) b	Annual Fish/Fur Seal Reports 1906-1912 <sup>c-</sup> i	Rounsefell (1930) j	Skud (1960) k	Reid (1971) l	Board of Fisheries Reports m	Best Blend	No.	Quota
1878		0						0	b	
1879		0						0	b	
1880		2						2	b 1	
1881		0						0	b 0	
1882	1,240	1,520						1,520	b 1	
1883	4,200	4,200						4,200	b 1	
1884	6,600	6,600						6,600	b 1	
1885	8,500	8,500						8,500	b 1	
1886	11,000	11,000						11,000	b 1	
1887	11,100	11,100						11,100	b 1	
1888	3,000	3,000						3,000	b 1	
1889	5,246	5,246						5,246	b 1	
1890	5,243	5,243						5,243	b 1	
1891	8,822	8,760						8,760	b 1	
1892	9,358	9,358						9,358	b 1	
1893	7,225	7,225						7,225	b 1	
1894	7,591	7,591						7,591	b 1	
1895	3,224	3,224						3,224	b 1	
1896	2,759	2,759						2,759	b 1	

Year	Moser	Cobb	Annual Fish/Fur Seal Reports	Rounsefell	Skud	Reid	Board of Fisheries	Best Blend	No.	Quota
	(1899) a	(1906) b	1906-1912 <sup>c-</sup> i	(1930) <sup>j</sup>	(1960) <sup>k</sup>	(1971) l	Reports m			
1897	3,501	3,501						3,501		b 1
1898		4,443						4,443		b 1
1899		3,552						3,552		b 1
1900		6,006					1,194	6,006		b 1
1901		6,275					1,250	6,275		b 1
1902		4,087					812	4,087		b 1
1903		6,522					1,494	6,522		b 1
1904		7,631					1,521	7,631		b 1
1905		6,364					1,309	6,364		b 1
1906			3,350				1,005	3,350		c 1
1907			2,480				1,382	2,480		d 1
1908			3,756				1,711	3,756		e 1
1909			5,200				1,075	5,200		f 1
1910			5,887	5,890			6,867	5,890		j 1
1911			9,570	7,526			12,057	7,526		j 1
1912			6,830	5,270			16,067	5,270		j 1
1913				5,830			13,496	5,830		j 1
1914				4,320			8,318	4,320		j 1
1915				2,918			6,964	2,918		j 1
1916				4,237			11,194	4,237		j 1
1917				4,618			12,445	4,618		j 1

Year	Moser (1899) a	Cobb (1906) b	Annual Fish/Fur Seal Reports <sup>c-</sup>		Rounsefell (1930) j	Skud (1960) k	Reid (1971) l	Board of Fisheries Reports m	Best Blend	No.	Quota
			1906-1912 i								
1918					3,085			17,825	3,085	j	1
1919					3,665			10,962	3,665	j	3
1920					12,760			16,452	12,760	j	7
1921					2,265			6,012	2,265	j	2
1922					8,279			16,950	8,279	j	
1923					17,464			21,240	17,464	j	
1924					25,316			29,395	25,316	j	
1925					50,430			57,782	50,430	j	
1926					70,978			73,843	70,978	j	18
1927					46,913			45,310	46,913	j	18
1928					58,776			53,007	58,776	j	16
1929						78,749	78,778	78,749	78,778	l	12
1930						70,855	70,854	70,855	70,854	l	13
1931						44,857	44,858	44,857	44,858	l	5
1932						49,786	49,785	49,786	49,785	l	5
1933						61,588	61,587	61,588	61,587	l	6
1934						66,842	66,842	66,842	66,842	l	7
1935						58,155	58,155	58,155	58,155	l	8
1936						36,713	36,712	36,713	36,712	l	5

Year	Moser (1899) a	Cobb (1906) b	Annual Fish/Fur Seal Reports <sup>c-</sup>		Rounsefell (1930) j	Skud (1960) k	Reid (1971) l	Board of Fisheries Reports m	Best Blend	No.	Quota	
			1906-1912 i									
1937						50,334	50,333	50,334	50,333	1	8	
1938						22,356	22,356	22,356	22,356	1	5	
1939						20,028	20,027	20,028	20,027	1	4	
1940						0	0	3,137	0	1	0	3,750
1941						1,917	1,915	6,230	1,915	1	1	6,250
1942						0	0	3,691	0	1	0	250
1943						6,235	6,235	6,235	6,235	1	1	12,500
1944						16,801	16,802	16,801	16,801	1	2	25,000
1945						24,126	24,523	24,126	24,523	1	3	31,250
1946						37,564	37,564	37,564	37,564	1	5	43,750
1947						41,829	41,828	41,829	41,828	1	8	43,750
1948						16,125	16,114	16,125	16,114	1	8	50,000
1949						14,279	14,278	14,279	14,278	1	4	25,000
1950						13,411	13,409	13,411	13,409	1	4	18,750
1951						10,652	10,652	10,652	10,652	1	5	12,500
1952						16,020	16,020	16,020	16,020	1	3	0
1953						12,435	12,435	12,435	12,435	1	4	0
1954						6,446	6,446	6,446	6,446	1	3	6,250

Year	Moser (1899) a	Cobb (1906) b	Annual Fish/Fur Seal Reports <sup>c-</sup>		Rounsefell (1930) j	Skud (1960) k	Reid (1971) l	Board of Fisheries Reports m	Best Blend	No.	Quota
			1906-1912 i								
1955						11,368	11,368	11,368	11,368	1 3	12,500
1956						22,819	22,819	22,819	22,819	1 3	22,500
1957							22,938	24,745	22,938	1	22,500
1958							36,185	38,797	36,185	1	42,500
1959							47,623	49,866	47,623	1	54,500
1960							36,706	38,906	36,706	1	44,500
1961							22,766	24,709	22,766	1 2	44,500
1962							13,977	16,959	13,977	1	35,000
1963							13,517	15,703	13,517	1 1	35,000
1964							22,128	23,553	22,128	1 2	35,000
1965							9,268	12,390	9,268	1	35,000
1966							5,073	5,670	5,073	1 1	35,000

a Moser (1899). Page 124.

b Cobb (1906)

c Cobb (1907). All figures from text on page 53-54, except Central Alaska production and fertilizer and oil from table on page 10.

d Marsh and Cobb (1908).. All figures from table at bottom of page 54, except Central Alaska production and fertilizer and oil from large table entitled "Products of the Alaska fisheries in 1907", and raw herring utilized for reduction from text on page 55.

- e  
Marsh and Cobb (1909). All figures from table at the bottom of page 65, except reduction figures from text at top of page 66.
- f  
Marsh and Cobb (1910). Reduction fishery figures from text on page 48. Text on page 48 describes an active, growing herring bait fishery, but does not give harvests.
- g  
Marsh and Cobb (1911). All figures from table on top of page 51, except herring utilized for reduction taken from text on page 51.
- h  
Evermann (1912). All figures from table on bottom of page 62. No reduction utilization mentioned, so this was calculated.
- i  
Evermann (1913). All figures from table on bottom of page 60. No reduction utilization mentioned, so this was calculated.
- j  
Rounsefell (1930).
- k  
Skud, Sakuda, and Reid (1960).
- l  
Reid (1971).
- m  
Board of Fisheries Report Tables: these do not list sources and contain minor discrepancies with historical data; historical data are felt to be more reliable.

### *Herring Food Fisheries*

In addition to the reduction fishery in the early era, herring were commercially harvested for food, usually being preserved by salting and pickling in wooden barrels. Data sources and reliability are generally the same as for the reduction fishery, with the addition of Huizer's (1952) helpful tabulation of food herring harvests from 1922-1949. Table 5.2 lists herring food fishery catches from the various sources, along with the time series of “best blend” harvests felt to be most reliable.

### *Herring Bait Fisheries*

Herring were undoubtedly harvested for bait in commercial quantities in the 19th century, but no reference to the quantity of herring harvested for bait is mentioned in Moser (1899) or Cobb (1906) for the period 1878-1905. Amounts of herring harvested for bait appear in the annual “fish and fur seal” report series, beginning in 1906 (Cobb 1907) and are detailed in Table 5.3. These reports appear to be the best source for bait harvests until Rounsefell (1930) begins his detailed review in 1910. Again, Huizer (1952) fills in the gap between 1929 when Rounsefell's (1930) data series ends, and 1949 when bait records have appeared in Board of Fisheries report tables. Board of Fisheries reports list this category as “Food and Bait” fisheries, but there has been very little use of herring for food in the modern era.

After statehood, Alaska required fishermen and processors to complete a landing receipt or “fish ticket” at the time that commercial catches are delivered and sold. While inseason estimates are based on verbal tallies from processors, final season catch totals are based on these fish tickets. Because fish tickets are records of an economic transaction, accuracy is felt to be high. For the post-reduction fishery era of state management, tables appended to annual Board of Fisheries reports which are compiled from these fish tickets are presumed to contain the best information about catch and are

Table 5.2. Comparison of Southeastern Alaska food fishery harvests from various authors, 1878-1949 in tons. Most reliable or “Best Blend” from sources indicated by source footnote.

Year	Moser a (1899)	Cobb b (1906)	Annual Fish/Fur Seal Reports 1906-1912 c- i	Rounsefell j (1930)	Huizer (1952) k	Best Blend
1878		19				19 <sup>b</sup>
1879		13				13 <sup>b</sup>
1880		12				12 <sup>b</sup>
1881		0				0 <sup>b</sup>
1882	0	0				0 <sup>b</sup>
1883	0	0				0 <sup>b</sup>
1884	0	0				0 <sup>b</sup>
1885	0	0				0 <sup>b</sup>
1886	0	0				0 <sup>b</sup>
1887	0	0				0 <sup>b</sup>
1888	0	0				0 <sup>b</sup>
1889	0	0				0 <sup>b</sup>
1890	0	0				0 <sup>b</sup>
1891	0	63				63 <sup>b</sup>
1892	0	0				0 <sup>b</sup>
1893	0	0				0 <sup>b</sup>
1894	63	63				63 <sup>b</sup>
1895	31	31				31 <sup>b</sup>

Year	Annual Fish/Fur Seal Reports			Rounsefell (1930) <sup>j</sup>	Huizer (1952) <sup>k</sup>	Best Blend
	Moser (1899) <sup>a</sup>	Cobb (1906) <sup>b</sup>	1906-1912 <sup>c-</sup> i			
1896	16	16				16 <sup>b</sup>
1897	59	59				59 <sup>b</sup>
1898		81				81 <sup>b</sup>
1899		503				503 <sup>b</sup>
1900		497				497 <sup>b</sup>
1901		1,025				1,025 <sup>b</sup>
1902		686				686 <sup>b</sup>
1903		323				323 <sup>b</sup>
1904		350				350 <sup>b</sup>
1905		1,191				1,191 <sup>b</sup>
1906			223			223 <sup>c</sup>
1907			336			336 <sup>d</sup>
1908			119			119 <sup>e</sup>
1909			0			0 <sup>f</sup>
1910			160	191		191 <sup>j</sup>
1911			2,187	1,983		1,983 <sup>j</sup>
1912			5,938	7,442		7,442 <sup>j</sup>
1913				4,859		4,859 <sup>j</sup>
1914				1,098		1,098 <sup>j</sup>

Year	Annual Fish/Fur Seal Reports			Rounsefell (1930) <sup>j</sup>	Huizer (1952) <sup>k</sup>	Best Blend
	Moser (1899) <sup>a</sup>	Cobb (1906) <sup>b</sup>	1906-1912 <sup>c-</sup> i			
1915				1,345		1,345 <sup>j</sup>
1916				4,753		4,753 <sup>j</sup>
1917				4,704		4,704 <sup>j</sup>
1918				12,304		12,304 <sup>j</sup>
1919				5,654		5,654 <sup>j</sup>
1920				930		930 <sup>j</sup>
1921				1,810		1,810 <sup>j</sup>
1922				7,189	4,570	7,189 <sup>j</sup>
1923				1,872	1,747	1,872 <sup>j</sup>
1924				2,354	2,218	2,354 <sup>j</sup>
1925				3,686	3,274	3,686 <sup>j</sup>
1926				1,012	1,007	1,012 <sup>j</sup>
1927				2,219	2,199	2,219 <sup>j</sup>
1928				2,916	2,927	2,916 <sup>j</sup>
1929					835	835 <sup>k</sup>
1930					921	921 <sup>k</sup>
1931					1,100	1,100 <sup>k</sup>
1932					1,676	1,676 <sup>k</sup>
1933					2,441	2,441 <sup>k</sup>

Year	Annual Fish/Fur Seal Reports				Huizer (1952) k	Best Blend
	Moser (1899) a	Cobb (1906) b	1906-1912 i	Rounsefell (1930) j		
1934					1,349	1,349 <sup>k</sup>
1935					1,367	1,367 <sup>k</sup>
1936					475	475 <sup>k</sup>
1937					45	45 <sup>k</sup>
1938					0	0 <sup>k</sup>
1939					0	0 <sup>k</sup>
1940					0	0 <sup>k</sup>
1941					0	0 <sup>k</sup>
1942					0	0 <sup>k</sup>
1943					4	4 <sup>k</sup>
1944					17	17 <sup>k</sup>
1945					6	6 <sup>k</sup>
1946					0	0 <sup>k</sup>
1947					29	29 <sup>k</sup>
1948					0	0 <sup>k</sup>
1949					0	0 <sup>k</sup>

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**a**  
Moser (1899). Page 124.

**b**  
Cobb (1906).

c  
Cobb (1907).

d  
Marsh and Cobb (1908).

e  
Marsh and Cobb (1909).

f  
Marsh and Cobb (1910)

g  
Marsh, M.C., and J.N. Cobb. (1911)

h  
Evermann, B.W. (1912)

i  
Evermann, B.W. (1913).

j  
Rounsefell, G.A. (1930).

k  
Huizer, E.J. (1952).

Table 5.3. Comparison of Southeastern Alaska bait fishery harvests from various authors, 1906-2007 in tons. Most reliable or “Best Blend” from sources indicated by source footnote. Bait fishery harvests from January-February are combined with harvests from the preceding year.

Year	Annual Fish/Fur Seal Reports 1906-1912 <sup>c-i</sup>	Rounsefell (1930) <sup>j</sup>	Huizer (1952) <sup>k</sup>	1972 BOF Report <sup>l</sup>	Pritchett and Hebert (2008) <sup>m</sup>	Best Blend
1906	776			831		776 <sup>c</sup>
1907	794			975		794 <sup>d</sup>
1908	879			963		879 <sup>e</sup>
1909	0					0 <sup>f</sup>
1910	787	787		787		787 <sup>j</sup>
1911	1,205	2,548		1,205		2,548 <sup>j</sup>
1912	2,446	3,356		2,466		3,356 <sup>j</sup>
1913		2,807		2,257		2,807 <sup>j</sup>
1914		2,900		2,740		2,900 <sup>j</sup>
1915		2,702		2,702		2,702 <sup>j</sup>
1916		2,204		1,483		2,204 <sup>j</sup>
1917		3,124		3,045		3,124 <sup>j</sup>
1918		2,436		2,780		2,436 <sup>j</sup>
1919		1,642		1,870		1,642 <sup>j</sup>
1920		2,763		2,042		2,763 <sup>j</sup>
1921		1,938		1,333		1,938 <sup>j</sup>
1922		1,482	1,052	1,744		1,482 <sup>j</sup>
1923		1,904	1,879	2,617		1,904 <sup>j</sup>
1924		1,725	1,106	1,800		1,725 <sup>j</sup>
1925		3,666	3,528	3,543		3,666 <sup>j</sup>
1926		1,853	622	1,117		1,853 <sup>j</sup>
1927		3,707	3,707	3,707		3,707 <sup>j</sup>
1928		3,535	3,107	3,107		3,535 <sup>j</sup>
1929			4,198	4,198		4,198 <sup>k</sup>
1930			4,462	4,462		4,462 <sup>k</sup>
1931			3,293	3,293		3,293 <sup>k</sup>
1932			2,747	2,747		2,747 <sup>k</sup>

Year	Annual Fish/Fur Seal Reports 1906-1912 <sup>c-i</sup>	Rounsefell (1930) <sup>j</sup>	Huizer (1952) <sup>k</sup>	1972 BOF Report <sup>l</sup>	Pritchett and Hebert (2008) <sup>m</sup>	Best Blend
1933			1,955	1,955		1,955 <sup>k</sup>
1934			2,563	2,563		2,563 <sup>k</sup>
1935			2,843	2,843		2,843 <sup>k</sup>
1936			2,854	3,147		2,854 <sup>k</sup>
1937			2,591	2,591		2,591 <sup>k</sup>
1938			3,071	3,071		3,071 <sup>k</sup>
1939			2,637	2,637		2,637 <sup>k</sup>
1940			3,138	3,137		3,138 <sup>k</sup>
1941			3,202	3,202		3,202 <sup>k</sup>
1942			3,691	3,691		3,691 <sup>k</sup>
1943			3,113	3,113		3,113 <sup>k</sup>
1944			2,591	2,591		2,591 <sup>k</sup>
1945			2,906	2,906		2,906 <sup>k</sup>
1946			2,993	2,993		2,993 <sup>k</sup>
1947			2,747	2,747		2,747 <sup>k</sup>
1948			2,595	2,595		2,595 <sup>k</sup>
1949			2,877	2,877		2,877 <sup>k</sup>
1950				2,307		2,307 <sup>l</sup>
1951				3,328		3,328 <sup>l</sup>
1952				2,082		2,082 <sup>l</sup>
1953				2,939		2,939 <sup>l</sup>
1954				1,745		1,745 <sup>l</sup>
1955				3,134		3,134 <sup>l</sup>
1956				2,196		2,196 <sup>l</sup>
1957				1,807		1,807 <sup>l</sup>
1958				2,613		2,613 <sup>l</sup>
1959				2,264		2,264 <sup>l</sup>
1960				2,116	2,116	2,116 <sup>m</sup>
1961				1,840	1,840	1,840 <sup>m</sup>
1962				3,172	3,172	3,172 <sup>m</sup>

Year	Annual Fish/Fur Seal Reports 1906-1912 <sup>c-i</sup>	Rounsefell (1930) <sup>j</sup>	Huizer (1952) <sup>k</sup>	1972 BOF Report <sup>l</sup>	Pritchett and Hebert (2008) <sup>m</sup>	Best Blend <sup>m</sup>
1963				2,064	2,064	2,064 <sup>m</sup>
1964				1,952	1,957	1,957 <sup>m</sup>
1965				2,094	2,094	2,094 <sup>m</sup>
1966				2,422	2,422	2,422 <sup>m</sup>
1967				3,025	3,025	3,025 <sup>m</sup>
1968				1,816	1,816	1,816 <sup>m</sup>
1969				2,644	2,644	2,644 <sup>m</sup>
1970				3,324	3,324	3,324 <sup>m</sup>
1971				2,992	2,045	2,045 <sup>m</sup>
1972				1,477	3,954	3,954 <sup>m</sup>
1973					5,856	5,856 <sup>m</sup>
1974					5,910	5,910 <sup>m</sup>
1975					5,688	5,688 <sup>m</sup>
1976					6,409	6,409 <sup>m</sup>
1977					4,042	4,042 <sup>m</sup>
1978					3,485	3,485 <sup>m</sup>
1979					2,717	2,717 <sup>m</sup>
1980					1,671	1,671 <sup>m</sup>
1981					1,530	1,530 <sup>m</sup>
1982					1,030	1,030 <sup>m</sup>
1983					620	620 <sup>m</sup>
1984					1,406	1,406 <sup>m</sup>
1985					2,442	2,442 <sup>m</sup>
1986					2,347	2,347 <sup>m</sup>
1987					4,016	4,016 <sup>m</sup>
1988					3,155	3,155 <sup>m</sup>
1989					3,843	3,843 <sup>m</sup>
1990					3,273	3,273 <sup>m</sup>
1991					2,719	2,719 <sup>m</sup>
1992					1,052	1,052 <sup>m</sup>

Year	Annual Fish/Fur Seal Reports 1906-1912 <sup>c-i</sup>	Rounsefell (1930) <sup>j</sup>	Huizer (1952) <sup>k</sup>	1972 BOF Report <sup>l</sup>	Pritchett and Hebert (2008) <sup>m</sup>	Best Blend
1993					879	879 <sup>m</sup>
1994					464	464 <sup>m</sup>
1995					484	484 <sup>m</sup>
1996					727	727 <sup>m</sup>
1997					840	840 <sup>m</sup>
1998					1,033	1,033 <sup>m</sup>
1999					926	926 <sup>m</sup>
2000					775	775 <sup>m</sup>
2001					355	355 <sup>m</sup>
2002					*	* <sup>m</sup>
2003					*	* <sup>m</sup>
2004					553	553 <sup>m</sup>
2005					689	689 <sup>m</sup>
2006					576	576 <sup>m</sup>
2007					655	655 <sup>m</sup>

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**c**  
 Cobb (1907).

**d**  
 Marsh and Cobb (1908). All figures from table at bottom of page 54, except Central Alaska production and fertilizer and oil from large table entitled "Products of the Alaska fisheries in 1907", and raw herring utilized for reduction from text on page 55.

**e**  
 Marsh and (1909). The fisheries of Alaska in 1908. Bureau of Commercial Fisheries Document No. 645. All figures from table at the bottom of page 65, except reduction figures from text at top of page 66.

**f**  
 Marsh, and Cobb (1910). Reduction fishery figures from text on page 48. Text on page 48 describes an active, growing herring bait fishery, but does not give harvests.

**g**  
 Marsh and Cobb (1911). All figures from table on top of page 51, except herring utilized for reduction taken from text on page 51.

**h**  
 Evermann (1912). All figures from table on bottom of page 62. No reduction utilization

mentioned, so this was calculated.

**i**  
Evermann (1913). All figures from table on bottom of page 60. No reduction utilization mentioned, so this was calculated.

**j**  
Rounsefell (1930).

**k**  
Huizer (1952).

**l**  
1972 Division of Commercial Fisheries Report to the Board of Fisheries, unknown author.

**m**  
Pritchett and Hebert (2008).

usually the only source. There are occasional discrepancies in the Board of Fisheries report tables where column totals do not match reported catches. In most cases these appear to be minor typographical errors. Alaska fish ticket data for the first decade of statehood have been lost, so it is now impossible to verify catches against original raw documents. The most recent Board of Fisheries Report (Pritchett and Hebert 2008) is presumed to be the best source for catch information for the modern era. Pritchett and Hebert (2008) is used to provide the herring catches from the 1960-2008 portion of the historical record (Table 5.3). The official bait herring season spans calendar years, with fishing occurring in both the fall and following spring. For ease in comparison with other fisheries, the spring harvests are included in the year of the preceding fall harvests in Table 5.3.

A very small fishery for fresh herring bait, where herring were held for some time in “pound enclosures” appears in the historical record from time to time. The maximum reported catch for this “bait pound” fishery is 81 tons in the 1990-91 season, averaging 17 tons since 1983, and there has been no harvest in 9 of the last 15 years. Because these fisheries play a very minor role in the history of Alaska herring fisheries, they are not considered further. The 1983 to 2008 harvests for these herring bait pound fisheries are given in Pritchett and Hebert (2008).

### *Herring Roe Fisheries*

Herring roe fisheries have all developed during the modern era under state management. The best available catch information is given in the most recent Board of Fisheries report (e.g., Pritchett and Hebert 2008).

### Overview of Reconstructed Catches

The resulting historical catch record (Figure 5.1) shows the dramatically large catches of the 1925-60 period preceded and followed by many decades of harvests in the

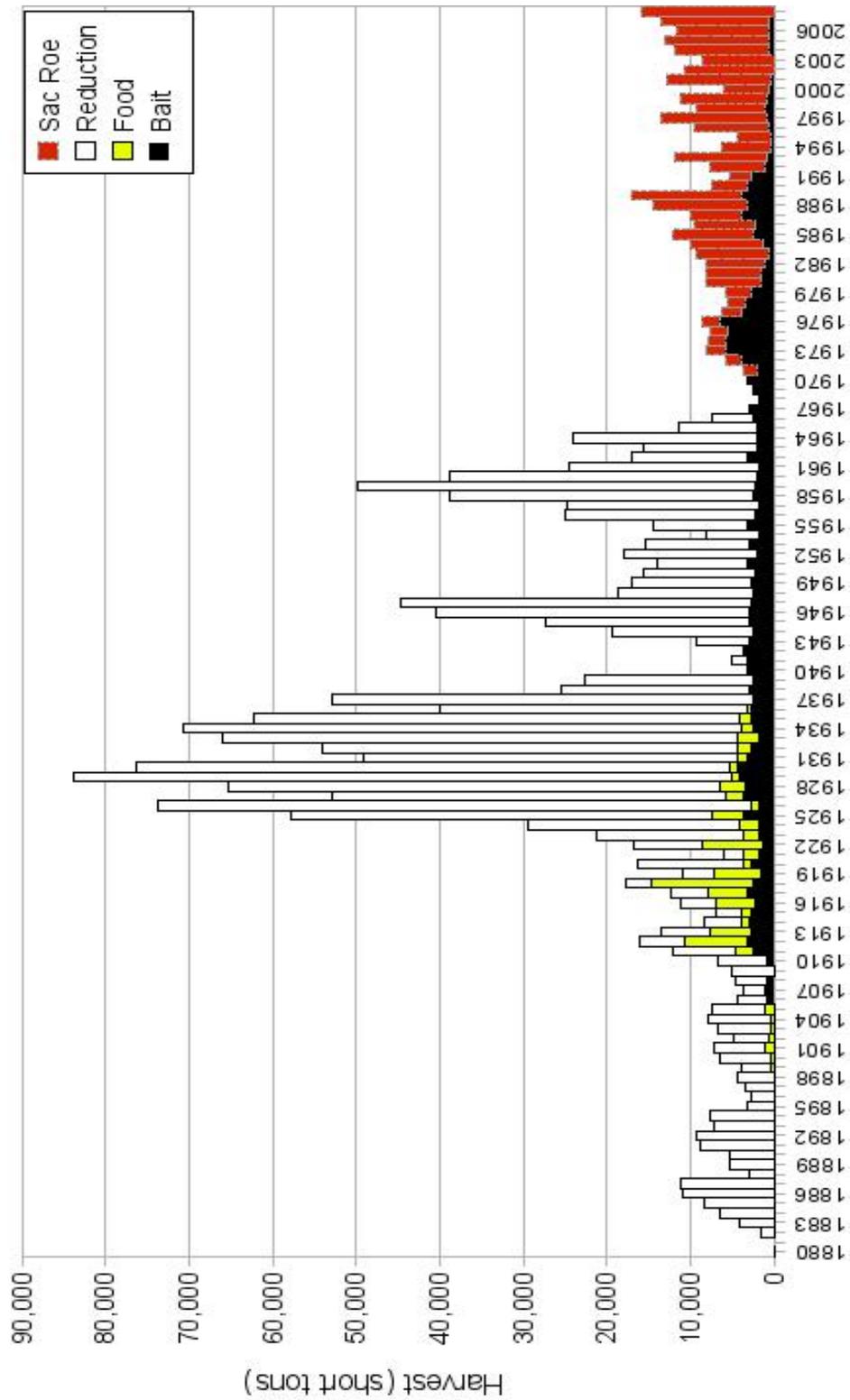


Figure 5.1. Southeast Alaska commercial herring harvests, 1880-2008, by fishery.

10,000 ton range. Underlying the pulses of catch in the reduction and roe fisheries, the herring bait fisheries have remained remarkably constant over the historical period.

### **History of the Fishery**

Early Europeans visiting Alaska would have been familiar with uses of the very similar Atlantic herring and undoubtedly utilized Pacific herring for food as well as bait for catching salmon and halibut. No records of the amount of herring used, traded, or exported by either Europeans or local Alaskan cultures are available prior to the purchase of Alaska from Russia in 1867 and for more than a decade afterwards. The amount of herring captured by individual fishermen and used for their own bait for commercial or personal use has always been largely undocumented, but has been a very minor component of overall utilization.

#### Reduction and Food Fisheries (1878-1966)

The history of reduction fisheries and salt-cured food fisheries is somewhat intertwined. Reduction plants often put up some food herring as well, particularly before the mid 1920s. Both reduction and food fisheries declined after World War II. No significant salt-curing for herring occurred after 1948 (Huizer 1952) and the reduction fishery ended in 1966. Both of these fisheries will be treated together.

#### *Killisnoo Plant*

The herring reduction fishery in Southeast Alaska began as a curious anomaly. The reduction plant at Killisnoo, near Angoon, was the first and only plant operating anywhere in British Columbia or Alaska for nearly 40 years. The Killisnoo plant was established by the Northwest Trading Company, an ambitious firm from Portland, Oregon, which sought to establish a foothold in the newly purchased (1867) and rapidly developing Alaska Territory. The aggressive and extravagant expansion of the Northwest

Trading Company was initiated by Paul Schulze, using his funding connections with Northern Pacific Railroad financier Henry Villard. The Northwest Trading Company began operations at Killisnoo as a trading post in 1878 (U.S. Dept. of Interior 1893). The operation was clearly well financed<sup>23</sup>, constructing shore plants, purchasing vessels and barges, and moving men and equipment around Southeast Alaska with ease, very quickly after the start of its operations. The steamer Favorite was purchased and in 1880 set out for Southeast Alaska under the command of Capt. J.W. Keene to support operations there (Wright 1895). By the spring of 1881, the new company had established trading posts at Howkan, Killisnoo, and Sitka, and played a crucial role in the founding of Juneau and setting up its first trading post (de Armand 1967). When not engaged in company support operations, the Favorite was chartered out to the U.S. Navy, which governed Alaska at the time, and its charter voyages included the first motorized vessel exploration of Glacier Bay in July 1880 by Commander Beardslee (Scidmore 1896). Scidmore (1885), visiting the newly-constructed Killisnoo plant in 1883 notes the extravagant expense of shipping in all the construction lumber to a place surrounded by dense forests with good timber:

This station represents an investment of over \$100,000; the oil works alone having cost \$70,000, and extravagant management having doubled all the necessary expenses of the first plant. As there was no water supply on the solid rock of Kenasnow, a reservoir with a storage capacity of 90,000 gallons of water was constructed; and with cedar forests on every side, every bit of lumber used was brought by freight from below.<sup>24</sup>

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<sup>23</sup> Initial capitalization of the Northwest Trading Company is listed as \$150,000 in the Portland City Directory of 1885.

<sup>24</sup> In fact the forests were primarily spruce and hemlock with some yellow cedar.

The U.S. Census Report for 1890 (U.S. Dept. of Interior 1893) states that the initial planning for the Killisnoo oil-reduction operation was for processing whales:

The enterprise was begun in an experimental way in 1879 by the Northwest Trading Company. The company had established a trading station at Killisnoo in 1878. It was observed that a large number of finback whales frequented the waters of that vicinity to feed on the herring and in 1880 whaling was attempted ...

The Killisnoo oil-reduction plant was the scene of the infamous Angoon shelling incident, which has been extensively covered elsewhere (e.g., Emmons and de Laguna 1991, Price 1990). That incident was started by the explosion of a whaling harpoon,<sup>25</sup> and the ensuing developments likely spelled the end of whaling operations at Killisnoo. The plant superintendant at the time, Capt. John M. Vanderbilt, had considerable trading experience with Tlingits, both at Killisnoo and at an earlier trading post in Wrangell (Muir 1915)<sup>26</sup>, and thus would not have been expected to botch the handling of the incident so badly. There was a backdrop of legal history before the incident concerning whether Tlingit law or U.S. Law should apply to such cases, which may have predisposed naval Commander Merriman to look for just such an occasion for a demonstration (Harring 1994). Perhaps Vanderbilt was somewhat panicked during the hostage-taking by the presence of his young family on Killisnoo at the start of the incident. At any rate, Vanderbilt removed his family to Sitka in the Favorite, where he informed Merriman of the incident, thus prompting the naval response. The company must have resumed peaceful coexistence with its neighbors and workforce fairly quickly because business resumed promptly. The conversion to processing herring must have

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25 Webb (1988) notes that the harpoon that exploded at Killisnoo was likely the rare and still experimental "California Whaling Rocket" invented by Gustavus Lilliendahl and Captain Thomas Roys. For details on the California Whaling Rocket see Roemer (1966) and Lytle (1984).

26 Muir maintained a friendship with Vanderbilt, begun at Wrangell on Muir's initial trip to Alaska, and continued in correspondence and an apparent visit to Vanderbilt in Sitka on Muir's subsequent Alaska trip. Muir's writing about Vanderbilt implies he understood and respected Tlingit culture.

already been underway because although the shelling incident took place in October 1882, a total of 1,520 tons of herring were processed for oil in 1882.<sup>27</sup> Production nearly tripled in 1883 to process 4,200 tons of herring, so the shelling appears not to have had much impact on the industrial operation at Killisnoo, though the cultural scars remained.

Exactly why the Killisnoo plant chose to switch from reducing whales to herring is not known, however it was likely that declining whale oil prices contributed to the decision well before the shelling incident. Whale oil prices had spiked during the civil war but were falling rapidly (Figure 5.2) as the Killisnoo plant began operation. The price of whale oil continued to fall as oil consumers switched to less expensive petroleum-based products. Entering the whaling industry was a risky proposition well before 1880; the U.S. whaling fleet had already declined from 735 vessels in 1846 to only 39 vessels by 1876 (Tower 1907).

On the east coast of the U.S. in the 1870s there was continued interest in producing animal oils, even though the prices were declining. Menhaden oil (produced in a reduction process similar to that for herring) was "interchangeable" with whale oil (Webb 2001; Reeves et al. 2002). When menhaden abundance declined sharply in the Gulf of Maine in the late 1870s, some fishermen, and their steamers, converted to whaling; when menhaden reappeared in the Gulf of Maine in 1886 "steamer whaling lost its appeal and most of the steamers returned to fulltime (menhaden) fishing" (Reeves et al. 2002). Scidmore (1885) notes that the Killisnoo plant managers (perhaps Vanderbilt and DeGroff, who were both born on Staten Island) were experienced in reduction processing of menhaden. Here we have a close correlation between east and west coasts in the pattern of activity during the initial years of the Killisnoo plant. The fact that in 1880 many of the New England menhaden plants had closed because of low menhaden

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<sup>27</sup> Moser (1899) reported the catch at only 1,240 tons, while Cobb (1906) reports 1,520 tons.

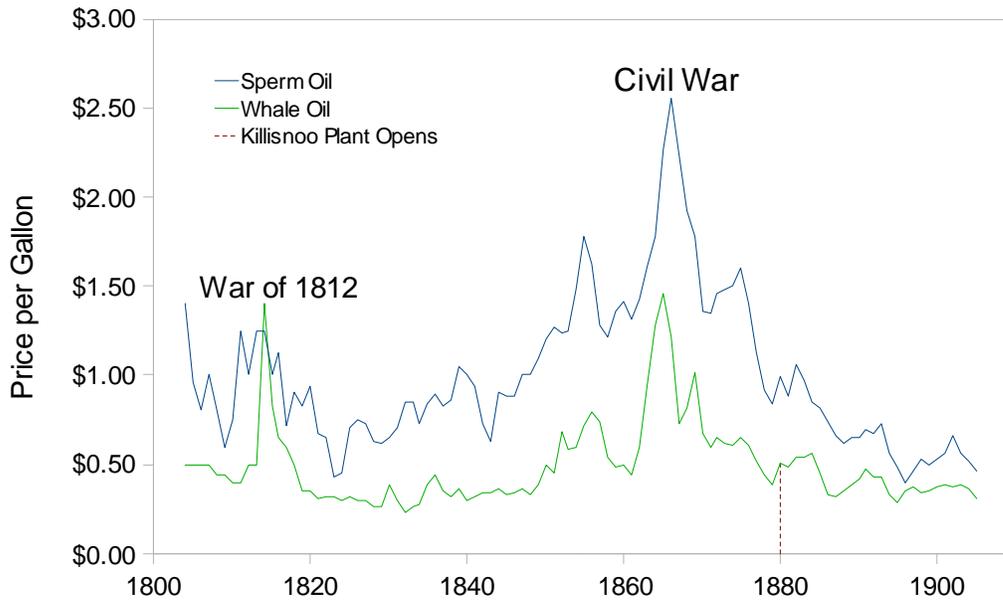


Figure 5.2. Whale oil prices 1800 – 1915, illustrating price spikes during time of war, and the relative timing of the opening of the Killisnoo herring reduction plant.

abundance (Johnson et al. 1915) could well have prompted the Northwest Trading Company to investigate replacement oils, both whale and then herring. Thus a brief menhaden and whale oil market anomaly in 1880 appears to have launched the Northwest Trading Company managers into the animal oil market. Once launched, the Killisnoo plant remained the lone Alaskan venture into the animal oil markets until 1919, a period of almost 40 years.

Moser (1899) notes that initially the Killisnoo plant produced only oil from the herring catch. In 1884 machinery to dry the herring carcasses was installed and the sale of offal as guano (fertilizer) began. It was the use for fertilizer that many Alaskans found so disturbing, preferring to see a greater abundance of herring left in the water for feed for other valuable fish like salmon and halibut, and to provide bait for those fisheries. Fertilizer was deemed a “lesser” use, and there were many attempts over the years to legislate against it (e.g., H.R. 9528, Committee on Merchant Marine and Fisheries, 1916). Of note, the Killisnoo plant was involved in a significant U.S. Supreme Court case over a substantial tax levied by the Alaska legislature to discourage non-food use of fish resources, such as herring reduction. *Alaska Fish Salting & By-Products Co. v. Smith*, 255 U.S. 44 (1921) alleged that the tax infringed on the barrier against “unreasonable” or “unduly burden-some” taxes established by the due process clause of the 14th Amendment. The court allowed the tax to stand and that case continues to be cited today as an important precedent establishing the boundaries of the 14th Amendment for disincentives such as taxing the tobacco industry (U.S. Dept. of Justice 1998).

Financial hard times beset Paul Schulze and his railroad men in the mid-1880s. Their railroad operations were always speculative, there was an ongoing recession (including Grant's panic of 1884), and their Northwest Trading Company may have expanded too rapidly, being particularly stretched at the Pyramid Harbor cannery (DeArmond 1990). The company went into the hands of trustees in 1888 (Moser 1899).

In September 1885, a bitter Edward de Groff (1885), a manager at Killisnoo, writes of a recent communication with Schulze:

Schulze fairly cursed the country this time when the Steamer came up. Said he had lost his own and his Friends money in it. I wonder if any of those egotistical chaps ever think that a great many of their misfortunes are their own fault - they are careful not to tell anyone if they do.

Herring catch had increased to 11,000 tons in 1886-87 just before the bankruptcy, but catches dropped to 3,000 tons with the bankruptcy in 1888<sup>28</sup>. The Killisnoo plant must have been a successful enterprise, however, because its assets were purchased by the newly formed Alaska Oil and Guano Company, which retained the Favorite and continued to operate the plant for many years, under the direction of Carl Spuhn. The Sitka store was sold to Vanderbilt and de Groff, and the Juneau store to former employees Karl Koehler and Edmund H. James (DeArmond 1990). The Killisnoo reduction plant was the sole surviving legacy of the adventures of the Northwest Trading Company.

While the Killisnoo herring plant would remain profitable for many years, the initial investors did not fare so well. The flaky finances and ensuing bankruptcy of Schulze and Villard's Northern Pacific Railroad was one of the underlying causes propelling the famous Panic of 1893 to the status of the worst depression the United States had ever seen. Eventually numerous shady real estate and other dealings of Schulze's, which the New York Times (1895) termed no less than "a land agent's theft," came to light. With personal debts thought to approach one-half million dollars, an exorbitant figure for the 19th century, Paul Schulze committed suicide in 1895. It is likely that Paul Schulze's reckless management and expansion of his other enterprises

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<sup>28</sup> The 1888 oil production was also intended to be purposefully limited to 30,000 gallons because of the "overstocked" oil markets (The Alaskan, June 2, 1888, Sitka, Alaska).

caused the failure of the Northwest Trading Company, not the underlying economics of the herring reduction industry. Carl Spuhn retained the company headquarters for the Alaska Oil and Guano Company in Portland<sup>29</sup> and guided the company through several more profitable decades. Spuhn was a German national who appears to have emigrated with few funds, only a connection to one of Villard's railroad men<sup>30</sup>. That Spuhn died leaving an estate of \$150,000 speaks to the profitability of the herring reduction industry in this period, as the Killisnoo plant appears to be Spuhn's sole source of livelihood.

Carl Spuhn suffered a debilitating stroke in 1915, removing him from management of the company. Although the management, owners, and Portland offices appear to be the same, the company changed its name in December 1915 to Alaska Fish Salting and Byproducts Company (Bower and Aller 1917). The name change may have reflected the increasing trend to produce salt-cured herring which was prevalent at the time, and also the increasing resentment towards the “lower” use of herring as fertilizer.

Several factors contributed to the ultimate demise of the Killisnoo plant. By the 1920s, competition had become stiff with many other reduction plants opening in Chatham Strait. The Killisnoo operation retained the labor-intensive Norwegian seine harvesting method and relatively cumbersome steam tenders long after other operations had switched to more modern and efficient techniques. Herring in northern Chatham Strait became scarce; abundant herring were then only found in southern Chatham Strait, much closer to the newer reduction plants. The plant finally closed after fire extensively damaged the town of Killisnoo in 1928, although the herring plant itself was spared (Walter Soboleff). The final years of operation are somewhat unclear as Lockley

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29 Portland city directories show that Spuhn maintained the company's office on the penthouse-like top floor of the Concord Building, at the time Portland's largest and most up-to-date office building (Niles 2008), a clue to the profitability of the Killisnoo operation.

30 Carl Spuhn's sister Bertha was married to Richard Koehler of Villard's Portland operations, and always lived with the couple in Portland. Koehler appears to be an investor in the Killisnoo plant and took over its management after 1915 when Spuhn suffered a debilitating stroke (Lockley 1928).

(1928) indicates that Alaska Fish Salting and Byproducts Co. actually went out of business in 1926. Rounsefell (1930) stated the company failed in 1920, and a new firm had organized to run the Killisnoo plant since 1923.

#### *Other Reduction Plants*

There is very little detail preserved in written records about the background of the additional herring reduction plants that sprang up during the 1920's. Rounsefell (1930) stated the maximum number of operating plants as 18 during 1926-27 (Figure 5.3). Perhaps the terse record resulted from the relatively short duration of most of the plants, or the fact that they did not have entire communities centered on their existence, as did Killisnoo. By the time these new plants were built, vastly improved engineering of herring harvesting and processing meant that comparatively few persons were required for their operation. The newer plants were far more conducive to seasonal, mobile operations, remaining fully open only for the months of herring fishing, then being mothballed for the remainder of the year with only watchmen present on the grounds. Unlike Killisnoo and its relationship with the towns of Killisnoo and Angoon, all of the newer plants were sited in remote locations far from existing communities.

#### *Expansion of the Fishery*

Prior to 1910, almost all commercial catch of herring in Southeast Alaska was used for reduction at the Killisnoo plant. The expansion of herring fisheries began with salt-cure operations for human consumption. Documented salt-cured herring production had been sporadic until 1900, when Petersburg-based fishermen began curing herring. Instead of shore-based plants, most early salt-curing operations were mobile, with the salt packing being done on scows that were towed to fishing grounds by fishing vessels. The Petersburg fishermen had extended operations to Chatham Strait by 1916 (Huizer 1952). The British Columbia salt-cure herring industry slumped in 1910-1911, spurring

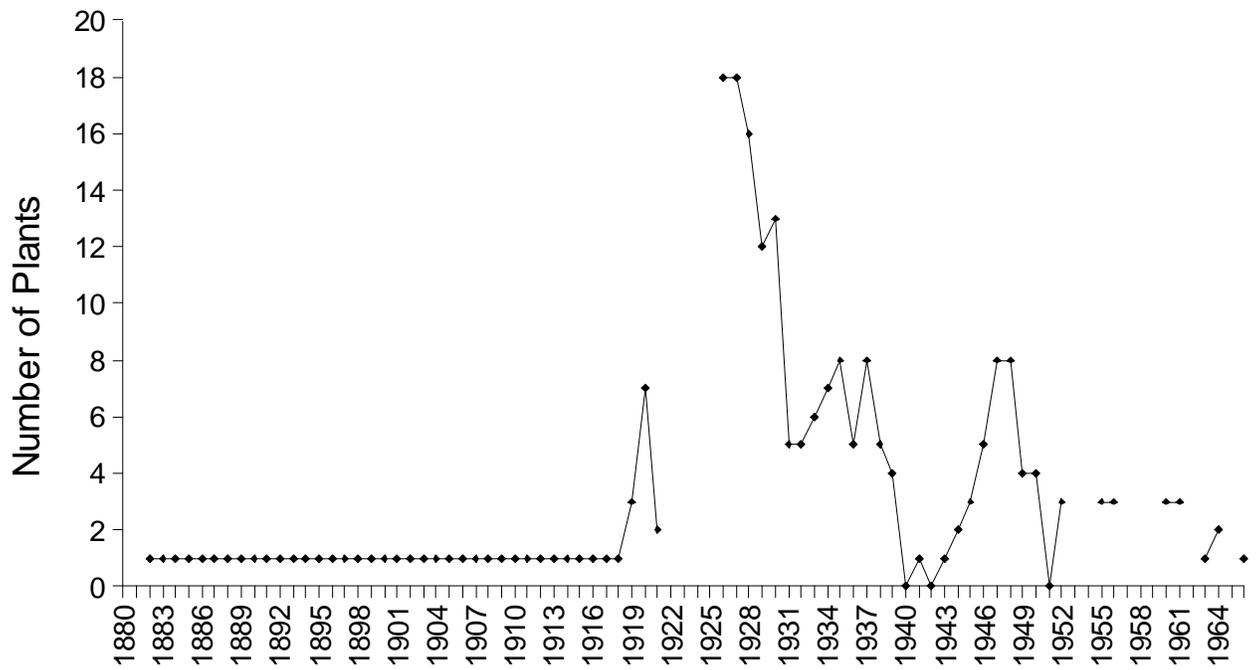


Figure 5.3. Number of herring reduction plants in Southeast Alaska, 1880-1966. Records of the number of plants operating from 1922-1926 have not been located.

development at Killisnoo and elsewhere in Alaska. In 1911 a fishery for salt-cure herring began expanding rapidly and for the decade between 1912 and 1922 food production averaged 35% of the overall herring harvest. In 1916 the Bureau of Commercial Fisheries brought in experts to train fishery workers in the method of "Scotch Curing," which produced a better and more valuable product than "Norwegian Curing". Both methods involve salt-brining herring in wooden barrels, but the Norwegian method is heavily salted, poorly gutted, and not as carefully graded into sizes. Canning of herring for food was also begun in 1916 at Port Walter (Strong 1917). A limited production of "dry-salted" herring for Asian markets also existed between 1910 and 1920. With prices bolstered by wartime shortages, the peak food catch of 12,304 tons in 1918 dramatically exceeded the reduction catch of only 3,085 tons that year. The large 1918 pack was poorly handled, resulting in very low prices for Alaska herring in subsequent years. During this period of expanded herring harvests for salt-cure production, large herring became scarce in Southeast Alaska, and most salt-curing operations moved on to Prince William Sound and Kodiak, where larger herring were still available (Huizer 1952). It is possible that the decline in fish size before 1920 was an early warning that herring were already being too heavily exploited in Southeast Alaska.

At the end of World War I, interest renewed in the reduction fishery, with the construction of three additional reduction plants along Chatham Strait in 1919. Some, as yet undiscovered, shift in the market for herring oil or fishmeal just after World War I must have occurred that led to the rapid expansion in fishing effort during the 1920s. It is also possible that the markets remained constant, but the drastic improvements in catching and processing efficiency made herring oil and fishmeal much cheaper to produce and thus enhanced profitability. The reduction industry expanded rapidly in the early 1920's so that by 1927 there were 18 large reduction plants operating in

southeastern Alaska (Figure 5.3). Almost all of the new plants were located in southern Chatham Strait (Figure 5.4).

Production peaked in 1929 when 78,778 tons of herring were harvested<sup>31</sup> and remained above 35,000 tons through 1937. In 1938 there was a sharp drop in yield and only five reduction plants operated in southeastern Alaska (Huizer 1952). In 1939, because of evidence of severe depletion of herring, regulations were enacted prohibiting all commercial herring fishing except for bait purposes in the vicinity of Cape Ommaney. The Cape Ommaney area had contributed 80% of the total herring catch in southeastern Alaska for the 12-year period from 1927 to 1938 (Huizer 1952).

In 1939 fishing effort shifted northward to Sitka, but still harvested large amounts of the same population as had been harvested at Cape Ommaney, necessitating further restrictions on the catch. Commercial fishing for herring other than for bait purposes was prohibited after August 2, 1939 in all of southeastern Alaska. However, political pressure from the fishing industry forced the Bureau of Commercial Fisheries to open an “exploratory” fishery, using 5 boats fishing cooperatively. Those vessels failed to catch any herring whatsoever. Political pressure to reopen the fishery continued, and a 6,250 ton quota was set for 1941, but the fleet was only able to harvest half of it. All of southeastern Alaska was finally closed during 1942 to allow herring populations to rebuild. Annual catch quotas were then implemented, starting at 12,500 tons in 1943 and increasing to 50,000 tons in 1948 as herring abundance was perceived to increase. Herring became scarce again in 1948 and the quota fell back to 100,000 barrels by 1951 (Huizer 1952).

The number of operating reduction plants had peaked in 1928. Because the efficiency of factory processes and vessels had increased, fewer plants, fishermen, and vessels could attain the same production as in the earlier, more labor-intensive era.

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31 Combined with food and bait harvests the 1929 maximum was 83,811 tons.

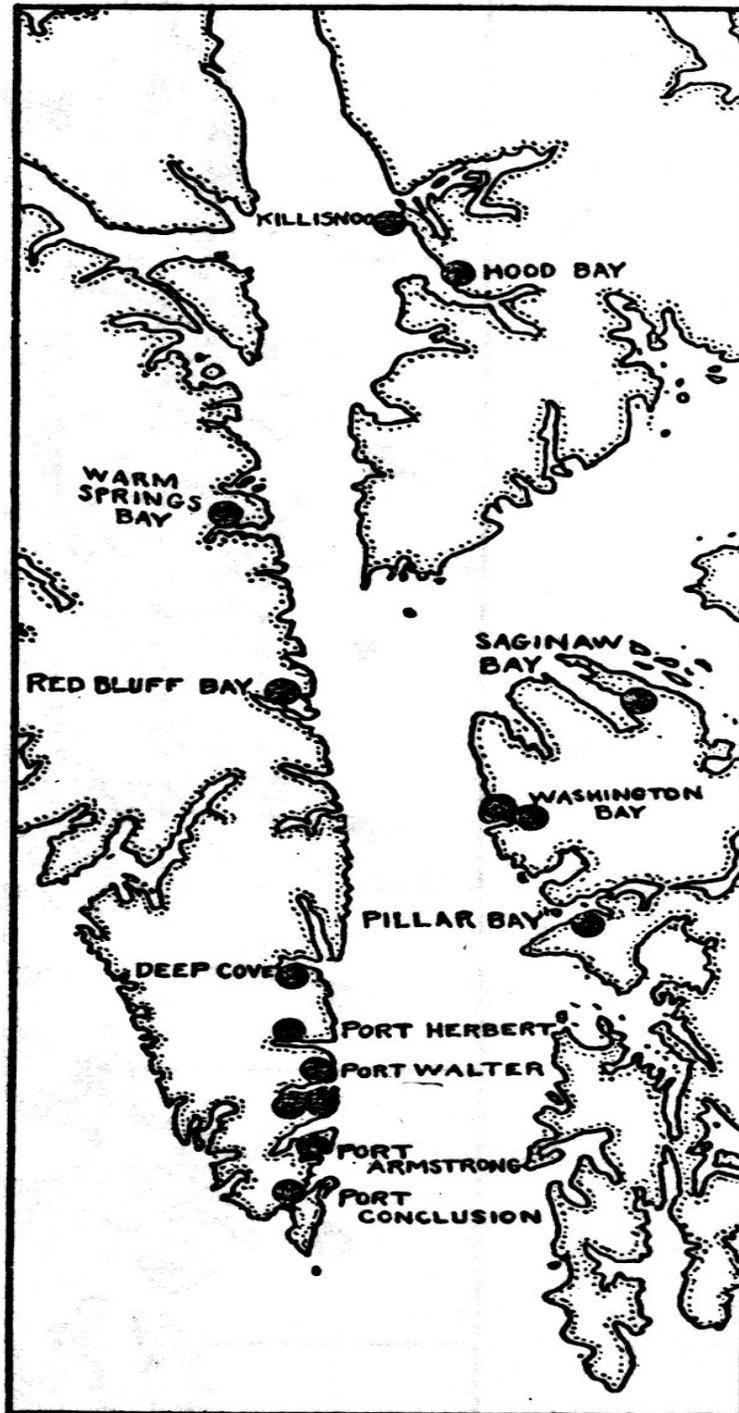


Figure 5.4. Locations of Southeast Alaska herring reduction plants (from Rounsefell, 1931).

Without the improvements in efficiency, the herring reduction fishery would have disappeared earlier, as prices for their products were deteriorating.



Figure 5.5 Commercial herring seining at City Float, Ketchikan Harbor, circa 1950.  
Photograph courtesy of Steve Schrum.

Interest in fishing for herring for reduction began to wane during the 1950s, in part because of the fluctuating abundance of herring. During the 1950s the Peruvian anchoveta fishery began a period of explosive growth, with catches exceeding 3 million metric tons by 1960, making Peru the largest fishmeal exporter in the world. With the glut of cheaper reduction fishery products on world markets, prices for Alaska-caught herring declined. The last herring reduction plant in Alaska, at Washington Bay, closed after 1966.

### Bait Fisheries

Herring have almost always been the preferred bait for longline, troll, and shellfish pot fisheries. Huizer (1952) noted that since the start of the halibut longline

fishery in 1895, herring had been used almost exclusively for bait, so as the halibut fishery has grown, the herring bait fishery grew along with it. In 1910, the first herring were frozen for bait at the New England Fish Co. plant in Ketchikan (Marsh and Cobb 1911), which helped supply halibut and salmon fishermen with bait year-round. Fresh herring was still usually preferred to frozen bait herring (Huizer 1952), and winter herring are preferred because they are firm and stay on hooks better than fat summer herring. Documented bait herring production has been relatively constant and low. From 1910 to 1970, bait herring harvests averaged 2,640 tons (Figure 5.1). Bait herring harvests increased to 4,000-6,000 tons annually during the 1970s because of increased demand from expanding shellfish fisheries in the western Gulf of Alaska and Bering Sea. Recent bait harvests have declined, averaging about 700 tons in the last 10 years.

### Roe Fisheries

In early 1960s the collapse of the herring fisheries in Hokkaido spurred the development of herring fisheries all over the eastern Pacific. Initially, roe fisheries in Southeast Alaska harvested only roe on kelp from naturally-spawned beaches. In 1971 fishing for sac roe began, and had quickly spread throughout Alaska to all major herring spawning locations. The fishery continues at present, though prices have eroded from the high levels of the 1980s. Globalization of culture within Japan is thought to have eroded the demand for traditional foods like herring roe. Currently, herring are harvested for sac roe at Sitka with purse seines, and in the Revilla Channel and Stephens Passage (Seymour Canal and Port Houghton/Hobart Bay) areas with gillnets.

## Herring in Japan<sup>1</sup>

Herring has also been an important part of cultures and histories in Hokkaido, Japan. Herring, or *nishin* in Japanese, is known as *Harutuge'uo* (spring-announcing-fish). The symbolic expressions with various writing characters for herring (鰯, 鰯, 鰯, 二身 and 二親) indicate its significance in the history and culture of Japan. Ainu also refer to herring as 'fish that calls spring.' Ainu people who lived on the west coast Hokkaidō called herring *kamuy-čep* (god-fish) in addition to their generic term for herring (*heroki*).

Many geographic names in Hokkaidō derive from the historical and cultural ecology of the Ainu. Ainu geographic naming shows metonymic characteristics, which mean that toponyms derive from "the presence of a particular resource (ordinarily plant or animal), usually in abundance" (Thornton 2008:93). *Heroki-kar-ush-i* (herring-to-catch-accustomed-to-place), an aboriginal Ainu toponym, was applied to several places along the coast of Hokkaido.

Herring established its commercial significance when the Matsumae feudal clan began operating a contract-fishery system in Hokkaidō in the seventeenth and eighteenth centuries. They contracted with merchants who set up fish trading posts. Under this system, herring fishing evolved to the major industrial enterprise in Japan. Dried herring meal for fertilizer was widely distributed and used in western and northern central Japan, and herring roe became a commercial food all over the mainland Japan. Meanwhile, Ainu became the forced labor pool for fishing herring, which the contract fishery operators exploited to maximize harvests and their own profits.

The herring fishery developed further in the modern Meiji Period. While approximately 75,000 tons of herring were harvested annually in the 1830s, the figure increased to 150,000 tons in the 1850s and peaked in 1897, with a catch of 975,000 tons of herring. Herring mansions (*nishin goten*), some of which still remain in Hokkaido, symbolize the wealth that herring fishery masters from this period accumulated. However, local herring stocks gradually declined and became subject to great fluctuations after 1904. Finally, in 1958, herring literally disappeared from coastal Hokkaidō. The reasons for the collapse of herring populations in Hokkaido are still not fully known. However, it is clear that herring and Ainu labor were key foundations of Japan's nineteenth century modernization. Unfortunately, herring is now referred to as *maboroshi no sakana* (phantom fish).

Today, Japan annually imports approximately between 50,000 and 80,000 tons of herring from Russia, the U.S., Canada, and Europe. Herring products in Japan are diverse. It is eaten as *sashimi* (i.e., raw), and it is also grilled, boiled, dried, smoked, salted, flaked, pickled, and seasoned. Herring is also pasted as an ingredient of fish cakes. Herring roe (*kazu no ko*) is a delicacy in Japanese culture and its high market price makes it a profitable luxury good for traders. Approximately 20,000 to 25,000 tons of herring roe is imported to Japan annually.

Since 1996, government-sponsored herring restoration plans have been in operation. In recent years, over two million artificially propagated herring fry have been released in the ocean for the restoration of local herring stocks. There have been modest increases in herring harvests in recent years, though the catch is still very low from an historical perspective.

<sup>1</sup> Shingo Hamada, Indiana University

## **Declines in Abundance**

### Early Views of Abundance

Nineteenth century writers often remarked on the abundance of herring in Southeast Alaska. Of all the possibilities among the grandeur of the newly-acquired Territory to comment on, these early visitors, tourists, immigrants, and scientists quite often included the diminutive herring in their observations. It is quite likely that some of their observations of extreme abundance are related to the peaks of strong year classes which periodically pass through herring populations, typically on a somewhat less than decadal scale, rather than the "average" abundance. Still, these written observations describe a remarkable abundance of herring.

Eliza Ruhamah Scidmore wrote what would become the first tourist guidebook to Southeast Alaska, making her first cruises to Alaska aboard the Pacific Coast Steamship propeller steamer Idaho in 1883, and the sidewheeler Ancon in 1884. Scidmore was a pioneering travel writer (and later a National Geographic board member) noted for her detailed descriptive language. On at least one of the voyages (both voyages are combined in her writings) the coastal steamers called at Angoon and Killisnoo, and Scidmore (1885) describes an abundance of herring:

From the end of August into January the waters of Chatham Strait are black with herring. The Indians used to catch them with primitive rakes, made by driving nails through the end of a piece of board, and with this rude implement they could quickly fill a canoe with herring, each nail catching two and three fish. Seines have supplanted the aborigine's hand rake, and a thousand barrels of silver herring have been taken at a single haul, although the average haul is about half as many barrels, and requiring eleven men to each net then.

Almost a decade later, Scidmore revised and republished her guidebook, after at least one additional cruise (1891) to Alaska. In this "Appleton's Guide-book," Scidmore (1893) records one enormous school of herring:

The factory's crews net from 300 to 600 barrels of herring at a single haul. Often 1,000 barrels are seined at once, and 1,600 barrels were recently taken by one cast of the seine in Sitka harbour. From September to May, all these waters are visited by great schools of herrings, and once in August the mail steamer passed through one school for four hours, the water silvered as far as could be seen, many whales and flocks of gulls attracted by this run of plenty.

By the 1890s "tourist steamers" were heading to Alaska, exploring Glacier Bay. Aboard one of the steamers, Arthur Inkersley (1895) writes in *The American Amateur Photographer*, about Killisnoo: "The waters of the neighboring inlet abound in herring which are taken from the middle of August to the end of December ..."

Moser (1899) recorded observations on the fisheries of Alaska during the first cruise of the U.S. Fish Commission research steamer *Albatross* through the inside waters in the summer of 1898. In his report about Killisnoo, Moser (1899) writes:

The herring of Southeast Alaska are small, but in season are rich in oil and of delicious flavor. They are found in many localities running in immense schools, sometimes in smaller numbers, in fact almost disappearing where formerly they were abundant, and appearing in localities not visited before, only to return after several years to their former feeding grounds. ... For many years the inlet at Kootznahoo has been the favorite resort for herring, though lately they seem less abundant. They are found in great numbers on the northern shore of Kuiu Island

and at times many are taken in the vicinity of Juneau. The steamer Dolphin<sup>32</sup> cruises through all the interior waters and makes a catch wherever herring are found.

Cobb (1906) borrows some of Moser's (1899) text, but adds some new observations about herring, including observations of declines around Killisnoo:

They are rather erratic in their movements, however, being in one place especially abundant one year and totally absent the next, possibly returning again after several seasons in greater numbers than before. In Southeast Alaska the herring arrive in April for the purpose of breeding, and deposit their eggs in countless numbers in the sea grass and rockweed near shore and on boughs of trees along the beaches near low-water mark. For many years the inlet at Kootznahoo, on Chatham Strait, was the favorite resort for herring, but they are much less abundant now, owing, it is claimed, to the constant fishing for them with purse seines, which breaks up the schools and drives them away. ... The northern shore of Kuiu Island and Gastineau Channel are also favorite spots, although the fish have been rather scarce in the latter place the last two seasons.

Evermann (1913) in his annual report on Alaska's Fisheries adds more uncertainty about abundance in some locations:

In Alaska it is said by some that herring are no longer as numerous as they were a decade ago, and the absence of large runs from Gastineaux [sic] Channel is cited in support of this contention. Undoubtedly it is true that Gastineaux Channel has shown but comparatively limited numbers of herring during the last few years, but this is not heard with reference to Auk [sic] Bay or other near-by waters well known for herring. It may be reasoned that the cycle theory--the periodic

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32 The Dolphin was another of the Killisnoo plant's steam tenders.

preference shown by fish for certain waters--is the chief cause of the present conditions in Gastineaux Channel. It is said by an old-time resident of the region that from 1885 to 1890 there were almost no herring in Gastineaux Channel, while for a few years thereafter the runs were moderately good, and in 1901 and 1902 they appeared in large numbers. Since that time an occasional school has been seen. It should be noted that at no time has this body of water been recognized as a regular heavy producer of herring. <sup>33</sup>

### First Attempts at Tracking Abundance

Rounsefell (1930, 1931) was assigned to study the developing problems with the Alaska herring fisheries, as it was noted that catches were fluctuating dramatically and it was not known if the cause was depletion or some other factor. Rounsefell's (1930) annotation of catches from the 1920s indicates growing awareness of reduced herring abundance (Figure 5.6). Rounsefell (1930) analyzed catch per unit effort (CPUE) data from the reduction fishery and concluded that through 1926 there was no evidence that the huge reduction herring harvests were depleting the resource. He noted that CPUE dropped in 1927 and 1928, but could not determine whether the reduced abundance of herring was due to depletion or natural fluctuations. Rounsefell (1931) concludes more definitively that herring had been depleted by fishing, and begins to make recommendations for restricting the fishery. His recommendations were largely unheeded until 1939 when the fishing fleet, despite roaming to wherever they could to find herring, was largely unable to find anything to harvest.

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<sup>33</sup> It should be noted that this period was marked by heavy industrial gold mining activity in Juneau and Douglas, including major discharges of toxins and tailings into Gastineau Channel., which may have impacted herring in the area. One observer suggested that there were major herring die-offs during this period, citing the Winter and Pond photograph of dead herring on Douglas beach (on the cover of this report) as a potential example of this. However, this is unconfirmed. The deleterious impacts of more recent industrial developments on herring, such as the pulp mill in Silver Bay near Sitka, are more clearly documented (see Chapter VI).

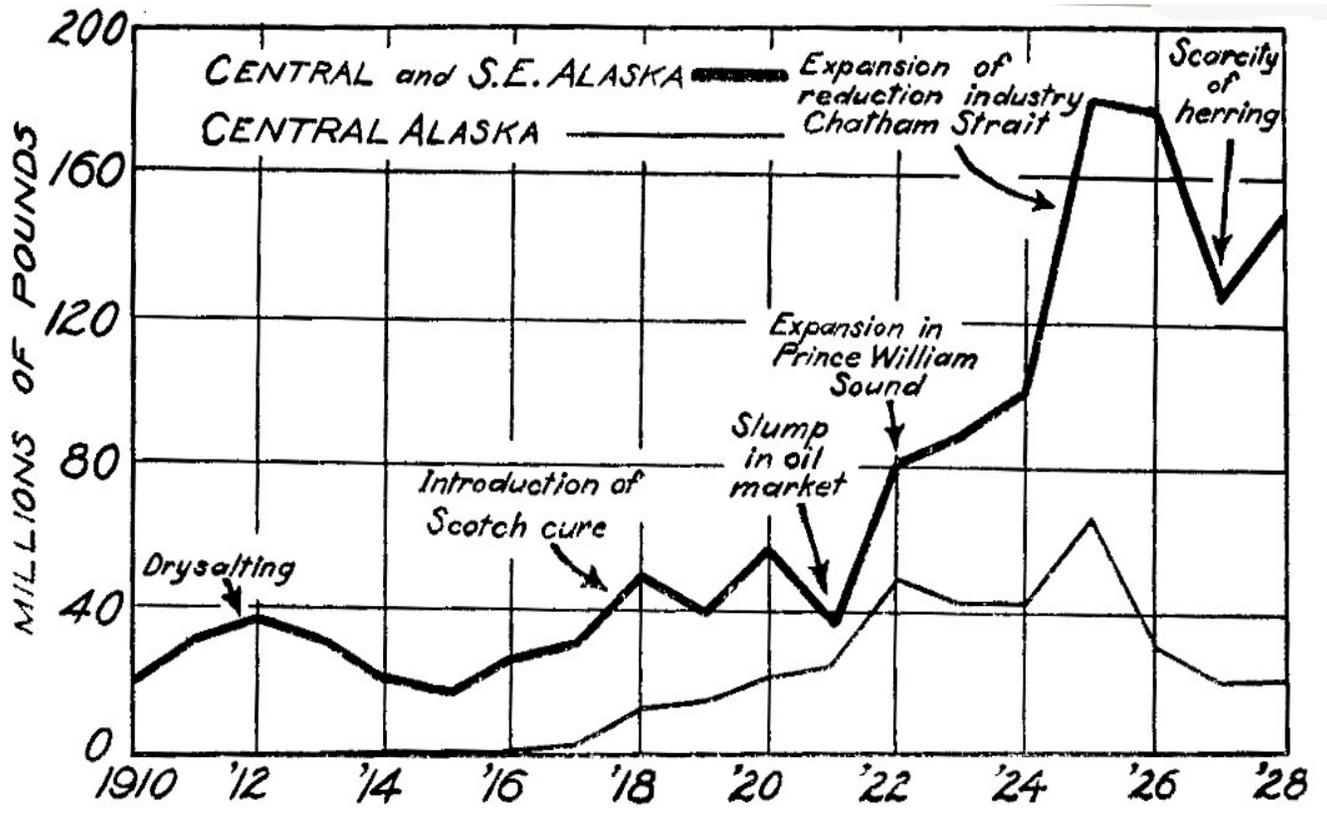


Figure 5.6. Herring fishery catches with annotations about herring abundance and fishery developments from Rounsefell (1930).

Dahlgren and Kolloen (1943) explain that the fortuitous appearance of the extremely large 1926 year class, just after Rounsefell's research, was able to temporarily sustain the enormous capacity of the reduction plants into the 1930s. They describe how the fleet had nearly fished out the 1926 year class, then had the good fortune to sustain the extremely high levels of effort with the large 1931 year class, before collapsing in the face of a more typical series of recruitments. Dahlgren and Kolloen (1944) note that three successive recruitment “failures” from 1932-1934 caused the collapse of the Southeast Alaska herring fishery in the late 1930s because the fishery was so intensive there were insufficient older spawners remaining from the very successful 1931 hatch to carry the population through. It should be noted that three successive poor recruitments is not at all unusual for Gulf of Alaska herring; often it is the norm and a three-year run of low recruitments would not presently be termed a “failure”.

Kolloen (1947) describes the development of a technique for following cohorts of herring through time using analysis of age compositions. The method appears to be an early form of what later would be termed “cohort analysis” (Pope 1972). The technique is able to identify and follow strong cohorts of fish, but it is now recognized that additional information is needed to track even relative abundance through time to determine whether the population is increasing or decreasing. Kolloen (1947) described abundance of herring from his technique, and presents a rosy picture of recovering herring populations, just before they crashed again in the late 1940s from overfishing. (Figure 5.7).

Kolloen (1947) thought the average expected yield for the southeastern Alaska herring fishery should be almost 40,000 tons. He notes that plant managers at the time figured they needed at least 6,000 tons of herring per plant to be economically viable. Kolloen's rosy forecast of 1947 and concept of 40,000 ton average yields were not to last. By 1951 herring populations had again crashed, quotas were ratcheted down, and catches

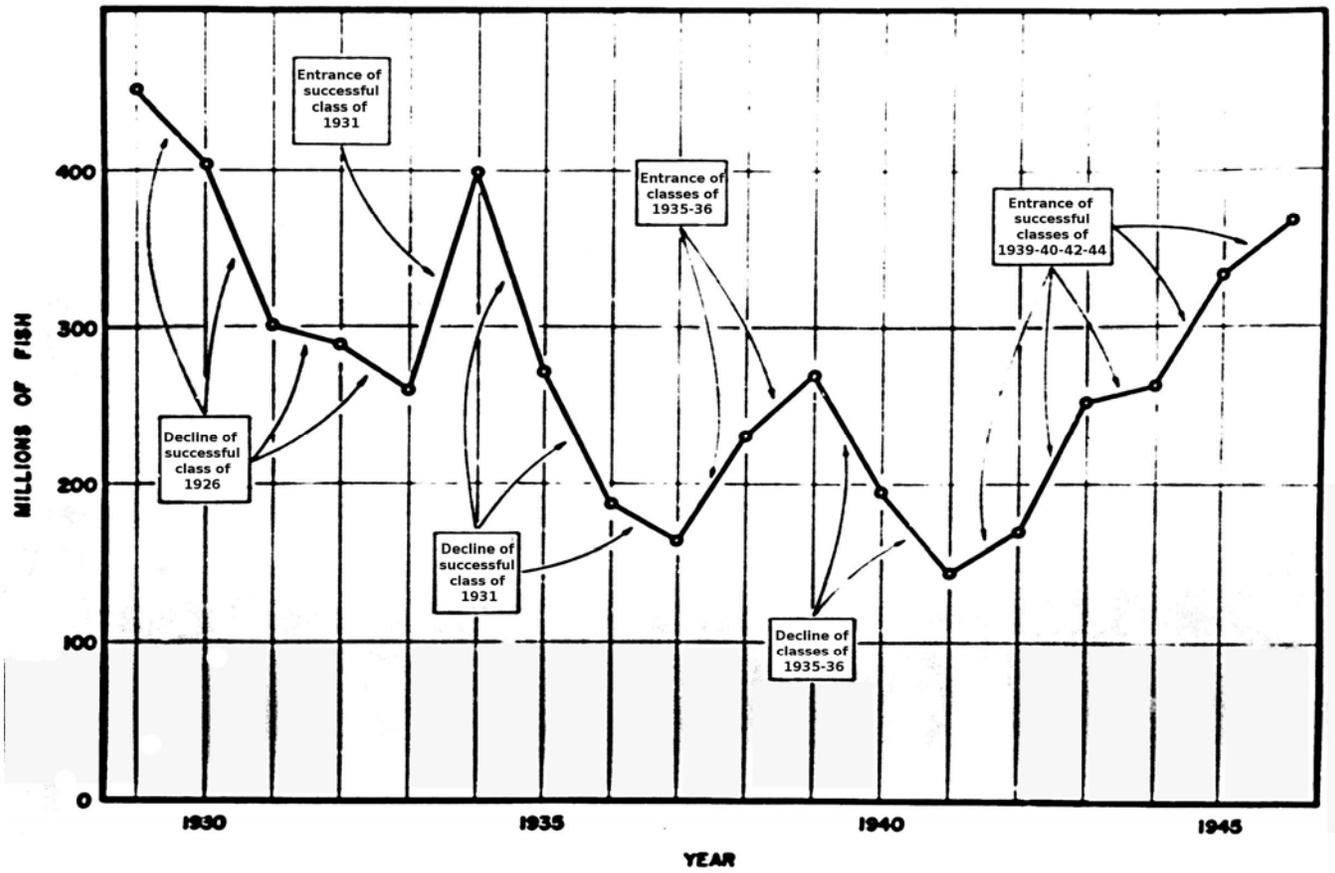


Figure 5.7. Annotated abundance of Southeast Alaska herring, 1929 - 1946 (Figure 2 of Kolloen 1947).

dropped. Kolloen (1947) notes that Cape Ommaney, where the most intensive fishing effort occurred in the latter part of the reduction fishery, contained almost entirely Sitka-spawning herring. It should be noted that while these herring were heavily exploited and population abundance fluctuated widely, they were never depleted to the point of extinction, as were other herring populations.

Another indication of the heavy exploitation of the reduction era is the reduced size of herring. This indicates exploitation rates so high that cohorts were cropped off before they were able to age and grow to larger sizes. Huizer (1952) noted that salt-curing herring for food declined in Southeast Alaska after 1918 because large fish became scarce. The curing production then moved to Prince William Sound and Kodiak, which were not as heavily exploited at the time. Then body size declined in those areas also, and in 1928 salt-cure herring production was initiated in Dutch Harbor, where very large body-size herring were available.

#### Local Depletion: Acute Overfishing Episodes

Several locations provide examples of excessive concentrations of fishing effort and have resulted in temporary and sometimes more permanent depletions of herring.

##### *Killisnoo*

Spawning and feeding herring were once abundant in the area around Killisnoo, but became nearly extinct after many decades of the Killisnoo plant operations. Kolloen (1947) lists Kootznahoo Inlet spawning herring as one of the four major herring populations:

Studies (principally tagging) have shown that there are four major herring populations in southeastern Alaska which are most easily identified through the locality at which they spawn. In order of importance these are the Sitka, Craig, Juneau, and Kootznahoo Inlet stocks.

Rounsefell and Dahlgren (1935) note that the spawning grounds in Kootznahoo Inlet were once of great importance, but had declined. Rounsefell (1931) had obtained records from vessel logs detailing how much of the Killisnoo plant's catch came from the local area around Killisnoo compared to the harvest from other areas. These data show a dramatic decline in Killisnoo-area "local harvests" from 1900 to 1915 (Figure 5.8). Vessels from Killisnoo then had to range further to obtain herring, which was one of the factors contributing to the demise of operations at Killisnoo.

There is so little spawning in the Killisnoo/Kootznahoo area now that it has not been included in areas surveyed by the ADFG since statehood. Clearly, removals of the order of 2,000 tons annually could not be sustained from this local population. Presumably there must have been extremely significant impacts on traditional herring harvests by Angoon area residents caused by the commercial depletion of these herring.

### *Seymour Canal*

Seymour Canal appears to be an area that was overfished, but has since recovered. Herring were harvested from the area beginning at least by the very early 20th century for both salted and reduction products. Although catch records by area are usually vague for the early years of the Alaska fishery, Rounsefell (1931) assembled sufficient references to document substantial harvests (minimally 500-2,500 tons annually) showing that Seymour Canal produced herring regularly for at least 18 years (1904 to 1921). Rounsefell (1931) then examined detailed catch records for every vessel in the fleet from 1926 to 1929 and noted there was not a single catch from Seymour Canal, concluding "this absolute failure is indicative of severe depletion." Herring were so rare in the Seymour Canal area that Rounsefell (1931) could not even obtain any herring for biological samples. Seymour Canal herring eventually recovered from the overfishing. Spawning there was sufficient to attract the attention of sac roe fishermen

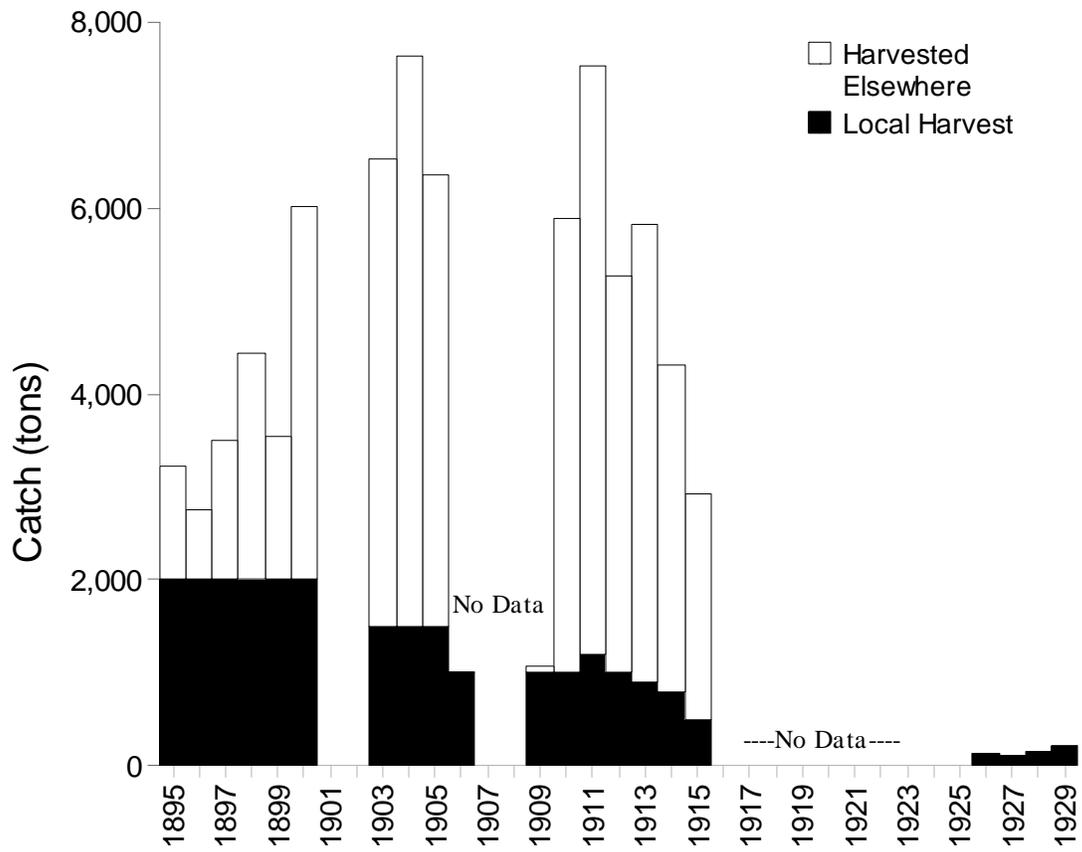


Figure 5.8. Harvests by the Killisnoo plant in the local area around Killisnoo contrasted with catch taken from other areas, 1895-1929 (data from Rounsefell 1930).

when that fishery developed in the 1970s. Harvests from the sac roe fishery have averaged 469 tons since 1971. The fishery has been closed for 10 of those 38 years to protect the population 1,076 tons over the last 5 years.

### *Auke Bay/Lynn Canal*

Abundant herring spawning has been historically observed in Auke Bay and lower Lynn Canal, with Kolloen (1947) listing that population as the third most important herring population in Southeast Alaska. From 1971 to 1981, sac roe harvests averaged 655 tons in the area. The fishery was closed after 1982 and very little spawning has been observed in this historically important area since then. Carls et al. (2008) note “There are indications that overfishing caused the stock collapse”. In 1982, ADFG herring biologists had recommended closure of the fishery, based on over-wintering and pre-season acoustic surveys. Just as with the reduction fishery closure of 1940, political pressure from the fishing industry over-rode biological considerations, and the final harvest of 551 tons in 1982 marked the last significant observation of herring in the area.

## **Harvest Policy**

### Quota Era

The first attempt to apply regulatory harvest policies were the quotas of the 1940s. Rounsefell (1931) had recommended a number of management measures, but these went largely unheeded until fishermen were essentially unable to find herring in 1939. Herring was so depleted that even though quotas were thought to be at unacceptably low levels economically, fishermen were not even able to find sufficient herring to harvest the quotas (Figure 5.9). For a time during the 1940s it seemed as though the quotas were effective, and fishermen were able to approximately achieve the quotas. However, catches dropped precipitously to 16,114 tons in 1948, down from 41,828 tons in 1947, though the quota had actually increased to 50,000 tons that year.

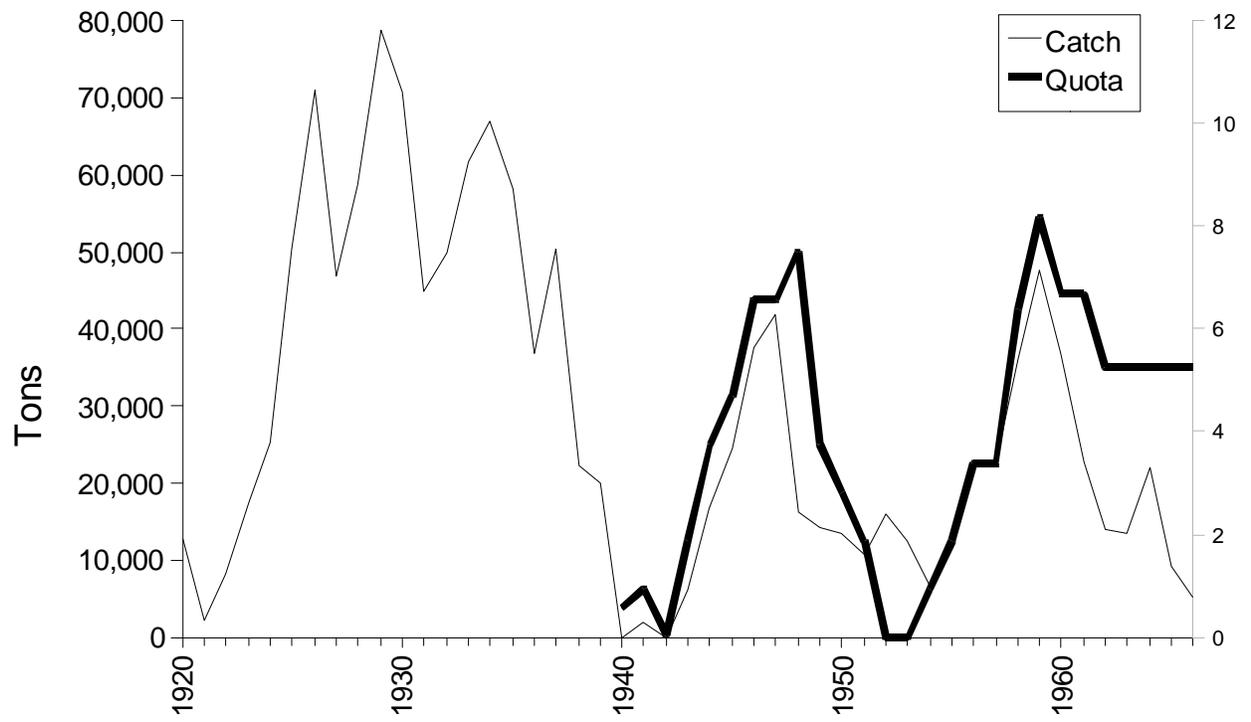


Figure 5.9. Quotas and catch for the Southeast Alaska reduction fishery, 1925-1966.

Clearly the abundance forecasting of Kolloen (1947) was not working. Catches continued to decline, but managers lowered the quotas more slowly than the catch declined. From 1948 through 1950, fishermen were not able to attain the quota. Kolloen's (1947) 40,000 ton expected yield appears to have been far from sustainable. The 1940s era of quota management appears to be generally unsuccessful. Because there was no stock assessment program to provide abundance estimates, quotas largely reflected fishing experience from the prior year, and thus dangerously lagged the population during periods of decline.

Herring catch shows a long period of more-or-less constant catch, ranging from 4,000 to 10,000 tons, from 1880 through 1918, when Killisnoo was the only operating plant. It might be argued that these harvests might have been sustainable, if the Killisnoo operation had been able to spread out its fishing effort spatially. Current Alaska fisheries, where effort is spread among the major spawning aggregations, have averaged 9,338 tons over the last 20 years, and harvests have fluctuated far less on a regional scale than during the herring reduction fishery.

#### Exploitation Rate/Threshold Era

By the early 1980s, consensus emerged among west coast herring biologists that a 20% maximum exploitation rate was appropriate for herring, and management agencies began shifting to this target. By the late 1980s, a consensus to set thresholds at 25% of the average unfished biomass also emerged. This policy was initially developed for British Columbia (Hall et al. 1988), and the rationale was extended for Alaskan herring fisheries by Zheng et al. (1993) and Funk and Rowell (1995).

In general, current Alaska herring fishery quotas are based on this framework of a variable exploitation rate combined with a threshold. The Alaska Board of Fisheries has now established in regulation a maximum exploitation rate (fraction of the spawning

population removed by the fishery) for herring of 20%. Fisheries are closed if estimated abundance falls below the threshold level. Lower exploitation rates are usually used when herring decline to near-threshold levels. In Southeast Alaska, this harvest policy is applied using a pre-determined “sliding scale,” ranging from a 10% (at threshold) to 20% maximum exploitation rate as the population expands above the threshold (Figure 5.10).

### Contemporary Abundance Estimation

Applying an exploitation rate-based harvest policy implies knowing the biomass. In some areas this meant stock assessment programs needed to be developed to estimate biomass before the harvest policy could be applied. Initially, biomass assessment techniques generated independent point estimates for each year and were of two different styles: “instantaneous” and “lagged”.

With the “instantaneous” methods, such as hydroacoustics and aerial surveys, biologists would make a field survey, estimate biomass, and quickly announce a quota based on the biomass observed. Several problems emerged from applying these rapidly-applied methods.

First, these approaches were plagued by unknown measurement errors. The precision of the estimates was usually unknown, because all survey resources were usually exhausted just to obtain a single point estimate, about which variability was unknown. In addition, the accuracy of the survey estimates was difficult to determine. Hydroacoustic measurements could be calibrated from physics theory and using caged herring, but field situations could be quite different and dynamic (Thorne and Thomas 1990; Thomas et al. 2002), and there were many unknowns. Aerial surveys were calibrated by capturing individual herring schools after surveyors had estimated their

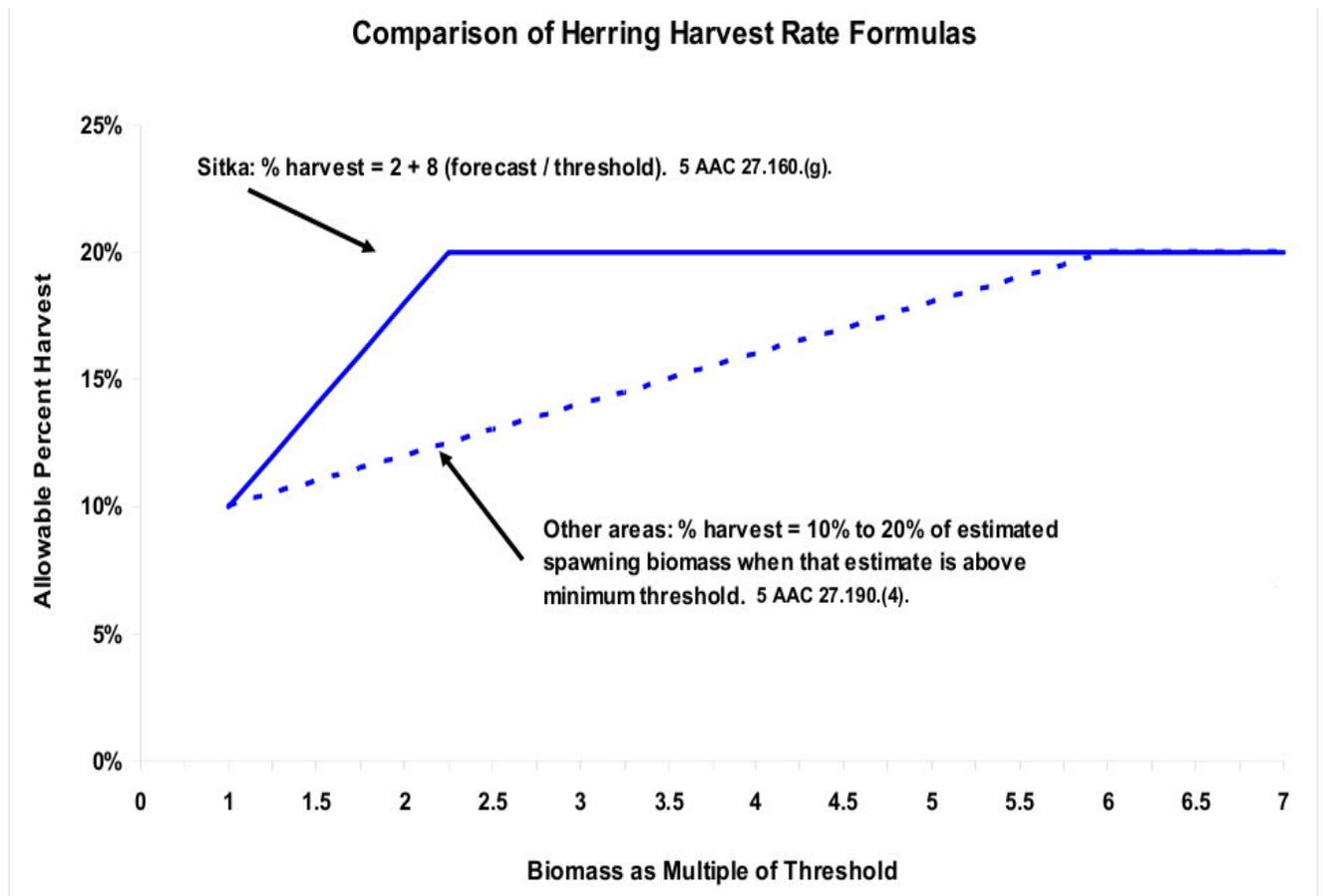


Figure 5.10. Sliding scale exploitation rate and threshold harvest policies as applied to Southeast Alaska herring (from Pritchett and Hebert 2008).

size from aircraft (Lebida and Whitmore 1985). However, large herring schools contained most of the biomass and were too large to be captured for calibration in this manner. In Southeast Alaska, the steep depth contours near shore precluded effective aerial survey estimation.

The second problem with the instantaneous estimates was processing time. Herring spawning events develop quite quickly once they move inshore, and there is little time to process data from surveys. In the 1960s and 1970s, hydroacoustic tapes had to be sent to Seattle for decoding to estimate abundance. Aerial survey data take time to process and calibration estimates were usually done post-season.

“Lagged” estimates were applied when biomass estimates had to be applied to the following year's fishery. These estimates occurred when it either took too long to process stock assessment survey data to apply to the current year fishery, or the surveys took place after the fishery, such as spawn deposition surveys. Spawn deposition surveys estimate the number of eggs deposited by spawning herring, using vegetation-style quadrat sampling of a subsample of the spawning beaches, usually using a two-stage survey design. Estimates of fecundity from a separate sampling program are then applied to estimate the number of females which had deposited the eggs.

Both “instantaneous” and simple “lagged” types of abundance estimates were completely independent every year. In recent years, age-structured stock assessment models (Funk and Sandone 1990; Quinn and Deriso 1999) have been used to produce abundance estimates using all available data, from current and past years combined. These models mathematically project herring cohorts through time, and treat abundance estimates and age composition samples as estimates of the unknown underlying population. In this way the models can incorporate measurement error, so that a single year's “outlier” estimate will not cause inappropriate exploitation to occur. Underlying these models is the assumption that population processes remain constant from year to

year. Usually, this means that the process of natural mortality is constant through time, among other processes. These models are very commonly applied for fisheries where both abundance and age composition estimates are available, such as for Pacific herring.

Run timing is another problem encountered in herring abundance estimation with some methods. Aerial surveys or hydroacoustic surveys of inshore, pre-spawning herring face the problem of “spawning waves” of herring that sometimes overlap, but sometimes may be separated by several days to several weeks (Hay 1985; Ware and Tanasichuck 1989). With the degree of overlap on successive counting days not known, fishery managers usually resort to using “peak” biomass estimates, which should be a conservative estimate to the extent that early-arriving or late-arriving herring would not be included in the estimate. This simplistic approach was somewhat reminiscent of that taken by early salmon managers with the “White Act” of 1924 which required that fishing be closed after the estimated midpoint of the salmon run (Cooley 1963, in Royce 1989). Salmon managers face the same problems in enumerating salmon escapements from aerial stream surveys, where they have developed “area under the curve” techniques and residence-time estimates to derive escapements for the entire run (Nielson and Geen 1981, Bue et al. 1998; Parken et al. 2003). Herring managers have not formalized this approach to overlapped abundance estimates, although some estimates of residence time have emerged from genetics studies (McPherson et al. 2003). Spawn deposition surveys are not prone to the run-timing estimation problem, because the surveys can usually be delayed until all herring spawning has been completed.

### Spatial Units for Management

Most contemporary herring fisheries in Alaska are regulated by management units delineated around geographically distinct spawning aggregations. These aggregations may occupy areas as small as several miles of beach or as large as all of

Prince William Sound, depending on the history of spawning patterns in the area. Management of winter bait fisheries is more complex because herring from several management units could be mixed together at that time of year. Managers strive to avoid that situation, but where it occurs, such as at Dutch Harbor, Alaska Board of Fisheries regulations usually allocate percentages of allowable harvest to each fishery.

Genetic techniques are not useful for managing herring, because there is considerable annual straying such that genetics are only distinguishable on fairly large scales. For example, Carls et al. (2008) noted that Southeast Alaska herring could barely be distinguished from Prince William Sound herring based on genetics alone. Because of the likelihood of local depletions, fishery managers must operate on a much smaller spatial scale.

#### Other Regulatory Controls

The Alaska Board of Fisheries also enacts regulations that control the types and amounts of fishing gear that may be used, allocates the allowable harvest among user groups, and determines the range of dates allowed for fisheries. The Alaska Department of Fish and Game determines the exact opening and closing times each season. For sac roe fisheries, openings are timed to occur when herring have produced the maximum amount of roe, based on inseason sampling. The duration of openings is also set to achieve harvest quotas as closely as possible. Entry into most herring fisheries in Alaska has been limited under the authority of the Commercial Fisheries Entry Commission (CFEC).

### **Ecosystem Considerations**

#### Influences of Climate on Herring Abundance

The abundance of a herring year class is thought to be determined early in its history. By the time that herring are susceptible to fishing gear and easily studied, it is thought that survival processes are fairly constant, except for rare cases such as the recent disease outbreaks in Prince William Sound. Herring year classes are tremendously variable in strength, ranging over three orders of magnitude. Environmental conditions in the first year of life likely explain much of the variability, though predation could also be important, as well as coupling between environment and predation.

Sitka Sound herring populations have been found to be correlated with sea surface temperatures and an index of upwelling (Zebdi and Collie 1995). Williams and Quinn (2000) performed the most extensive study to date of environmental effects on herring populations. Their study examined Pacific herring from the Bering Sea to British Columbia and found that temperatures (air and sea surface) during the year of spawning were the best predictor of herring abundance. However, herring abundance still varies widely independent of temperature, so there remains much variability to be explained. Williams and Quinn (2000) note that the temperature correlations in their study likely act as a proxy for some other, as yet undetermined, mechanism that is itself correlated with temperature.

### Influence of Industrial Whaling

A brief flurry of commercial whaling occurred in Southeast Alaska from 1907 through 1923 that may have had considerable impact on herring populations. The Tyee Whaling Company established a whaling station in Alaska at Murder Cove on Admiralty Island in 1907 and operated until 1913. At the time, the Southeast Alaska inside waters were viewed as "unexploited" for whales. The Tyee Whaling Company had the first American-built steam-powered whale chaser, the 97-foot "Tyee Junior," whose

equipment included a harpoon gun on the bow (Marsh and Cobb 1910). A declining catch and the sinking of the company's gas-powered schooner by a wounded whale ended its operations. As early as 1909 the catch had fallen well below expectation, even though the firm seems to have employed a flotilla of small vessels made over as chaser boats.

The United States Whaling Company opened a shore station at Port Armstrong in 1912 and continued operations there until 1923 when it shifted operations to New Zealand. Kirchoff (1990) notes that from 1912 to 1922, nearly 1,600 whales were processed at Port Armstrong.

Whale harvests are reported by year in the annual “fisheries and fur seal” reports. However, after 1913 it is not possible to separate the Southeast Alaska portion of the whale harvests from that of the shore plant at Akutan. The annual reports show that the United States Whaling Company at Port Armstrong continued to operate the same three catcher vessels (Star I, II, III) through 1918, so there should be some continuity to the Southeast Alaska portion of the harvests before and after the Akutan operations began. Southeast Alaska whale harvests were about 200 whales per year (Figure 5.11) from 1909 to 1913, and likely of a similar order of magnitude from 1914 through 1918. Interestingly, humpback whale harvests show a decline after 1915, which could possibly indicate some depletion.

It is likely that the removal of the large number of whales had considerable impact on the marine ecosystem of Southeast Alaska. Recent studies have shown the importance of top-down predation effects elsewhere in the North Pacific and the far-reaching effects of industrial whaling (Springer et al. 2003). One possible effect of the large whale removals would have been a dramatic increase in herring. The whale removals initially came from southern Chatham Strait, and later from Cape Ommaney and offshore of southern Baranof Island, which are the same areas as the reduction fisheries later utilized for herring. A recent model of humpback whale consumption has

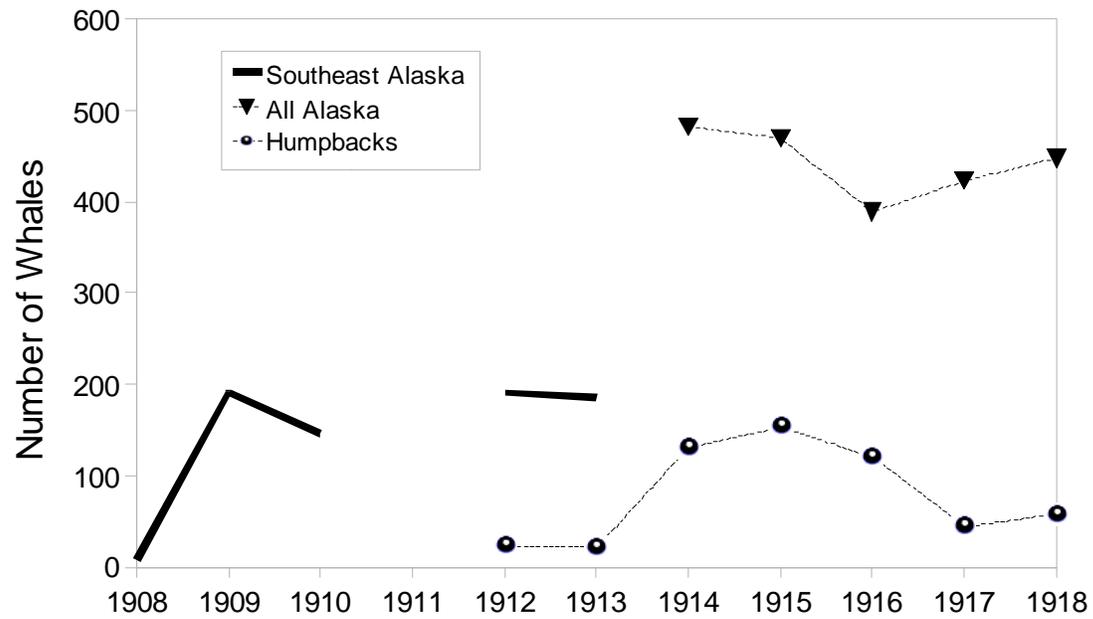


Figure 5.11. Alaska shore-based whaling harvests, 1908-1918.

demonstrated that commercial whaling removals near Kodiak likely released 10,000 tons of prey annually (Witteveen et al. 2006).

The hypothesis is proposed here that the industrial whaling removals from Chatham Strait in 1907-23 allowed an unusual bubble of herring abundance to occur that attracted and enabled the rapid growth of the herring reduction industry in Southeast Alaska. The large harvests of the 1920s were greater than that to be expected from “fishing up” alone. The bubble of abundance burst dramatically from overfishing as commercial herring fleets far more than replaced the herring removals by whales. The population explosion of herring during the 1920s is even more remarkable considering that some herring spawning groups (Kootznahoo and Seymour Canal) had already been lost to overfishing by the Killisnoo plant and salt-cure industries.

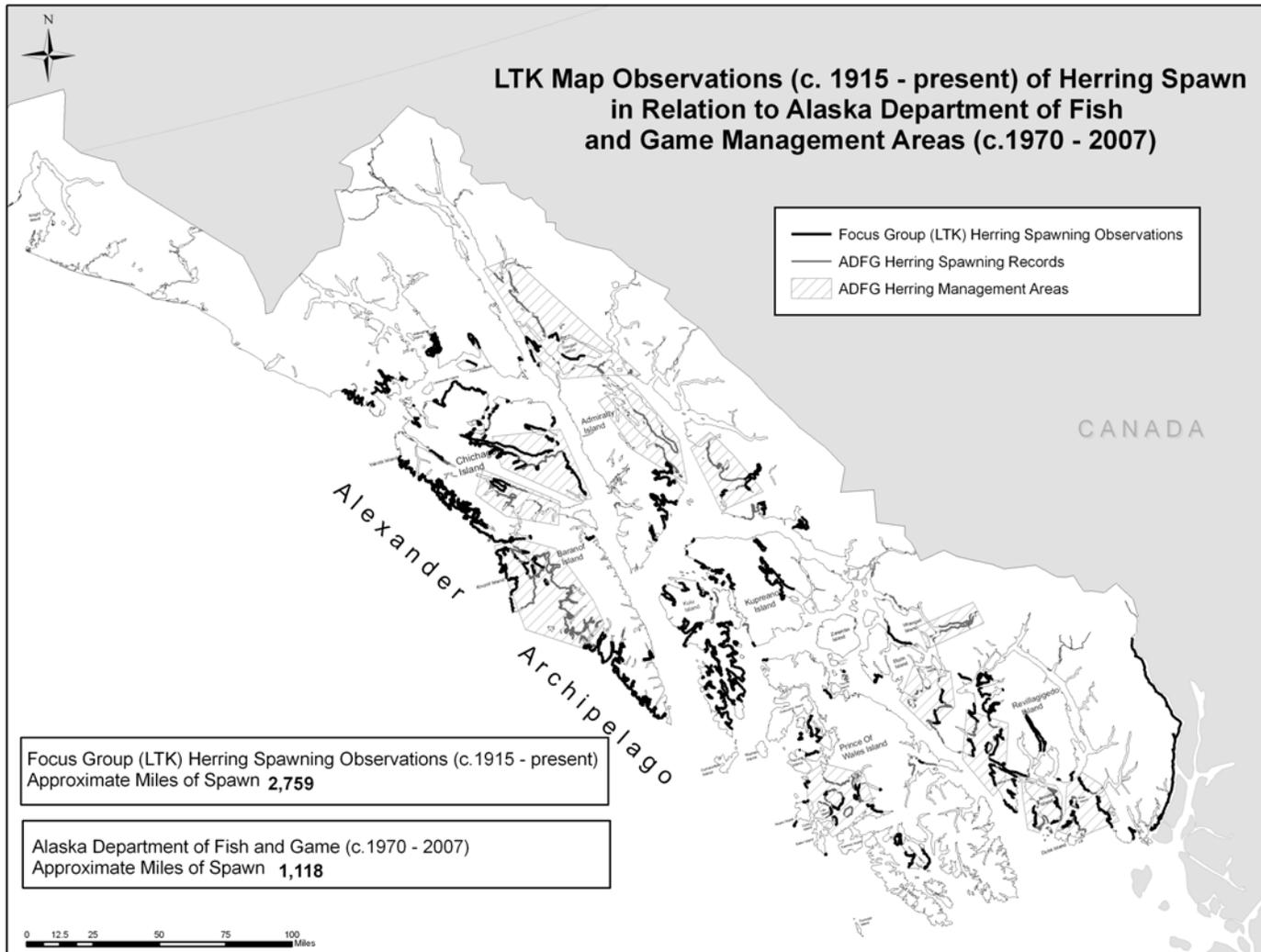
## **VI. LOCAL AND TRADITIONAL ECOLOGICAL KNOWLEDGE: HERRING SPAWNING AND MASSING OBSERVATIONS<sup>1</sup>**

As part of this project, semi-structured, qualitative interviews were conducted with Alaska Natives, commercial fishermen, sport fishermen and local residents. Both individual and focus group interview formats were utilized. A total of 86 individuals were interviewed. During these interviews, participants were asked a number of questions regarding the local and traditional knowledge of herring behavior and ecology, including observations regarding both past and present herring spawning and massing areas (see Appendix C). Each interview session was recorded, transcribed and then submitted for review to the interviewee; this process was not comprehensive however, due to time and funding restraints, and the resultant maps should be considered a work in progress. In addition to these audio recordings, participants were invited to identify and mark herring spawning locations on maps provided by the interviewer, though not all participants chose to utilize these maps.

The resultant interview data were integrated into a Geographic Information System (GIS) using both line and point representation. First, participant observations of herring spawning locations recorded on the maps made available at each interview session, were manually integrated into the GIS and overlaid with a Southeast Alaska baselayer that allowed each observation to be identified with the corresponding section of coastline (see Map 3: LTK Map Observations of Herring Spawn in Relation to Alaska Department of Fish and Game Herring Management Areas). Using a previously georeferenced digital image of herring spawn recorded by the Alaska Department of Fish and Game (ADFG) (Pritchett, personal communication 2007), it was possible to calculate and compare the temporally aggregated (c.1915 – present) total miles of spawn

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<sup>1</sup> Primary authors: Jamie Hebert, Portland State University and Thomas F. Thornton., Portland State University and Environmental Change Institute, School of Geography and Environment, University of Oxford.

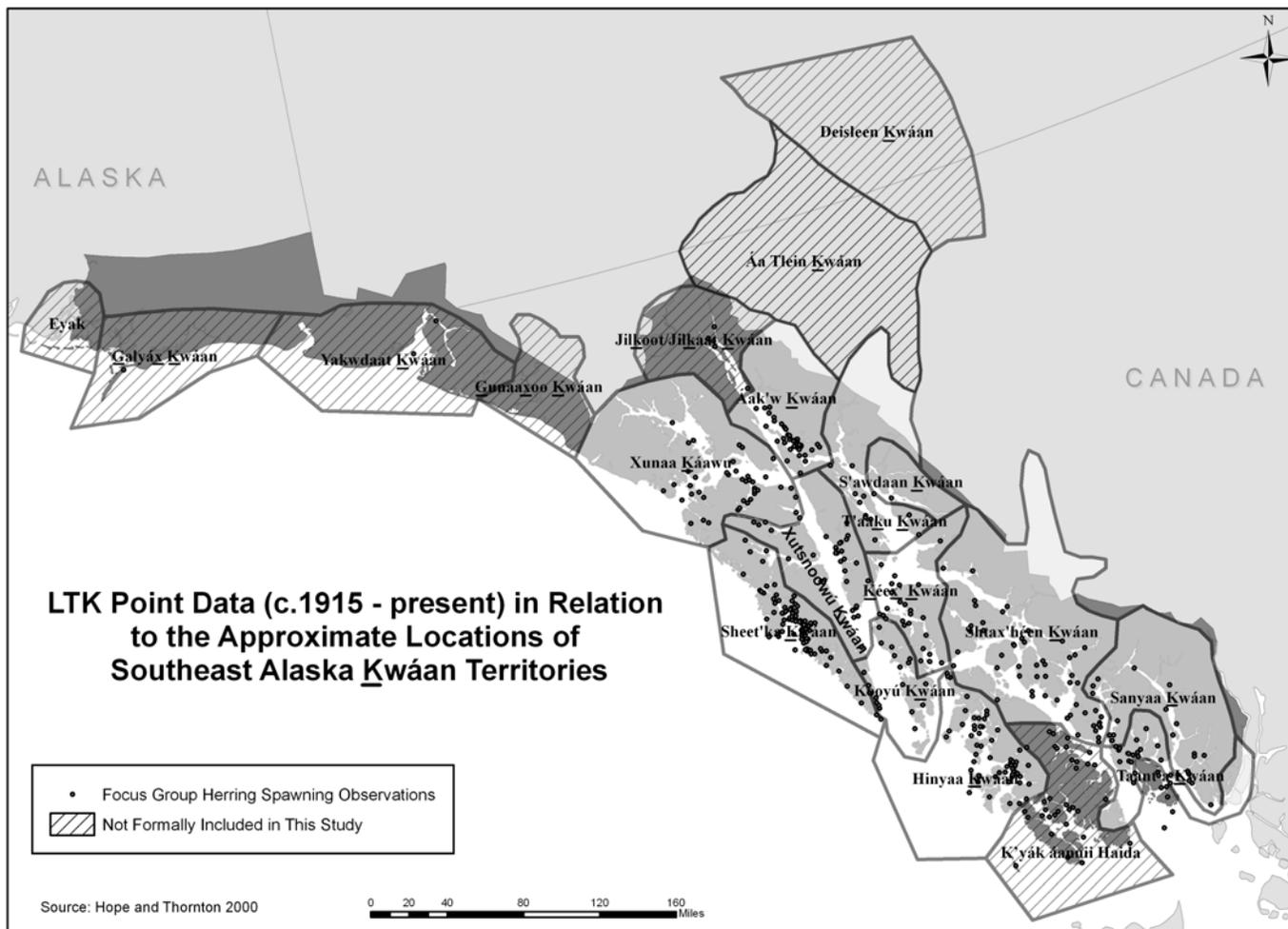


Map 3. LTK Map Observations of Herring Spawn in Relation to Alaska Department of Fish and Game Herring Management Areas

identified by both our interview participants (2,759 miles) in relation to the miles of spawn documented by ADFG (1,118 miles).

Second, because not all interview participants identified herring spawning and massing areas on the maps, and because 117 unpublished interviews were also analyzed as part of this project, point locations of herring spawning and massing were extracted from interview transcripts and entered into a Microsoft Access database with associated latitude and longitude coordinates (see Map 4: Herring Spawning and Massing Observations (Overview Map)). These coordinates were then imported into the GIS software as point locations. Using a georeferenced digital image of kwáan areas (Hope and Thornton 2000), these point locations were then identified and grouped by the kwáan territory in which the herring observation was made. Each point location may have one or more observations of herring spawning and massing associated with it. The following sections are the results of this data conversion. Together these data can be matched against other environmental records, such as historical and prehistorical herring catches, climate variation, boat traffic (Appendix F), whale activity, and so on.

In eliciting, verifying, and synthesizing herring observations, we tried to gain as much detail as possible about space (location) and time. However, not all observations are situated precisely. We also identify themes in the observation data, such as comments on predation, to facilitate analysis. However, it is beyond the scope of the present study to comprehensively analyze all the observations collected against other historical and environmental sources. This synthesis and identification of themes is a baseline from which we propose to continue this analysis in the next phase of research, building on the present GIS mapping and database framework developed for this project.



Map 4. LTK Herring Spawning and Massing Observations (Overview Map)

### **Sanyaa and Taant'a Kwáans: Saxman/Ketchikan/Cape Fox**

Sanyaa Kwáan begins in the south at Cape Fox on the mainland, including Fox Island. It continues north to encompass a portion of the Misty Fjords National Monument, including Boca de Quadra, West Behm Canal and continues north to the headwaters of the Unuk River. It expands westward toward the Cleveland Peninsula but stops at Spacious Bay bending south to include Betton Island yet excluding George and Carroll Inlets and Thorne Arm. We conducted one focus group in Ketchikan in March of 2008. Additional individual interviews were completed in March 2008 and April 2009. Twelve people were interviewed altogether.

The Taant'a Kwáan territory includes a portion of the southern region of Prince of Wales Island, continues north to encompass Gravina Island and continues northeast onto Revillagigedo Island to include George and Carroll Inlets and Thorne Arm. It again, bends southward to include the Revillagigedo Channel and then north again to include the eastern banks of the Portland Canal.

The Tongass, or Taant'a, Kwáan adopted their name from their original home, Prince of Wales Island (Tàan, “Sea Lion”). The name was applied due to the prevalence of sea lions along the western shores of the island and at Forrester Island, Southeast Alaska’s largest sea lion rookery. The group was largely displaced from Prince of Wales Island, however, by the Kaigani Haida, who colonized the southern portion of the island in the past two centuries. As a result, the Tongass Tribe, as they are also known, began moving eastward, first to Annette Island (now Tsimshian territory), where they established villages at Port Chester and Tamgas Bay (Ch'èix' Àani, “Thimbleberry Town”), and then to Tongass Island (Taagwaas') in Portland Canal, where they settled at Kadúk xuka (“On the Cottonwood”), and finally to Ketchikan (Kichxáan) on Revillagigedo Island, where they are centered today (Emmons n.d.).

The Alaska Department of Fish and Game (ADFG) currently manages two separate commercial herring fisheries that fall within the Sanyaa and Taant'a Kwáan territories: West Behm Canal and Revilla Channel.

The first of these, the West Behm Canal (Section 1-E and 1-F) has operated as a sac roe and bait pound fishery since 2003. The fishing schedule alternates between gillnet and purse seine gear when herring threshold levels are met. Clover Passage and Tongass Narrows remain closed. The bait pound fishery is allocated 10% of the GHL for the West Behm spawning population. Threshold was not met in 2005 and there has been no commercial fishery opening since then (ADFG 2009b). The first ADFG records of herring spawning activity in the West Behm Canal began in 1976 and have continued nearly every year through 2009. Nautical miles of spawn documented during this same time period (1976 – 2009) ranges from zero nautical miles to approximately 21 nautical miles (Marc Pritchett, personal communication 2007). No commercial fishery has occurred here since 2006 because the spawning biomass is well below the threshold level of 5,000 tons.

The second ADFG commercial fishery included in the Sanyaa and Tannt'a Kwáan territories is the Revilla Channel (Section 1-F). Previously referred to as the Kah Shakes/Cat Island fishery, the area had supported a gillnet sac roe fishery since 1976 and a winter food and bait fishery. Herring spawn estimates did not meet threshold levels in 1990 and the sac roe fishery did not open. In 1992, ADFG passed emergency regulations to expand the sac roe fishing area to include both Kah Shakes and Cat Island. To reflect these changes, the management area has been renamed the Revilla Channel. Concerned with the negative impacts of the sac roe fishery at Kah Shakes/Cat Island, in 1993, the Ketchikan Herring Action Group filed a court case protesting the expansion of the Kah Shakes/Cat Island management area, collected testimony from local residents describing

the depletion of the herring stock at Ketchikan and Annette Island. The Group was joined in their efforts by the Indians at Metlakatla but the case was dismissed by the courts due to lack of scientific evidence and ADFG was found to have acted within the acceptable parameters of fishery management (Rauwolf 2006). Herring spawn estimates did not meet ADFG threshold levels in 1999 and herring levels have continued to fall below threshold and a sac roe fishery has not opened in Revilla Channel since that time.

The following is a list of locations within the Sanyaa and Taant'a Kwáan territories that were identified as notable herring spawning and massing areas during individual interviews and focus group interviews conducted during this synthesis project and in previously documented research efforts:

Badger Bay, Behm Canal, Betton Island, Blank Inlet, Blank Islands, Boca de Quadra, California Head, Carroll Inlet, Cat Island, City Float, Clover Pass, Foggy Bay, Fox Island, George Inlet, Gravina Island, Herring Cove, Kah Shakes, Ketchikan Harbor, Knudsen Cove, Loring Cannery, Lucky Cove, Mary Island, Mountain Point, Point McCartey, Sargent Bay, Saxman Village, Spacious Bay, Thomas Basin, Thorne Arm, Thorne Bay, Tongass Narrows, Totem Bight, Walker Cove, Ward Cove, Weasel Cove, Wistanley Island, Yes Bay/Why Bay.

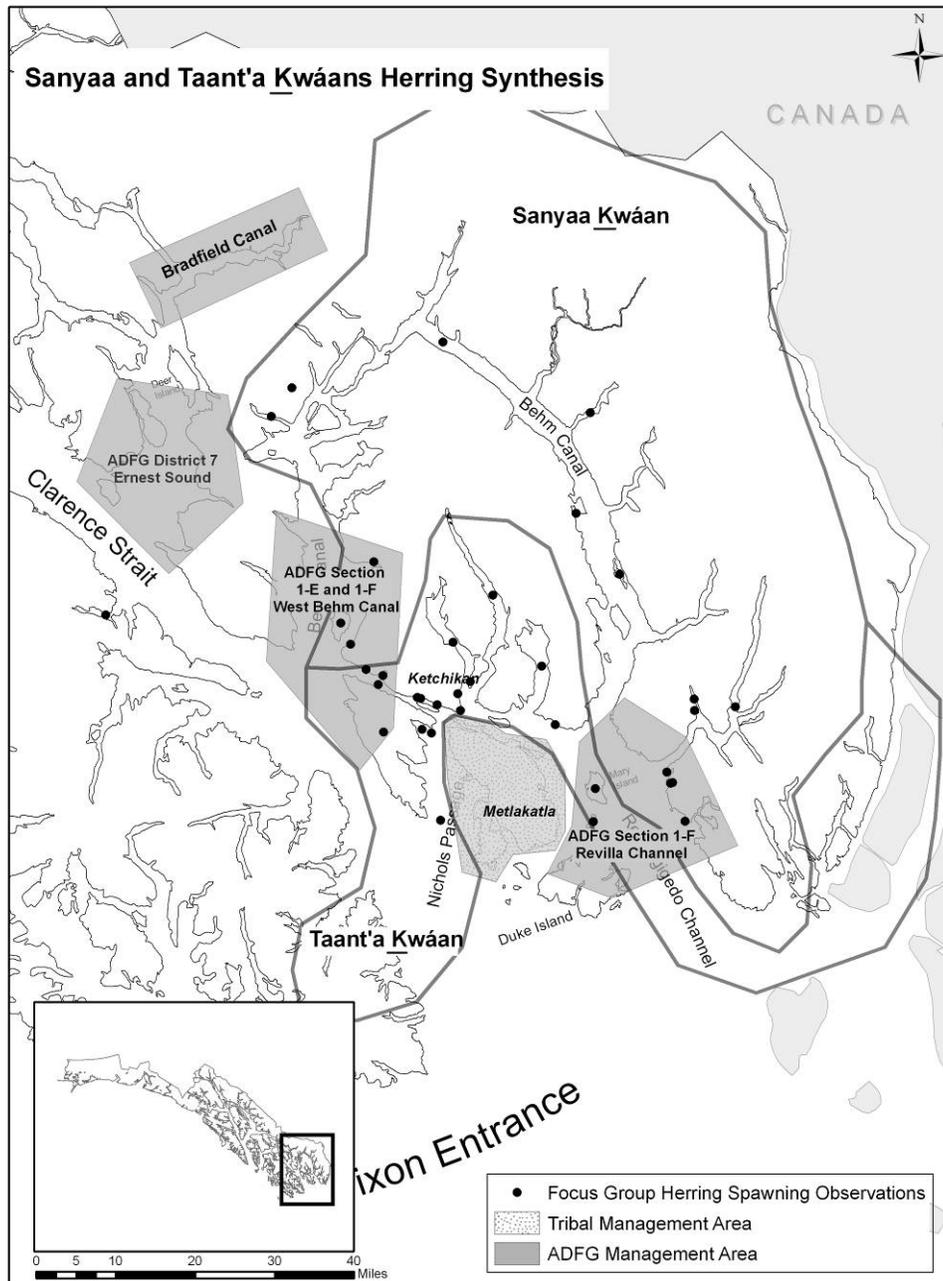


Figure 6.1: Overview of Herring Spawning Areas and LTK Observation in Sanyaa and Taant'a Kwáans

## **Regional Comments**

In those years [past 23 years] herring stocks were plentiful around Duke Island area, Cape Chacon, George Inlet, Carroll Inlet, Behm Canal, Quadra and Revillagegado Channel in front of Ketchikan. For the bait fishery the herring fishermen were able to meet their herring needs in the Revilla Channel right in front of the City of Ketchikan. (Arnold Ludwigsen, 1993)

I can remember massive herring schools in Tongass Narrows from Saxman Village to Ward Cove, Alaska and in bays and inlets throughout the Behm Canal. They started to slowly disappear until today [1993] they are gone. (Glenn L. Lervick, 1993)

Used to have very heavy spawning area from Kah Shakes to the mouth of Boca De Quada to the mouth of Smeaton Bay going up West Behm Canal. (Franklin James, Sr.)

I also fished the other end of Behm Canal [in the 1940s and 1950s]. Herring were spawning all the way from Pt. Alva to and through Princess Bay. Another area of heavy spawn was Sargent Bay. Beyond that, I couldn't say as that area was closed to trolling. I tried Kah Shakes several times as it was the site of heavy population of herring spawning all the way through Foggy Bay, but could never find many king salmon that would bite. (Ben Fleenor, 1993)

There were masses of herring schooling up around Thomas Basin, Ward Cove, Knudsen Cove, George and Carroll Inlets, and at most points along the inside passage. ... Not long after starting the egg harvest and sac roe fishery, I noticed a

decided decline in the quantity of herring in those same places, that we had seen the masses before. ... One is hard pressed to find a herring in any of the former locations. (Joe R. Hassell, 1993)

### **Badger Bay**

Martin Perez, Sr. commented on the presence of herring at Badger Bay:

The first bay—Badger Bay and Weasel Cove [had herring spawn]. (Martin Perez, Sr.)

### **Behm Canal**

West Behm Canal was identified as both a herring spawning area but also as a location where commercial herring seining occurred.

... I was looking at this here. Loring there is already marked off, but it used to spawn all over the place in Behm Canal. Not just there, it would be all over up in here. (Arthur Kennedy)

Fifty miles of spawn they had down in Behm Canal, couple, either two or three years go, and then the next year they figured they were going to have a fishery and the herring never showed. ... What goes on in that Ketchikan area, the herring move around so much. They don't come back to the same spot like they do in Sitka. (Nels Otness)

Well, we fished [herring seining]—what do you call it? West Behm Canal? (Leonard Skeek)

### **Betton Island**

Herring spawn was identified at Betton Island:

They have herring spawns around Betton Island: herring bait fishery in and around that Ketchikan has decreased the herring and the herring spawns are small... (Franklin James, Sr., 2007)

Lawrence “Snapper” Carson viewed the location as a herring spawn ‘sanctuary’ of sorts:

This is Betton Island and Clover Island is inside it. It’s not on here. But that’s Betton Island right there. This herring, actually, if we could, they spawned here last year and this herring will never be fished. If the Department ever does open it, it will be from outsiders. So this is kind of a, I hate to say the word sanctuary, but maybe it’s kind of a sanctuary for these herring. I think they’ll use the numbers if they ever come back. But they won’t fish in there. (Lawrence “Snapper” Carson)

### **Blank Inlet**

A decline in herring population in Blank Inlet was noted by Jonathan Dewitt:

More recently, on March 17, 1993, I went sports fishing at Blank Inlet. It was pretty dead out there, no sea gulls, no herring, and no fish. There was a time I could go out fishing at any time of the year and catch fish, well that is not the case anymore. I'm lucky if I can catch a fish at all. Each year I catch less and less fish, the reason, there are no herring for the fish to feed on. (Jonathan Dewitt, 1993)

### **Blank Islands**

Herring spawn at Blank Island was identified by Franklin James, Sr.:

Franklin: Ok, right here is Gravina and this is Blank Island and that’s where she was spawning.

Interviewer: All around it?

Franklin: Mmhm. That’s, right along the shore here. (Franklin James, Sr.)

### **Boca de Quadra**

Boca de Quadra has been used by the Natives for trolling and purse seining. In 1946 it was noted that “Boca de Quadra is now little used by the Native people because, according to statements made by witnesses, the fish traps in the area have reduced the opportunity of catching fish” (Goldschmidt and Haas 1998: 80). Martin Perez, Sr, of Ketchikan remarked on the presence of herring in Boca de Quadra in the past:

Quadra was another big place for herring. (Martin Perez, Sr.)

### **California Head**

Martin Perez, Sr. identified California Head as a herring spawning location:

Used to spawn at Mountain Point and across in California Head. Used to be a big spawn there. (Marin Perez, Sr.)

### **Carroll Inlet**

Carroll Inlet was identified as both a herring spawn location and as a location that herring bait fishermen utilized (see Regional Comments, Arnold Ludwigsen and Joe R. Hassell).

George Inlet, Carroll Inlet and Thorne Arm also had sizeable populations of spawning herring, these exist no longer. (Ben Fleenor, 1993)

I remember the herring bait fishermen taking what they needed in Ward Cove and reading about how they moved into George Inlet, Carol [sic] Inlet, and Thorne Arm as the herring stocks diminished. (Thomas B. Ramiskey, 1993)

They [bait] fished very little in George and Carroll [in the past]. (Sonner Murphy)

### **Cat Island**

The Tongass Natives once had a village on Cat Island that was occupied until the late nineteenth century (Goldschmidt and Haas 1998:83).

And they fished Cat Island for five or six years and all the sudden there was no herring at Cat Island, see? So then they says, “Well, the herring swam over the Metlakatla.” Well, during all this period of time, they were fishing at Metlakatla and they had their own herring biologist and they were harvesting at a lot smaller rate than what the Alaska Department of Fish and Game was doing, see? So, you know, they’ll sit there and tell you, “Those herring move.” (Ralph Guthrie)

### **City Float**

City Float, outside of Ketchikan, was once abundant with herring according to Joe R. Hassell:

I recall very vividly the huge, unlimited schools of herring around the docks, log booms, and the boils out in the straits. From a skiff, we used a herring rake to catch herring for bait. It was a grand extension of my earlier years, upon arriving in Ketchikan in 1949, to see that the same conditions existed here, as the abundant salmon fishing and huge herring population was extremely impressive in the Ketchikan area. In the early 50s, we put up our own herring in salt, and froze some as well. The herring were plentiful, and one could select any size desired. There were no problems obtaining as many as one could use, with a hoop-net, from the docks and floats around the entire area. The cold storage put up frozen bait each year, which were caught by seining, in front of town. (Joe R. Hassell, 1993)

### **Clover Pass**

(See Gravina Island: Dennis Diamond)

## **Foggy Bay**

Foggy Bay once supported herring spawn:

Well what the Fish and Game says, and this is where you can look at it and if you ask them this question, you know, they say it's all one stock of herring in Southeast Alaska. Well, that's bullshit. You know, that's just pure bullshit. And a good example is down on the Foggy Bay shore. They fished there for 15 years and all the sudden there was no fish on Foggy Bay. Well, the guys found some herring at Cat Island. Well, they never had to look Cat Island for fish, see? So what the Fish and Game says is, "Well, the herring moved over to Cat Island." (Ralph Guthrie)

Foggy Bay, you know. That much [several inches thick] spawn all over. (Martin Perez, Sr.)

## **George Inlet**

Many consultants identified herring in George Inlet (see also, Regional Comments, Arnold Ludwigsen, Joe Hassell; Carroll Inlet, Sonner Murphy, Ben Fleenor, and Thomas B. Ramiskey):

Used to seine at Buggy's Beach [near Ketchikan] and all around, clean up into George Inlet, Carroll Inlet ... (Martin Perez, Sr.)

## **Gravina Island**

Gravina Island was once the location of smokehouses owned by the Wolf Clan. The Natives once used Bostwick Inlet as a place to dry fish and meat and gather berries (Goldschmidt and Haas, 1998:83).

I'm kinda the young one here. But I know what I've seen in my time, when we used to sport fish. You know, knowing all the herring that used to be around in Clover Pass

and Camino shoreline and Gravina, all that in there, you just don't see them like you used to. (Dennis Diamond)

And it's like Dennis said, when you see what's happening out there you know, you sit out there on the fishing grounds, sport fish, troll for cohos, kings, like I've done all my life here and, 40 years of it anyway. And all the sudden now you have to watch out for your trolling because of the whales. I used to never seen and now all the sudden I go out there and I sit anywhere outside of Gravina, no matter where I'm at, I can be anywhere, I don't care, they're everywhere. (Lloyd Gossman)

And so when I was a kid, a teenager, they used to spawn on the outside here, Gravina, and then Ham Island was solid, Canary (??) Islands, all the way to Kah Shakes Cove. Now there's nothing. Just spot spawn, very little, spot spawning. ... And the right here in Gravina there seem, you can see very little spot spawn there and some spot spawns here ... ...around Gravina Island the herring spawns are very small due to the over harvesting of herring bait fishery around Ketchikan area. They have stopped the herring bait fishery in the area for over 30+ years and the herring are making a slow comeback. (Franklin James, Sr.)

### **Herring Cove**

According to Mike Fleenor, Herring Cove was named for the large amounts of herring in the location:

This name [herring cove] was given to our area because there were herring galore up to recent years. (Mike Fleenor, 1993)

Many consultants noticed a considerable decline in herring populations at Herring Cove:

I grew up in Herring Cove. While growing up I would fish in my 8' punt for king salmon in front of our home. In the first part of April the herring would show up in huge schools. (Andy Rauwolf)

It has been my observation that in these last few years we have not had this abundance of herring showing up, and wanted to voice opinion on the current problem because in recent years there has not been any herring showing up. (Zelma Brand, 1993)

We used to get them out there at. ... Herring Cove. (Owen James)

I saw evidence of spawn by Herring Cove there too. (Eric Jordan)

### **Ketchikan Harbor**

Many local residents commented on the decline of herring in Ketchikan Harbor:

When I first got to town I went to work on a shrimper (Ionamay) I was amazed at the large schools of herring that I saw. I had never seen anything like it. (Dan McQueen, 1993)

For the past years, there has been a noticeable decline in the number of herring locally but last year it was shocking not to see a single herring. ... The herring in our inside waters are gone, along with the sea life that fed upon them. It might be possible to bring them back, but until more study can be done, it seems imperative that we save the herring that are left in other areas. (Elizabeth Chambers, 1993)

I was born and raised in Ketchikan. In the years I was growing up - herring were abundant in the harbor every year. Sadly - this is no longer the case. (Maxine Mason, 1993)

The herring have disappeared almost entirely from our inside waters. (Mike Fleenor, 1993)

In the early years of my residency in SE Alaska - namely Ketchikan, I observed areas of herring spawn a foot deep in the City Float location and along adjacent beaches...today to my knowledge it's difficult to find spawn, if at all. (Roman S. Keleske, 1993)

Growing up in the 40s and 50s in the Ketchikan area, I have seen the depletion of the herring at a high level and I fear the biologists and people involved in the management of the sac-roe herring fishery haven't the foggiest idea what, when, and where the herring stock were at that era. (Jerry Germain, 1993)

Now, regarding the herring population in Southeast. When we first moved here, the bay in front of town would be full of the little critters. I remember Andy Gunderson and Spike Murphy BOTH fill up their fish holds right in front of the old Cold Storage dock. I was a kid when I helped unload those boats. Nowadays, a person can't find enough to pickle for personal use. I still fly everyday and have a hard time finding spawn or herring as it used to be. (Herman Kudwigsen, 1993)

As the herring fisheries was [sic] reopened after the herring reduction plants were closed I heard warnings from some concerned fishermen. I remembered these concerns and made it a point to watch these traditional spawning areas for any signs

of change. It took years but then I started noticing a change for the worse. Years later some areas totally died out. Some of these areas were not even remotely close to a herring fish opening area. I moved to Cordova in 1991 but the decline of spawn and the number of spawning areas prior to moving has been very dramatic to say the least, if not down right scary. There is something very wrong and even potentially dangerous going on with the herring populations in Southeast Alaska for me to be witnessing these dramatic changes. This situation needs immediate attention. (David Werner, 2007)

In areas around Juneau, Petersburg, Wrangell and Ketchikan there was [sic] several really good populations of herring that have gone below this healthy level, and they have been held down, and do not have the opportunity to bloom when conditions are good. (James Parker, 1993)

Things no longer seen: Kids fishing herring off the dock. (Dennis Mann, 1993)

I remember when the bays [around Ketchikan] were full of Herring [sic] from December on throughout the summer months. (Matilda Kushnick, 1993)

You know, people don't believe that you'd go on to cold storage docks in Ketchikan when the herring was spawning and there'd be herring spawn all over. Well, they weren't good to eat you know, because they tasted oily, you know. And whether that herring materialized out of it or not, nobody really knows. But they spawned, they used to spawn everywhere, you know. ... Oh, you know, come to think of if I've seen herring and they, already, when I grewed up the herring started to decline. But still, I

can remember the whole bay here, Ketchikan Narrows flooded with herring. Now you don't see any. They used to spawn all over the piling. (Martin Perez, Sr.)

Dick: The gillnet fisheries just cleaned everything out, especially from Ketchikan ... It was in the wintertime ... Early 1960s.

Interviewer: And when did that start? When did that change happen, that they came in there and...?

Dick: See, it was in the early 60s. ...

Interviewer: Yeah, that sounds about right. That's when they started up those winter bait fisheries. (Dick Stokes)

### **Kah Shakes Cove**

Many commented on the once plentiful herring at Kah Shakes Cove. The area was once a viable sac roe fishery, but has remained closed to commercial fishing since 1998 (see additional comments: Behm Canal, Ben Fleenor).

I remember when we fished down there at Kah Shakes. The first time I fished down there was '72, we power-trolled down there for king salmon ... And we'd go down there and we just had a flasher fathom meter on there and it wouldn't even work because the whole thing would just turn red from all the herring. It was just incredible. (Dennis Diamond)

As Kah Shakes area stocks steadily declined from 1981 until present, the stocks in the channel and adjacent waterways declined also and collapsed with Kah Shakes. (Andy Rauwolf, 1996)

We flew it and they had a little tiny spawn going off at Thorne Bay that was trying to come back at Kah Shakes and they needed 6,000 tons, they only had like 3,200 tons estimate at Cat Island so they couldn't open it. So they went over and they factored in this little spawn at Kah Shakes. Probably three fourths of the fleet at least, we took pictures of it, went over there and they sat on this little spawn about the size of, less than the size of this main building here. I mean it was wall-to-wall nets. And there's never been a herring spawn there since. That was the end of it, cut-and-dry. They caught every fish that was there. That was it. They wiped it out. And that was management that did that. (Andy Rauwolf)

When we used to fly Kah Shakes when it was down there you would be four miles away and you could see the milky water. And then it would go up and down the beach for ten miles and it would go offshore probably a half a mile and then about '91 it was half of what it was. '92 it was a quarter of what it was. '93 it wasn't there. So where it went who knows? I mean it just... The problem is now we're supporting a whole bunch of whales we didn't have before. (Steve Schrum)

The statement that you have a rapidly declining population in Lynn Canal is not true. Herring are not like salmon. You can't tell the status of herring by where they spawn. Herring can spawn in an area, depart from that area, and maybe not come back at all, but that's not to say the population is in decline. For example the Kah Shakes herring population that supported a fishery simply left that area. Those fish do not spawn by Boca De Quadra, but is not viewed that the herring are going extinct. They went across to Revilla channel, and spawned near Annette Island, and other areas. The Seymour Canal population has spawned in Hobart Bay and around Gambier Bay. It's a feature that herring move around. It's not biologically correct to measure the

spawning biomass and say that's a measure of stock status of the herring. There's not a shortage of herring in the summer period. There's not the research effort to determine the status of these herring populations. It's almost impossible to open a coho that's not full of herring, and there's lots of whales feeding on them. There's not an indication that there's a trend outside of the unreliable indicator of the spawning area that there's a decline in the herring population. Analysis is always suspect when going back and using a baseline of a high population in a specific spawning area. (Jev Shelton, 2007)

And then we moved here and then we used to go out by Kah Shakes and get the eggs there. We can't anymore. They closed the area off. (Matilda Kushnick)

Not too long ago they wiped out Kah Shakes. About five years ago, my Uncle Art and I were over there at Cat Island. We went over to get some fish eggs there. The whole place was loaded with herring. While we were waiting for Aaron to put some branches out so we could see if we could get some fish eggs on them. They had an opening there for four hours. You could see herring jumping everywhere. All the gillnetters came in there and just came in four hours later and they were all gone, tenders were all gone, boats were all gone, and we only see one herring jump after that. And then they can't figure out what's happening to the herring. (Marvin Charles, Sr.)

We started off, ok, when I first started fishing here [in 1971], we had seven areas to fish. We had Helm Bay, Kasaan Bay, Kah Shakes, Sitka, Lisianski Inlet...I believe we had a little bit at Tenakee—no, no—Seymour Canal, and Juneau. And through my

part of fishing these things, we've lost every area with the exception of Sitka. (Charlie Skultka)

Kah Shakes is past tense. And so they asked this guy, when you're fishing herring around Kah Shakes, does the herring move? And these guys are talking. I asked this old Indian guy. "Yep, they move." We've been arguing like everything for a long time. We should have asked him. He says, "Wait. You didn't let me finish. They move in boxes to Japan." ... They move by boxes to Japan. They didn't move to Cat Island. The ones that were Cat Island were always going there. They just wiped out Kah Shakes there. Kah Shakes was there for hundreds and hundreds of years, maybe thousands, but when they started fishing it out they just wiped it out. They never moved. We tried to prove that to them in court. (Franklin James, Sr.)

And so when I was a kid, a teenager, they used to spawn on the outside here, Gravina, and then Ham Island was solid, Canary (??) Islands, all the way to Kah Shakes Cove. Now there's nothing. Just spot spawn, very little, spot spawning. ... I can tell you this is ... Kah Shakes ... It used to be so thick there. They wiped that out on gillnet fishing. Just killed it dead. That's the Kah Shakes area ... Kah Shakes Island and the areas around there was over fished by sac roe herring fishermen and there are no spawns in that area, just like Ketchikan. (Franklin James, Sr.)

Then on the mainland Kah Shakes Cove used to have a big spawning. (Martin Perez, Sr.)

### **Knudsen Cove**

See Regional Comments, Joe R. Hassel.

### **Loring**

According to Martin Perez, Sr., a herring pound was once in operation at Loring:

There's a little island there below Loring, kind of a bay, and then they had a pot [also known as a herring pound] in there. And they had so much herring in there that when you dropped anchor there, fishing for, maybe I won't say years after, but when you pulled your anchor, you couldn't stand the smell of rotten herring from the bottom. They did a lot of things like that. People didn't take into consideration what was going on. (Martin Perez, Sr.)

### **Lucky Cove**

Martin Perez, Sr. identified herring spawn at Lucky Cove:

Oh they used to spawn Ham Island, and across Lucky Cove. (Martin Perez, Sr.)

### **Mary Island**

Juanita Perez remembers herring at Mary Island:

Well, we used to anchor in there when we were trolling: Marys Island. You remember it used to be just white with eggs . ... Mary Island had all them eagles there when we anchored in there them few days at night. (Juanita Perez)

### **Mountain Point**

Mountain Point was identified as a herring spawning location (see additional comment: California Head, Martin Perez, Sr.).

As an ardent king salmon fisherman, early April was always an exciting time of year. That was when the huge masses of herring would flood Mountain Point, with the king salmon in hot pursuit. We never got skunked in those days. (Andy Rauwolf)

But you know you look at Mountain Point. In our history, the longest—I moved here when I first came from Academy School—came here in, moved here in 57—never had seen a spawn at Mountain Point yet it spawned there last year. (Franklin James, Sr.)

### **Point McCartney**

Point McCartney is no longer a useable herring roe subsistence area according to Owen James:

And also back around the other side of McCartney, Point McCartney too ... Used to get a lot back in there too until after the—can't harvest any there now because of the logging camp that was there for quite some time too. (Owen James)

Leonard Skeek described the herring boats he saw at Point McCartney:

Well, the herring get—we used to see plenty of once in a while the herring boats used to come out that way. It was about at Port McCartney and Cape Bendel, Turnabout Island. (Leonard Skeek)

### **Sargent Bay**

Martin Perez, Sr. remembered herring spawn at Sargent Bay:

Then there used to be another big spawn—I was just a young guy, a kid then. Sargent Bay in Behm Canal. ... Big spawn there, yeah. I remember when I was a little guy, I see all the killer whales used to come up in their spawn time, you know. You don't see no spawn up there any more. (Martin Perez, Sr.)

### **Saxman Village**

See Regional Comment, Glenn L. Lervick.

### **Spacious Bay**

Spacious Bay was described as a location that winter bait fishermen utilized:

Another place that's interesting—I just looked this up because there was several years after that, the bait fishery opened in October and we were in North Behm Canal and there was a school of herring up off the Unik River and there was Porter, the same fellow that fished up here, he found them in Spacious Bay, and they were up shallow. And he made this huge set. And we loaded, well there was 240 tons. (Lawrence “Snapper” Carson)

[Referring to bait fishermen] Came all the way from Spacious Bay. Ward Cove produced a lot of herring in the winter before the pulp mill came. They caught fish in Kasaan. There was Skowl Arm. (Sonner Murphy)

### **Thomas Basin**

Thomas Basin was once so full of herring that they could be scooped up in a net or a bucket (see Regional Comment, Joe R. Hassell).

Well, when it was--this herring right here, this whole channel, during the winter months you can go right into Thomas Basin and if you want herring you just go on the dock and dip and you got a big net full. That was all the time into the later part of the 50s. (Franklin James, Sr.)

They come into Thomas Basin you could catch them with a bucket in Thomas Basin. (Martin Perez, Sr.)

### **Thorne Arm**

See additional comments: Carroll Inlet, Thomas B. Ramiskey, and Ben Fleenor.

## **Thorne Bay**

Sonny Campbell remarked on herring massing at Thorne Bay:

I remember thinking at the time, how can there be so many fish in the ocean. I would stand on the dock and watch in awe as this huge blanket of Herring [sic], around the docks and in the bay, moved below me [at Thorne Bay]. (Sonny Campbell, 1993)

## **Tongass Narrows**

Many comments were made regarding the decline in herring populations in Tongass Narrows:

There used to be a fishery right out in Tongass Narrows. There used to be a winter bait fishery going on right out there. I mean everybody would be sitting around the docks watching them pull 'em aboard. ... Years ago in the 40s there was a train wreck. [In the] 30s and 40s ... they fished the herring hard and they died off. And, of course, they put them through the fertilizer plants and everything. Then, within just a short time after that, the salmon died off. That was pretty hard pickings there to find a good load of fish in those years in the late 40s and 50s. I mean you just didn't find that many. They started coming back and they did make a recovery, but now they're going back down again. And the biomass out there in Tongass Narrows was huge. I mean, it would boggle your eyes. You could sit there and a company [boat] would come in and those doggone herring would go to the bottom the docks in city float and those areas and the floats and stuff would just sit there and shake buckle up, there were just so many herring going down heading in the same direction. And you don't see that anymore. In fact, you're lucky if you sit down and you see two or three swimming together and I'm really concerned because the Fish and Game are sitting back and telling us, 'Well, they're just swimming to a different area now that's why they're not at Cat Island or not here or not there anymore. They're biomassing

somewhere else.' Well, if you ... nailing those biomasses, pretty soon there isn't anything left to swim anywhere else. And all you're going to have is little pockets here and there and that's what's happening now because of the predator situation and the commercial fishing situation. Because they're not [Fish and Game], they're not using good sense. (Ken Kiffer)

The bulk of the [bait] fishery was Tongass Narrows. From Coastguard base to Ward Cove. (Sonner Murphy)

Sonner, just as a question, the last time I really remember them being that thick in Tongass Narrows was around '70-'71. Does that sound about right to you? I remember '68, '69 the whole channel was just filled. 1970-71, that was not the case. That was when I first started to work construction back then, about 1970. I was working right there on the waterfront, you could see that there was a tremendous difference in numbers. But 70-71 is when the Narrows just all the sudden it didn't seem like there wasn't. ... (Lloyd Gossman)

On April 1, 1981, we returned home from work to see the glassy waters in front of our home overlooking Tongass Narrows just north of Saxman flipping with herring as far up and down the channel as you could see. We jigged up several gallons for pickling and bait. That was one of the last big herring runs I saw in the channel. The following year a smaller amount came in and we caught a few. After that, we saw no more large schools. (Andy Rauwolf)

Upon arriving in Ketchikan, I believe that what impressed me the most was the life that I observed while being on the water or watching from the beach. Tongass

Narrows was really alive not too many years ago! There were thousands of gulls and diving ducks, hundreds of eagles soaring overhead, and herds of sealions during the winter when great masses of herring flooded the narrows! (Thomas B. Ramiskey, 1993).

It used to be at any time of year the bays, inlets and the Tongass Narrows were filled with schools of herring. I used to see school after school of herring on my fish finder, that was just five years ago, now I don't see any herring to speak of. I used it to do a lot of King Salmon [sic] fishing, but haven't done so in the last five years because there's no herring. I use to do very well fishing for kings in the late fall and winter. (Jonathan Dewitt, 1993)

I can remember massive herring schools in Tonagass Narrows from Saxman Village to Ward Cove, Alaska and in bays and inlets throughout the Behm Canal. They started to slowly disappear until today [1993] they are gone. I have become increasingly aware of this situation the last four years especially this fall and winter 1992-1993. I work and live on the waterfront and I have never seen the Narrows like this, almost sterile not even a minnow of any kind. (Glenn L. Lervick, 1993)

Also, the feeder King salmon [sic] we used to fish in Tongass Narrows, during the winter months, declined at the same time. In my opinion, that fact is not coincidental. The decline of the King salmon simply declined due to the lack of their feed, the herring. (Joe R. Hassell, 1993)

Usually—they used to spawn the whole channel in here in 1958: the whole channel, Tongass Narrows. (Arthur Kennedy)

### **Totem Bight**

Juanita Perez remembered herring at Totem Bight:

Even right down here too at Totem Bight. The rocks there were white [with herring eggs]. (Juanita Perez)

### **Walker Cove**

Walker Cove belongs to the Teikweidí Clan and is used by the Native people for trolling and seine fishing (Goldschmidt and Haas 1998:81). Martin Perez, Sr. identified a small herring spawn that once occurred in this location:

And there was a small spawn up in Walker Cove: mouth of Walker Cove. (Martin Perez, Sr.)

### **Ward Cove**

Consultants commented on herring populations in Ward Cove during the winter (see Regional Comment, Joe Hassell, Glenn L. Lervick and Carroll Inlet, Thomas B. Ramiskey):

Now, I live right here [Ward Cove] and there was some fairly good spawn here last year. I was pretty happy with it. There's a Native family spot in the middle out here and I've kinda watched that bait this winter and it laid right on the bottom there. They're just starting to move now. I think it probably was the same fish that spawned here last year, you know, in that area. (Lawrence "Snapper" Carson)

There was still herring in there [Ward Cove] in the wintertime in the '70s. ... Well, there was a little spawn like right around where Steve's got his hangar. But I haven't seen a spawn in there. I might have missed it. (Dennis Diamond)

Interviewer: Yeah, I've seen some photos of herring in by the dock there. How about out in Ward Cove too? ...

Burt: Mmhm.

(Burt Cosgrove)

Well, I fished around Ketchikan for bait herring. That was back in the 70s, but that was just for the cold storage plants there. ... No, right in Tongass Narrows. There's a lot of herring out by the pulp mill. They'd lay underneath log rafts. So at dark we'd go out there, wait around, they'd come out from beneath those log rafts and make our set. ... by the log storage. And I only did that for about a couple times and then that little quota that they had there, it was just what the cold storage plants would put up for their bait herring. (Bob Kirkman)

Well, the herring population now is just a drop compared to what it used to be. We had herring all through here, all through the—so far south, we went through herring: schools and schools of herring in my young days. Even as far down as—I fished down, way down, all the way down to Washington, Oregon. But the herring up in this country all the way down into Hecate Straits—that's Canadian waters—all the way up to above Juneau and all over. I remember when there was schools and schools of herring. Now we don't see that any more. ... First they were blaming the Indians because they set branches out you know, for the spawn. But that wasn't so. They just then discovered that fishing for the fertilizer. And we had fertilizer plant in Ketchikan at one time. (Martin Perez, Sr.)

The pulp mill in Ward Cove was identified as a possible factor in herring population decline:

Ward Cove produced a lot of herring in the winter before the pulp mill came. ...

During the bait fishery, the whole time up through the '40s, in early '50s there was tons and tons of herring. They didn't have reduction plants down here. There was a reduction plant in Ward Cove. They tried herring a couple times. No amount of tonnage. But when the pulp mill in fact hurt the herring a lot. The bay was full of herring when the pulp mill was built, and for quite a few years, you go in there and anybody that works on those tugboats. In the middle of the night you reach down in the water to disconnect a raft and there was dead herring all the way up to your shoulder. What they do, I think they, they weren't poisoned but the water was so polluted that when the herring pushed, up, the top ones suffocated from all the nasty. (Sonner Murphy)

They were dumping seven known carcinogens in the bay there [Ward Cove]. I went through all that stuff. It was really... And one of the, when they released you know that stuff at night, that was the same thing that we used in WWI and WWII as a chemical warfare agent: phosphogen. That shit. Yeah, we used to hook up to, just like you were saying. We hated it. Putting our arms in that stuff. And if you fell overboard you just ripped all your clothes off and threw them away. (Tom Copeland)

### **Weasel Cove**

Martin Perez, Sr. described a herring pound in Weasel Cove:

The first bay—Badger Bay and Weasel Cove. ... Weasel Cove. The reason I remember Weasel Cove, they had a herring pot [also known as a herring pound]. (Martin Perez, Sr.)

### **Winstanley Island**

Winstanley Island once supported a herring spawning population:

Far up Behm Canal is Winstanley Island [herring spawned there]. (Martin Perez, Sr.)

### **Yes Bay/Why Bay**

Yes Bay was once the site of both a village and then in later years, smokehouses and a cannery (Goldschmidt and Haas 1998:82). Alva Peratrovich commented on a past, failed attempt to open Yes Bay as a herring gillnet fishery:

This one, Why Bay, Yes Bay, or Why Bay over here was one of the first herring roe/gillnet. When they first opened it, I had a permit ... But it didn't pan out. [i.e., they closed the fishery]. (Alva Peratrovich)

### Predation

Many factors have been identified as the cause of herring population decline (commercial fishing, pollution, etc.). In addition to these place-specific observations, there were consultants who identified changes in herring predator behaviors and populations (halibut, salmon, sea lions, seals, seabirds, whales, etc.) that may be affecting herring populations in and around Sheet'ka Kwáan. Herring are described as an integral part of the marine food chain, a keystone species:

Herring are close to the bottom of the food chain. A lot of wildlife and sealife depend on them for survival. We do too. (Litzi Botello, 1993)

[Herring] is very important. Most all mammals and birds need food. Our wildlife, mammals, fish and birds need herring for food. (Ray Ford, 1993)

[T]he preservation of herring is extremely important in the food chain and its destruction will wreak havoc with all species. (Roman S. Keleske, 1993)

Today there is no herring gulls, sea lions, salmon or other sea live [sic] that indicates Herring [sic] are still in the area. (Matilda Kushnik, 1993)

[S]almon, cod, rockfish and endless other species dependant upon the herring for feed. No feed-no fish! (Robert C. Lewis, 1993)

Upon arriving in Ketchikan, I believe that what impressed me the most was the life that I observed while being on the water or watching from the beach. Tongass Narrows was really alive not too many years ago! There were thousands of gulls and diving ducks, hundreds of eagles soaring overhead, and herds of sea lions during the winter when great masses of herring flooded the narrows! (Thomas B. Ramiskey, 1993)

I was amazed at the abundant wildlife in and on the ocean. Huge flocks of seabirds could be seen working on schools of herring - the species on the bottom of the food chain. (Rochelle L. Rollenhagen, 1993)

One of the worst (by impact) is the devastation of the herring stocks. The effects impact all facets of the fish and wildlife in the area. It has reduced the eagle population by forcing them into the role of total scavengers, instead of abundant hunters (especially during the nesting cycle). Other mink, seals, sea lions, whales and the fish of the area are some of the other creatures which have been gravely affected by the loss of herring. (Charles H. Zieske, 1993)

The winter kings are all gone. There's not the sea lions, birds or herons or many more predators that once was here. The waters were alive with food (herring) and now the sea is dead. (Mike Fleenor, 1993)

Salmon slicing through seals and sea lions churning up the water while from above, eagles were diving and grabbing claw full of herring which would just squirt out and fall back into the boiling mass of silver herring below. (Dan McQueen, 1993)

Some consultants blame the salmon hatchery for the declining herring populations because they see the salmon feeding on juvenile herring (see the Life Cycle section for more on this):

[O]ver grazing by hatchery salmonoids[sic] , has disrupted the lower segments of the ocean food chain. (Chris Chavasse, 1993)

It's like Andy said too, and this one thing that, that really tops the vine with me, is when the Neets Bay Hatchery for instance. They put all their eggs up there, there's all these dogs [salmon]. They say dogs don't eat herring well they're full of shit. They do. And they eat lots of them. Nobody ever planned on all that mass of fish coming back through. And I think that's got a lot to do with it too, you know, because when those fish come back, they come back in serious numbers and we never had those before. (Dennis Diamond)

Salmon were identified as a predator species highly dependant upon healthy herring stocks:

Also, the feeder King salmon we used to fish in Tongass Narrows, during the winter months, declined at the same time. In my opinion, that fact is not coincidental. The decline of the King salmon simply declined due to the lack of their feed, the herring. (Joe R. Hassell, 1993)

And you know how I learned all that is whenever there was any herring, and in them days there was fishing grounds. There was salmon. And I learned all the little nooks

and corners from my dad. Spawning, whenever there was herring there was fish.  
(Martin Perez, Sr.)

It was customary to catch halibut and all kinds of bottom fish plus salmon right in the channel in front of Ketchikan which is now impossible as the fish are depleted and I feel this is because of the absence of herring on which they fed. (Arnold Ludwigsen)

Some salmon fishermen noted the lack of herring in the stomachs of the salmon they caught, evidence that the salmon are feeding on alternate fish species:

As we cleaned our catch [of salmon] we patiently checked each fish stomach for Herring [sic]. None!! Not one! (Sonny Campbell, 1993)

The salmon that we caught did not have any herring in their stomachs and it was in all of our conversations that this was indeed disturbing. ... The herring in our inside waters are gone, along with the sea life that fed upon them. (Elizabeth Chambers, 1993)

As of now salmon catches reveal very little, if any, herring in the stomach of salmon.  
(Arnold Ludwigsen, 1993)

[There has been a] decrease noted by many other groups that catch salmon and examine entrails and find no herring. (Merek E. Mura, 1993)

Last year [1992] I didn't catch but 1 or maybe 2 salmon (of all species) that had any herring in them ... For the last 4 years 99% of the Coho I caught in August - September were full of salmon fry. (Dan McQueen, 1993)

My husband, son and I have sport fished this winter a few hours/week for 3 months. We caught one king salmon albeit a 37# [lb.?] one. It had a baby skate in its stomach. There is no winter king commercial fishing here anymore - there isn't any feed. If you want to make some money you have to go "outside" where there are some herring left. (Andrea L. Hernandez, 1993)

Rising populations of species that prey on herring were a concern:

We have a predator population on the rise, a fish and game budget cut to the core, and no commercial fishery on the stock. (Scott File, 2007)

The number of predators that are feeding on the group have increased. (Nick Yurko, 2007)

There are other existing problems, marine mammals are increasing the pressure on the herring stocks at this time. Because of our laws this cannot be changed. If we have the feed the whales and sea lions, we can't afford to kill any herring stocks until the other problems have been addressed. (Terry Wills, 1993)

And I tell you what, we have a hell of a predator problem out there and Tom's right. I don't see it to be, you know, the commercial fishery in my mind, yeah it definitely put a dent in it, but we got something else going on out there now. Because you can take the Quadra fishery down here, here it hasn't happened how many years? You don't see that coming back at all. What you see is, everywhere you go you see sea lions, seals by the hundreds and these humpback whales? We never seen humpback whales in here like we've seen before. (Dennis Diamond)

Rising populations of whales were often quoted as a herring depletion factor:

Well [the whales] they are [increasing], I know when I fished with dad in the late 40s and early 50s, it was exciting to see a whale. Because you hardly ever saw a whale. You saw more killer whales than you saw whales. And orcas, there was more of those around then there was big, big whales. But I go out now fishing and if you don't see 8-10 whales a day you're slipping because you're not watching out, because there's that many out there. They're all over the place. (Keith Kiffer)

...If you watch all these 'Nature Nazi Channels' they, they say all these whales head over to Hawaii or California in the wintertime. That's false. That's very false. There might be a handful go ...but the majority of them stay right here. (Dennis Diamond)

And it's like Dennis said, when you see what's happening out there you know, you sit out there on the fishing grounds, sport fish, troll for cohos, kings, like I've done all my life here and, 40 years of it anyway. And all the sudden now you have to watch out for your trolling because of the whales. I used to never seen and now all the sudden I go out there and I sit anywhere outside of Gravina, no matter where I'm at, I can be anywhere, I don't care, they're everywhere. (Lloyd Gossman)

Some consultants noted changes in seals, sea lion, and seabird populations:

And another thing we got going on right now, and I don't know, Andy, you probably seen this, I know Tom, you've seen it, we've all been—I work at the Coast guard base down the road here. But all winter right out in front of the Coast guard base there's been this flock of probably at least 300 loons. And I've worked here 20 years, I've never seen these things before. And they're out there in the channel all winter, they never left, and they'll dive. There'll be a couple of them that stay on the surface and the whole flock of them dives. And they're going down and what they're doing is they're eating on all these firecracker herring because I know because I see them in

the summer time come in along the dock there. You don't see the big herring. When I started here 20 years ago it was all big herring down there off the coast guard base. You don't see that anymore. It's all these little herring. You think about that flock of birds diving on those-it's not only that, there's been a whole bunch of sea lions been out there all winter too-but we got a serious predator problem. (Dennis Diamond)

It was pretty dead out there, no sea gulls, no herring, and no fish. (Johnathan Dewitt, 1993)

I have counted as many as 150 sea lions feeding in this same area. (Ben Fleenor, 1993)

The seals are so skinny. We used to get enough grease from one seal. Now we have to get two, three seals to get five gallons of grease. (Matilda Kushnik)

I have observed two sea lions this fall and winter [1993] - one in December and one in March, where in the not to [sic] distant past you would see hundreds. I have also noted fewer sea ducks. The winter King Salmon are all but gone from this area also. (Glenn L. Lervick, 1993)

I have had no recent sightings of sea lions who used to feed on the herring. ... (Arnold Ludwigsen, 1993)

There are almost no nesting eagles; in fact, the eagle population is probably 20% or less of what there was when I first moved herre. The fish eating bird population is way down, river otter are disappearing. (Sylvia Geraghty, 1993)

I remember sighting whales and schools of porpoise in groups of fifty to one hundred. I remember see these same sights in Dixon Entrance, Clarence Straits, Ernest Sound, Sumner Strait, Frederick Sound, Stephens Passage, Lynn Canal, Icy Straits, Chatam [sic] Straits, and Sitka Sound.... Today, it is possible to drive a boat a hundred miles and rarely see more than a handful of birds, a few seals, an occasional sea lion or two, a few porpoise, and an odd whale or two. (Thomas B. Ramiskey, 1993)

During Feb - March 1993 I have not located any herring anywhere I have traveled, nor have I caught any fish, salmon, rock bass, snapper, halibut, or Ling cod that had a herring in its belly. I did see some sea lions feeding on the surface but when I got close I saw they were feeding on a cod fish of some type. What attracted me to this was the birds flying and diving but they were only feeding on scraps of cod fish. But in 3 days of cruising around these were the only active birds I saw and there weren't but 15 or 20 of these little gulls and one eagle flew out and got one of them. ... (Dan McQueen, 1993)

### **Hinyaa Kwáan: Craig/Klawock/Hydaburg**

Hinyaa territory stretches along the Pacific Coast shoreline of Prince of Wales Island, the largest island of the Alexander Archipelago, from Point Baker in the north to Meares Passage in the south. It includes all of the islands along the coast including everything between Kosciusko and Suemez Islands (Langdon 1977). The territory extends inland to encompass El Capitan Pass, Tuxekan Pass and Klawock Inlet. We interviewed in Craig and Klawock during June of 2008. One focus group was scheduled but attended by only two individuals due to a funeral for a prominent elder being arranged on the same evening. Eight people were interviewed altogether, including one man from Hydaburg.

Otherwise separate interviews were not conducted in Hydaburg, in part due to the recent release of a LTK report on herring spawning in Hydaburg by Anne Marie Victor-Howe (2008).

Both Tlingit and Haida Indians have occupied the Hinyaa territory for thousands of years. Archaeological evidence at Chuck Lake on Hecata Island dates human occupation back at least 9,000 years (Davis in Victor-Howe 2008). Prior to the northward expansion of the Haida, there were three Tlingit settlements on Prince of Wales Island: Shakan, Tuxekan and Klawock. When the Kaigani Haida Indians migrated from Langara Island, of the Queen Charlotte Islands in British Columbia, they established settlements on Long, Sukkwan, Dall and Prince of Wales Islands (Victor-Howe 2008), possibly utilizing already present Tlingit seasonal campsites, before establishing the first permanent Haida settlement at Kaigani in the mid-1700s (Langdon 1977). In 1911, the Kaigani from Howkan, Klinkwan, Sukwan and Koianglas relocated to Hydaburg as part of a consolidation agreement with the US government.

Herring are the first fresh fish to arrive in spring and herring spawn on *Macrocystis* kelp is both a delicacy to be consumed by family, shared with friends, and traded for such items as eulachon grease, dried salmon, dried halibut. Historically the herring roe was harvested from *Macrocystis* kelp beds and dried and stored in bentwood boxes. Today, salting and freezing methods, as well as improved transportation have made fresh herring spawn on kelp a desirable trade item (Victor-Howe 2008).

The first herring spawning events were recorded in Tlingit oral history. Fish Egg Island “has been an important herring spawn-on-kelp harvest location for the Tlingit and the Kaigani Haida for nearly a century” (Langdon in Victor-Howe 2008: 36). The island features prominently in the oral history, and is named for the whiteness created by the spawning activity each spring (Sháan Dàa, or “White Island”). The Craig Alaska Native

Village Corporation, Shaan Séet (“White Strait”), is named for the Strait by Fish Egg Island, which would also turn white with herring spawn during the spring run. Olson (1967:79) documents an oral historical account of a March raid by Chilkats from Klukwan on encampment of “some three or four hundred people” at Sháan Dàa, in which “nearly 200 of the campers were killed and about 40 women were captured.” The following year, “the same Chilkat clans raided again...[and] found the Klawak people gathering herring eggs at the same place. There was a big ceremony going on.”

The local encampment, as with the large spring encampments at Sitka Sound, likely included egg harvesters from multiple clans and settlements. Indeed, Langdon suggests (pers. comm.. 17 June 2010):

Shaan Daa was important not only for herring spawn and fish collection but also sea lion harvest as they followed the herring to the area and were harvested by Tlingits (testimony of William Demmert Sr.). In addition, following introduction of potatoes, Shaan Daa became the central gardening site of the Klawock Hinyaa people. Huge gardens were located on it. Oral traditions of both Tlingit and Haida indicate that kelp with remnant spawn were particularly prized as fertilizer. The kelp was dragged up and placed on the soil at the time of planting. I have ... a photo showing a portion of the Shaan Daa site which is enormous and quite precisely arranged in a linear manner, almost implying community planning of some kind.

Site history - Haida use of the island and the point where the cannery in Craig was/is located was apparently established as a settlement of some dispute between the groups. I have attached [see below] a picture of the cannery point site with the Haida seasonal structures and herring drying racks apparent. My Tlingit sources always assert that Haidas could use the site but did not own it. This is differen[t] from another Haida site out on Noyes Island about which there

is no Tlingit oral tradition establishing Haida use through some type of agreement or arrangement. Shaan Daa is also referred to in John Sturgis' journal as the site from which a group of Tlingits visiting Kaigani came from.

The following are additional historical spawning places identified by participants in Victor-Howe's, 2008 Technical Paper No. 225 *Subsistence Harvests and Trade of Pacific Herring Spawn on Macrocystis Kelp in Hydaburg, Alaska*: Dunbar Inlet, McFarland Islands, Corlies Islands, Fish Egg Island, the Craig/Klawock area, Mears Island, Jackson Passage, Blanket Island, Sukkwan Island, Jumbo Island, Shipwreck Point, and an area between Island Bay and Dunbar Inlet

The Alaska Department of Fish and Game (ADFG) have managed a small portion (Section 3-B) of the Hinyaa K̄wáan, Klawock Territory as both a winter food and bait fishery since the 1960s and as a spring, herring spawn-on-kelp in pounds fishery since 1992 (see Figure 1). Currently, 85% of the guideline harvest levels (GHL) are allocated for the bait fishery and the remaining 15% is allocated toward herring the spawn-on-kelp fishery. We interviewed bait fisherman with knowledge of Hinyaa K̄wáan herring spawn in other communities, such as Petersburg and Sitka.

The first ADFG records of spawning activity began in 1957 and continued through 1971. Further records are not available until 1988 and continue to the present 2008 herring spawning season. According to this documentation, the first major spawning event occurs near the end of March and continues through mid-April. Nautical miles of spawn documented during this same time period (1957 – 2008) ranges from one nautical mile to nearly 32 nautical miles

ADFG identifies the following as “traditional” spawning locations in the 2008 Southeast Alaska Herring Spawn-On-Kelp Management Plan: Fish Egg, Wadleigh, Clam

and Abbess Islands. Spawn has also been documented in Portillo Channel, Port Real Marina, San Fernando Island, San Juan Bautista Island, Blanquizal Island, San Christoval Channel and Shinaku Inlet.

The following is a list of locations within the Hinyaa territory that were identified as notable herring spawning and massing areas during individual interviews and focus group interviews conducted during this synthesis project and in previous research efforts:

Abbess Island, Alberto Islands, (Bartolome) Baker Island, Clam Island, Craig/Klawock, Eagle Island, Edna Bay, Fern Point, Fish Egg Island, Fox Island (Belanny Islands), Graveyard (Pitt) Island, Klawock River, Klawock Harbor, Kosciusko Island, Marble Island, Meares Passage, Noyes Island, Point Baker, Port Protection, Portillo Channel, Prince of Wales Island, Rocky Cove, San Fernando Island, San Juan Bautista Island, St. Joseph Island, Steamboat Bay, Tokeen area, Tonowek Narrows, Turn Point, Wadleigh Island, Warm Chuck Inlet, and Warren Channel

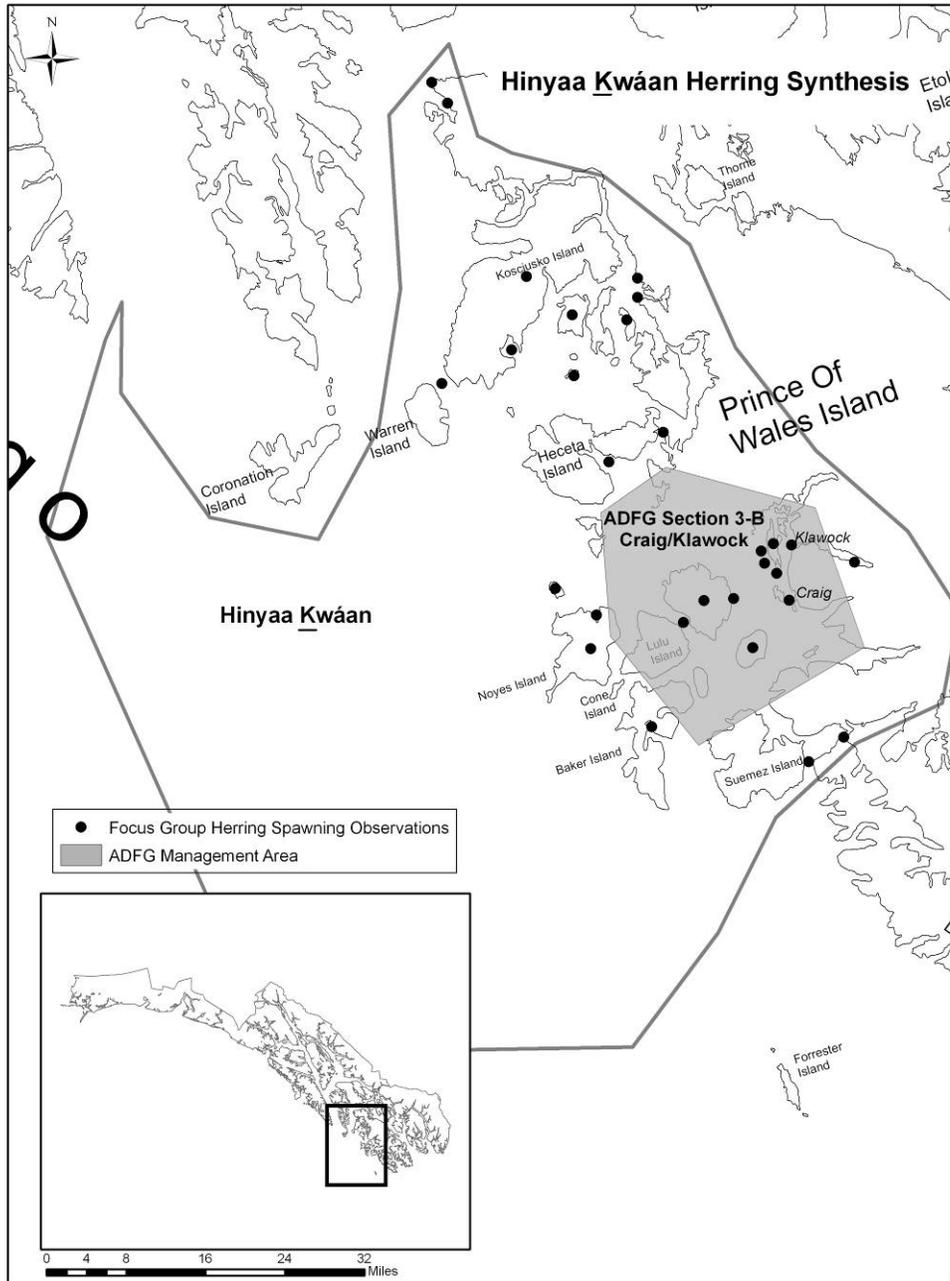


Figure 6.2: Overview of Herring Spawning Areas and LTK Observation in Hinyaa Kwáan

## **Regional Comments**

Franklin James, Sr. made the following comment regarding herring spawn areas throughout the Craig/Klawock area:

Herring spawns in the vicinity of Craig and Klawock area; in 1957 to 1967 they over harvested herring roe on kelp, poor mismanagment by the fish and game. In 1968 they closed that fishery down. My comment; I grew up in Craig and I could tell you where all the herring spawned in the area, I will give you a brief synopsis of the spawning areas around Craig and Klawock; it used to spawn from Joe Island to Madre de Dios Island, around Pt. Miraballes (Sugar pt) Caronados Island, Cape Suspiro, all around Craig, Balandra Island, Ballena Island, Fish Eggs Island (real name "Shunada" wich means herring eggs or fish eggs) it would spawn all the way from Craig to Kawak [sic] Island, Wadleigh Island, Entrance pt, Clam Island, Alberto Islands, Abbess Island, East side of San Fernando Island from Fern pt to Pt Amargura to the North East side of Silvester Pt. Since all poor management by the fish and game it has only been spawning around Fish Egg and Clam Island and a little around Wadleigh Island; they have been having a bait fishery in Big Harbor area and around St. John Island, and that is taking its toll on the herring spawn area; just before the herring spawn, they let a few permit holders pond fish for herring and that is taking a great toll on the herring spawns. This year the only place had a little spawn is the East side of San Fernando Island; MY COMMENT: I really do not think the fish and game no [sic] what they are doing until it is too late.

(Franklin James Sr. 2007)

There used to be heavy herring spawns in Sea Otter Sound area from Gas Rock to Camp Island, to Turn Pt, to Hoot Island, Owl Island, Orr Island, Marble Island, White Cliff Island and Eagle Island; for many years they let these big herring seiners

that fished for fertilizers plants fish off and around Warren Island, and that kind of depleted the herring; the also let local herring boats fish for bait herring during the winter months in Tokeen area and that also thinned out the herring; that has been stopped and the herring are now making a come back]sic]; again poor mismanagement by the fish and game. This part of the area we claimed for 6,000 years, our marking and carvings on the rocks say we are the owners. This area has never been opened for a herring sac roe fishery or a pond fishery; if they try we will fight them in courts. (Franklin James, Sr. 2007)

Ever since 1991, I have watched and recorded the years over our herring returned to the spawning areas, as well as our subsistence areas ... Whereas, herring used to show up in high abundance to spawn on all the kelp, on the islands listed below. These areas are also subsistence areas: ... San Fernando Island from Point San Pasqual to Point Santa Lucia, Palisade Island and small islands surround Palisade's Island. (Marvin J. George, 2008)

### **Abbess Island**

Abbess Island was identified as a herring spawning area:

This is ah, when they're coming towards Klawock, ... Wadleigh used to spawn all the way from this shore all the way around here to Klawock, Abbess Island, Clam Island, and all these islands that are going out. (Franklin James, Sr.)

### **Alberto Islands**

Two participants identified the Alberto Islands as a herring spawning area:

[Herring spawn] out to Clam Island, Alberto Islands and the all the way out. It goes all the way out toward Eleven Mile, toward Picnic Bay. There used to be big spawn.

Then out towards St, Nicholas Bay, Big Harbor, there's all these spawning areas...(Clara Peratovich)

Ever since 1991, I have watched and recorded the years over our herring returned to the spawning areas, as well as our subsistence areas ... Whereas, herring used to show up in high abundance to spawn on all the kelp, on the islands listed below. These areas are also subsistence areas: ... All of Alberto Islands ... These areas mentioned were our sacred and secret spawning areas we the Klawock Tribes kept quiet for years, until someone opened up and now we have lost those spawning areas. Our branches were just as thick as Sitka's branch fish eggs in the Alberto Island areas.

We the indigenous people of Craig and Klawock used to troll, sport fish king salmon in the early big tides all through Alberto Islands in the tiny bay all the way out to the Alberto Reef. Nowadays, we cannot do any sport fishing without running into an anchor or buoy, and left over [sic] busted up ponds [also known as herring pounds] left behind and herring nets, ropes and junk left behind from the commercial fishermen from the herring pond fisheries. (Marvin J. George, 2008)

### **(Bartolome) Baker Island**

Baker Island was noted as a herring massing area in the past:

When I was halibut fishing, we'd run into big balls of herring off of Bartolome (Baker Island) area. (Byron Skinna)

### **Clam Island**

Clam Island was an important egg gathering site for Craig and Klawock residents (See additional comments: Abbess Island (Franklin James, Sr.), Alberto Islands (Clara Peratovich))

But this year, we got our fish eggs on the Clam Island on the north end of it. And that's just a dinky little area for a lot of people to go and get it there. We just lucked out ... and we got our fish eggs there this year, but there was nothing all over the place. (Burt Cosgrove)

### **Craig area**

Craig was noted as a herring spawning location:

It's [herring spawn] never been very far from Craig. It's just basically right around Craig. You watch for the birds and the sea lions and all that stuff and that'll pretty much tell you about where about, where they're at. (Jeff Trimmer)

Anyway, but, you know when I was a kid [living in Petersburg], the eggs that we got came from around Craig ... (Ralph Guthrie)

Consultant #13: They nicknamed that [early roe on kelp fishery] 'The Great Rape of Craig' when they just went in there and wiped out all the kelp. ...

Byron Skinna: The removal of the eggs. That's what killed it. ... They took the kelp and the eggs. And when there was no more kelp, the herring moved but they didn't have far to go. Here. Here. It just pretty much killed it off.

(Consultant #13 and Byron Skinna).

### **Eagle Island**

Eagle Island also produced herring spawn:

Mmhm. That's Eagle Island. Ok, it used to spawn all the way around Eagle Island and these islands and right here is Marble Island and Orr Island. (Franklin James, Sr.)

### **Edna Bay**

Dick Eide, a commercial fisherman since 1956, describes finding herring in Edna Bay:

We looked all through this Davidson Inlet, Sea Otter Sound, we found fish [herring] in Edna Bay. (Dick Edie)

### **Fern Point**

Fern Point was described as a place where herring spawn:

And then [herring spawned at] Fern Point last year [2007]. (Burt Cosgrove)

It spawned this way, all the way to Fern Point and right here ... (Franklin James, Sr.)

### **Fish Egg Island**

Many interview participants describe the abundance of herring spawn around Fish Egg Island, which is named for the abundance of spawn there (*Sháan Dàa*, or “White Around”):

...but then they said for quite some time and there’s a decline in herring. And the ducks from Fish Egg all the way up to San Fernando, up toward Big Harbor, you could see, literally, ocean ducks—the whole would have thousands of sea lions just keep the wake right here in the, right by the (?) creek. All the way around. ... And then the herring used to be literally knee deep on the beach. ... Yeah, because even on Fish Egg and all the way around Fish Egg, there’s a herring—herring eggs used to be ankle deep to knee deep. You know things wash ashore when it would get stormy, and a lot of the herring eggs had washed ashore. (Arthur Kennedy)

Well, when the herring hit the main spawning ground over in Fish Egg Island, the outer bay, you know, that’s the main spawning ground. (Clara Peratovich)

Started herring picking there in the last 4 years probably. It varies. We'd go from south end of Fish Egg Island out to north end. (Jeff Trimmer)

And I don't even know what's left on Fish Egg. There isn't much of anything there. (Byron Skinna)

This year [2008], they never came in to Fish Egg... There's ah—there was no spawn this year on Fish Egg, I guess. Or not that I'm aware of. (Consultant #13)

Mike wanted to go out and get some subsistence herring roe at Fish Egg Island out by Craig. (Dick Stokes)

But also a lot of these guys can help you because you see there's lots here [on the map] that is missing, that has been flown. Remember, you can start up here in Craig and see, we started the research there with Carl. Remember Carl Rosier, Lyle Simpson, all of those were right there. In my estimation, the—that fishery was probably one of our best fisheries: the spawn-on-kelp. And the criteria that was used is we used twelve to twenty miles of spawn within this area before we would have a fishery. And then the fishery usually took place, remember, just on Fish Egg Island, this little dab here. (Tom Copeland)

Some participants identified a decline in herring spawn at Fish Egg Island:

They start using the speedboat engines, outboard motors, and they run in and scare the herring. It just spooks them. Now they're starting to spawn away from the main spawning ground. They don't come in. ... Noticed quite a change of the cloudiness [of the herring milt visible when spawning]. Last year there was quite a bit and this year there wasn't all that much. (Elmer Carteti)

Outside of San, north end of San Juan Batista (10:29), Box Islands and they would spawn all the way around Fish Egg, Wadleigh, right on up to Klawock. ... And when we got involved and since we bought those years a tremendous change has come because you look a the southwest, the southeast winds and what they will tell you about it, or the strong southwesterly winds and westerly winds, fish eggs used to wash up all over by the beach by the tens and thousands of pounds and how they used to wash up. That's how much herring there was. It was right in the open on Fish Egg and they'd wash up and when we start picking those we were the biggest buyers and on average up to around 300,000 pounds of eggs we'd send over to Japan. So I think this clearly depleted that spawn. (Franklin James, Sr.)

While living there, ok, we had like a subsistence lifestyle and every spring we'd go to Craig for the first spawn and we'd collect roe on kelp, roe on branches, herring. ... I've been watching these herring ever since I was about 5 years old and I'm 65 years old. So, yeah, when I was a little guy, we'd go down the beaches and get them with deck buckets. You know, they were plentiful back then. ... I've been watching these herring ever since I was about 5 years old and I'm 65 years old When I was growing up we used to go to Fish Egg Island and Craig to get our kelp and set our branches. ... Yeah, we'd get our fish eggs from Fish Egg Island and then oh, around St. John and there they'd spawn but we didn't mess with that that much. ... And now I'm seeing them, they're spawning around Fish Egg still, but lightly. (Charlie Skultka)

Well, when the Tlingits and Haidas first did an actually treaty, Fish Egg Island was a present to the Haidas as a peace offering. And through the years after they got the

island, they shared it just like it was before they had it. So it's always been apart of both tribes' friendship. (Charlie Skultka)

I'm originally from Craig/Klawock. I moved away from there 50 years ago—and Kuiu. We always had a resource in the herring and eggs. We used to salt it down, dry it up in the trees and preserve it for the winter. Only what we could use. Now you can't even get any. (Matilda Kushnick)

Ever since 1991, I have watched and recorded the years over our herring returned to the spawning areas, as well as our subsistence areas ... Whereas, herring used to show up in high abundance to spawn on all the kelp, on the islands listed below. These areas are also subsistence areas: ... All shores of Fish Egg Island. (Marvin J. George, 2008)

### **Fox Island (Belanny Islands)**

Fox Island, just south of Fish Egg Island, was a location as a place where herring once spawned:

And there's an island there they call Fox Island because there was a fox farm there at one time. I don't know what the scientific name is for that island but all through there then into the north and then Fish Egg. (Clara Peratrovich)

Ever since 1991, I have watched and recorded the years over our herring returned to the spawning areas, as well as our subsistence areas ... Whereas, herring used to show up in high abundance to spawn on all the kelp, on the islands listed below. These areas are also subsistence areas: ... Belanny Islands (or Fox Islands) – just off the south end of Fish Egg Island. (Marvin J. George, 2008)

### **Graveyard (Pitt) Island**

It spawns all the way, all around Craig, all the way through the Graveyard, all around there and St. Nicholas Bay. (Clara Peratovich)

I've found them around Graveyard Island here. (Jeff Trimmer)

### **Klawock**

Some interview participants described a decline of herring spawn in and around the Klawock area including Klawock Harbor and Klawock River.

### **Klawock Harbor**

Especially in Klawock Harbor. The herring were so plentiful even sharks used to come into the bay. (Matilda Kushnick)

[T]hat was back in the 60s when they [commercial sac roe fishermen] used to come in and just clean it out. (Consultant #13)

Long time ago when I was raised [in Klawock]—oh gosh, I don't know. We used to get herring eggs on kelp like that. But now if you get some like that you're really lucky to get some. (Byron Skinna)

Yeah, they used to. There used to be a few seine boats out—a few seine boats used to seine the herring right in front of the cold storage. It was New England (Fish Co?) at the time. And they would load up their boat there and they'd—not their boat, but they'd have a tender tied up alongside them and they'd just brail all that herring into

the tender and they'd move it into the cold storage and down the road and then they'd come out and they'd empty their net out there. But sometimes they would load the tender two, three times. And they would do that for a couple weeks there and then they'd quit there. But boy, they were trying to be conservative with the fish but the people can only process the herring to the best of their ability. They weren't too accurate. I mean, they couldn't—there was a waste. A lot of waste. (Arthur Kennedy)

### ***Klawock River***

When I was a kid, I used to go up there when the herring used to come in solid, we'd sit out on all these docks and snag herring because you'd just see them—it would just, rainbows going by when they're flashing. And then if you wanted the biggest herring, you went up the creek. (Consultant #13)

They're not so much there anymore. There's not much left to go there. (Byron Skinna)

### **Kosciusko Island**

One commercial fisherman described herring massing around Kusckusko Island:

I don't know about the spawning around here, but when I was running up here this spring, I came through the pass and I anchored up here and there was—I was running into big balls of herring coming up here. (Consultant #13)

### **Marble Island**

Marble Island was identified as a herring spawning area by both commercial fishermen and subsistence users:

And then [I've seen herring spawn] over here on Marble Island. (Dick Eide)

I don't know about the spawning around here, but when I was running up here this spring, I came through the pass and I anchored up here and there was—I was running into big balls of herring coming up here. (Consultant #13)

Ok, it used to spawn all the way around Eagle Island and these islands and right here is Marble Island and Orr Island. (Franklin James, Sr.)

I don't know if this is Marble Island or Mable Island or not, but they spawn all over in Hydaburg: all over in there. (Arthur Kennedy)

### **Meares Passage**

Meares Passage was one location noted for winter bait fishing:

Then we [bait] fished down in here. ... Meares Pass and then up in here. Right there. (Dick Eide)

And I partake in that, and we [bait] fish right here. A lot of that herring that comes in here, winters in here and we fished 360 tons out of there ... But we ran into schools that were like 25—between 10 and 25 fathoms that ran for a mile. (Consultant #13)

It should be marked right here and here. But anyway, where they were seining right here is, this right here coming in, here's Waterfall. They were seining right here in Meares Pass. Coming in this way. (Franklin James, Sr.)

Yeah, and then in the springtime when the fish would come in to spawn there [Meares Pass], they never showed up because we caught them all up there! ... Yeah, until the price was worth going out there. And we got so much herring there one

night, we turned our boat over. ... Yeah, in Meares Pass. Had so many herring it turned the boat over. ... And then they put two and two together. It started declining when they started fishing the herring in Meares Pass. ... Yeah. We dumped—have you ever seen the boat the Icy Queen? 58-footer. Pulled that over in Meares Pass in the middle of the night. (laughing) Pretty soon all you could see was our crew. I was in a skiff towing. I see the boat going a little more, a little more, a little more. And when they decided they had to cut the bridle, to let the lead line go, it was too late. Whole Icy Queen lay on her side. And then she went completely up and the crew was standing on the side of the cabin and then walked her down to the keel. She didn't sink. She was upside down though. (Bob Kirkman)

And ok. Follow it on through later years they had a bait fishery that took place in Meares Passage. And in my opinion that was the splitting place for the herring. Some would go towards Craig and some would go towards Tlevak Strait and then that was the herring that would end up at McFarland: my opinion. And after several years of the Meares Pass fishery, the McFarland fishery spawn became nonexistent. (Charlie Skultka)

### **Noyes Island**

Noyes Island was identified as a herring spawning area by both commercial fishermen and subsistence users:

A year later, in 1982 ... One day when we were fishing near Noyes Island we witnessed a similar sight of herring boiling on the surface and all the Fish, Birds and Sealions [sic] feeding. ... that was the last time I have seen anything like it. (Dan McQueen, 1993)

I've had fishermen tell me that there was a town at Noyes Island because so many herring were there and the coho stayed there to feed. There was a (herring) reduction fishery there, and other stocks may have been fished past recovery too. (Phillip Gray, 1993)

I did see some—where is that island—Noyes Island. ... I don't know [when], but I swear I saw some up in here. (Elmer Carteeti)

Then they go outside Noyes Island. All them places too you know. (Martin Perez, Sr.) Steve Langdon (pers. comm., 17 June 2010) notes a there was a Haida herring camp on Noyes Island, as well.

### **Point Baker**

The decline of herring spawn at Point Baker was noted by many local residents:

No longer are there large schools of Herring [sic] at Sunny Bay, Saginaw Bay, Point Baker, Snow Pass and many places in between. (Richard B. Stough, 1993)

Point Baker at one time had huge herring, now they are nonexistent. Also the annual run here has declined to an extremely low level. (Roman S. Keleske, 1993)

Having lived in the Baker/Protection area for about 12-13 years, I have watched each year the herring disappear until now in 1993 I don't expect to see any. Two years ago a few schools, small ones, passed by my float. Last year I saw only one. To fish as they do the last schools, no matter how large they are, is the act of foolish, greedy people. (Paul C. March, 1993)

When I was a little girl in Point Baker huge, abundant fields of herring were taken as a fact of life. Secure and accepting, we assumed by their sheer numbers and importance that they would always be around, but, alas, the infinite became finite in less than half a lifetime. So hard to describe now black bodies of biomass as far as the eye could see filled the green sun lit waters around us. As well as the resultant followers of the teaming bounty - whales, porpoise, sea birds, seals, sea lions, salmon, etc. ... We are left with silent waters and a rich interactive eco-system wiped out. These days when fishing for salmon, we rely on almost odorless, flavorless, frozen herring from Puget Sound and are not surprised that they seem suitable to salmon. (Darlene Larson, 1993)

As a resident who grew up in Pt. Baker I have seen many changes in the country during the last 40 years. One of the worst (by impact) is the devastation of the herring stocks. ... But for a few remnants, this local biomass was cleaned out in the mid 1970s. ... While I was growing up, there was a local herring stock here; it spawned nearby and contributed considerably to this whole area. The bay of Pt. Baker would turn dark from the density of the herring school in the harbor. (Charles H. Zieske, 1993)

Growing up in Sumner Straights [sic] in the Point Baker area I had taken for granted the apparent limitless number of herring. Anyone who needed bait could stand on the dock and jig a bucket of fresh bait anytime they wanted. The Bay would be full from one end to the other ... now we have virtually no herring. The disappearance occurred sometime in the mid 1970s when I came back out to Baker from Wrangell there were no herring. Apparently that spring or sometime during the bait herring season down towards Craig, AK, some of the boats didn't do to [sic] well and on their

way back to town stopped and made several sets outside of Point Baker. This was witnessed by at least several local people, anyway the local school of herring (biomass) whatever- was caught and we haven't had any herring for 15 years. In my experience fishing from one end of Alaska to the other, it is critical to manage and study the herring situation more critically - as they are a primary link in the food chain. (Samuel Carlson, 1993)

Since I have lived here in Pt. Baker, I have seen twice, in 1989 and 1991 a school of immature herring (1-2 years old probably) arrive in the fall and stay in our area for about a month and then leave. Where did they go when they left our area? ... There have been perhaps three different springs when I can recall small schools of mature herring showing up in our waters in April or May, after the spawning time. Where had those fish spawned? (Donald Hernandez, 1993)

Since moving here from Petersburg in 1986 I have witnessed two schools of herring in Point Baker. For one month during the Fall [sic] of 1989 a school of herring stopped in Pt. Baker. The seagulls went crazy and I counted 20 seals in the bay in one day ... I have lived and fished in the Point Baker area for seven years. I have been fortunate to hear stories from long-time residents of the days when herring was a very big and important part of the local ecosystem. Apparently there was a time, 15-20 years ago, when herring could be had just about anytime someone had a need of one. Huge schools of distinctively large fish wintered here, every winter. Unfortunately, I was not a witness to this abundance. The herring resource disappeared before my arrival. (Andrea L. Hernandez, 1993)

Statements long gone from Point Baker/ Is that rain? No it's herring flippin./ Better stay with this net, herring will fill and sink it./ Is the bay always silver with herring?/ Yes most of the time. (Dennis Mann, 1993)

And there was herring that spawned in Point Baker. And then there was, you know Reed Bay, Threemile Arm area. You know, there was a big stock of herring that used to spawn there and they were fished out by that group of herring seiners, you know, that was finally—like I told you, was finally coming down about 1957 was probably the last year that they fished there. Or, you know, within a year or two. And anyway, they had these huge herring in Point Baker ... (Ralph Guthrie)

### **Port Protection**

Residents of Port Protection have noticed a decline in herring spawn in that area:

I moved to Port Protection in 1983 and never had a problem getting all the herring and smelt we could use. (Jack M. Mason, 1993)

In 1985 I moved to the Port Protection/Point Baker area. At that time the herring were plentiful ... Every year I have noticed a definite decline in the amount of herring coming into the bay. This year - there have been none! (Maxine M. Mason, 1993)

Where I now reside in Port Protection, during the past twenty years or so, the past ten years I observed a steady decline of herring and the past three years hardly and the current winter, none at all. (Roman S. Keleske, 1993)

In the 14 years I've lived in Port Protection I've seen the herring schools go from acres of fish to just dozens of fish. I'm talking about spawning schools. They spawned

in every little cove in Port Protection. I've seen them spawning on the Tide Flat when the tide was out. Thousands of them. I've been able to catch all the bait I needed for trolling in just a few minutes. But over the years I've seen them all but disappear. A few years ago I had to quit setting the bait net for fear of wiping out the run. And the most I've ever needed to take was just 2 five gallon buckets full. And all of the old timers have told me there use to be many, many more than what I saw in my early days in Port Protection. ... They spawned in a creek close to our house. A friend and I were walking back there one day and actually saw herring spawning at our feet. It has been quite a while since I have seen a school of herring back there. (Litzi Botello, 1993)

In the mid 1970s I watched thick schools of herring in our area. 2 boats (seiners) wiped out our local stocks in just a few sets. They have not recovered. In my opinion, Roe [sic] harvests on mobile stocks, migratory herring schools has contributed greatly to this decline. (John W. Bean, 1993)

In the past few years you could see the decline in the number of herring coming into the bay. This year there hasn't been enough to warrant putting the net in the water. (Merek E. Mura, 1993)

Where I now reside in Port Protection, during the past twenty years or so, the past ten years I observed a steady decline of herring and the past three years hardly and the current winter, none at all. (Jack M. Mason, 1993)

### **Portillo Channel**

Portillo Channel is described as no longer a productive herring spawn area:

The whole area and they'd spawn all the way down to Pedro [St. Philip Island] then come back and spawn all the way on the western side of San Fernando right going into Portillo Channel into St. Agnes. Now, you don't see that no more since they wiped that area out. (Franklin James, Sr.)

Steve Langdon (pers. comm.. 17 June 2010) adds the following observation about the marine ecology of this area:

I have long wondered about area of Portillo Channel known as the "Cabbage Patch" around which I have been on many occasions. It is the largest concentration of macrocystis I am aware of in the POW [Prince of Wales Island] or any other area yet it is not a site of significant spawning in recent history. However, there is a village nearby and a major group of fish traps in the intertidal zone of the nearby stream on San Antonio Island. By examining the issue of macrosystis kelp concentration and distribution, a picture might emerge concerning past locations of spawning that have been disrupted.

### **Prince of Wales Island**

One commercial fisherman made this comment about the entirety of northern Prince of Wales Island:

As a commercial fisherman for over 15 years in SE AK, I have noticed a herring massacre. There are no more herring coming to N. Prince of Wales Is. AK. (Terry Kline, 1993)

### **Rocky Cove**

Rocky Cove is described as a herring spawning area:

You see the spawns were big when I was a kid. It used to spawn at Rocky Cove right there by Waterfall. Yeah, because that's on the north end of Rocky Cove. (Franklin James, Sr.)

### **San Alberto Bay**

San Alberto Bay had an abundance of herring spawn in the 1970s:

In Alberto Bay. Heavy [herring spawn] out in those areas in the 70s. (Franklin James, Sr.)

Marvin J. George also identified San Alberto Bay as a herring spawning area:

Ever since 1991, I have watched and recorded the years over our herring returned to the spawning areas, as well as our subsistence areas ... Whereas, herring used to show up in high abundance to spawn on all the kelp, on the islands listed below. These areas are also subsistence areas: ... San Alberto Bay – Cruz Island – all east shores. (Marvin J. George, 2008)

### **San Fernando Island**

Some interview participants described the transition of herring spawn areas to San Fernando Island while others noted a decline:

They're starting to spawn way out. Further out toward San Fernando. (Clara Peratovich)

And then all the herring disappeared and went out around San Fernando. (Consultant #13)

Oh yeah. Out there, San Fernando, everywhere. (Jeff Trimmer)

In here too. That's pretty dead. (Byron Skinna)

The whole area and they'd spawn all the way down to Pedro [St. Philip Island; nicknamed for the herring seiner "Pedro" (Steve Langdon, pers. comm.. 2010)] then come back and spawn all the way on the western side of San Fernando right going

into Portillo Channel into St. Agnes. Now, you don't see that no more since they wiped that area out. (Franklin James, Sr.)

### **San Juan Batista**

San Juan Batista was another area identified as a herring spawning area:

That's pretty dead. There's a little spawn here, but not much. This is pretty dead.  
(Byron Skinna)

Yeah. [Herring spawn in] St. John [,]. San Juan Batista. Right here. (Arthur Kennedy)

Outside of San, north end of San Juan Batista, Box Islands and they would spawn all the way around Fish Egg, Wadleigh, right on up to Klawock [there was spawning].  
(Franklin James, Sr.)

They kind of spread out. There're always feeder fish. Come across them here and there around St. John's and whatnot. They move around. (Jeff Trimmer)

### **St. Joseph Island**

St. Joseph Island was a location utilized by the reduction plant fishery:

Then the, like my sister was talking, they used to let the fertilizer [i.e., reduction plant fishing] boats, after they wiped out Chatham Straits, and then they let them come fish outside of Hole-in-the-Wall: inside of St. Joseph and outside of St. Joseph Island. (Franklin James, Sr.)

### **St. Philip Island**

St. Philip Island was identified as a herring spawn location:

So when I was telling you about the spawn that came right here, this is, how do you call that, Philip's Island. (Franklin James, Sr.)

Then they'll spawn over by Philips Island. (Clara Peratovich)

### **Steamboat Bay**

There were so many herring in Steamboat Bay at one time, one interview participant described the sound of the fish flipping like rain:

Yeah. It's way off. When I was 12 years old it sounded like it was really raining where my dad and I were fishing out there. And it sounded like it was really raining. And I remember I had the skylight open. That's when it opened in the front of the boat. And I jumped out of my bunk and there was blue sky out. And my dad, I could tell my dad was up because I could smell coffee, so I went upstairs and the rain, it sounded like the rain was just pouring down. And I looked outside and you could see from where we were tied up on the float you could see all the way across Steamboat Bay and he said, "Take a good look at that." He said, "Take a real good look at that." He said, "You will never ever see this again in your lifetime." (Arthur Kennedy)

### **Tokeen area**

The Tokeen area was noted for herring spawn (See Regional Comments (Franklin James, Sr.)

Of course we [bait] fished up here in-I've seen herring spawn along here... ..from an airplane. (Dick Eide)

### **Tonowek Narrows**

Dick Eide, a bait fishermen, describes the herring caught at Tonowek Narrows:

But I have also caught herring over in here. But they were small. (Dick Eide)

### **Turn Point**

Franklin James, Sr. describes the spawn at Turn Point:

That's where she'd spawn and this is Turn Point and she's spawn along the shore this way. (Franklin James, Sr.)

### **Wadleigh Island**

Wadleigh Island was a productive place for herring spawn:

Outside of San, north end of San Juan Batista (10:29), Box Islands and they would spawn all the way around Fish Egg, Wadleigh, right on up to Klawock. (Franklin James, Sr.)

And they're getting over on the San Alberto Island and where they're getting them now like up behind Wadleigh Island. When I was a kid, I didn't even know there was a spawn up there around Wadleigh, but they have it. (Charlie Skultka)

Byron: They're gone!

Interviewer: The outside of Wadleigh Island?

Byron: Yeah.

(Byron Skinna)

Yeah. So, we always go to the south end and next year it [spawning] could be on the north end and it could be on the backside of Wadleigh. (Jeff Trimmer)

### **Warm Chuck Inlet**

Commercial fishermen utilized the Warm Chuck Inlet area:

As they wiped that out, they moved in to the Warm Chuck (Inlet) area, where it's kind of deep the herring concentrate real heavy up here. Those herrings, belong to Craig and Klawock area. (Franklin James, Sr.)

### **Warren Channel**

Charlie Skultka, a bait, sac roe, and subsistence fisherman, describes the herring in Warren Channel in the wintertime:

When I used to fish them commercially there in the wintertime, we would find the herring oh all the way down. We'd come out of Sumner Straits and get into the Warren Channel and there'd virtually be like a 40-fathom band of them down there at the Boca de Fines. (Charlie Skultka)

### Predation

Many factors have been identified as the cause of herring population decline (commercial fishing, pollution, etc.). In addition to these place-specific observations, there were consultants who identified changes in herring predator behaviors and populations (halibut, salmon, sea lions, seals, seabirds, whales, etc.) that may be effecting herring populations in and around Hinyaa K̄wáan.

Consultant #13: Oh, the last ten years seem like the whales just came on strong.

Interviewer: Mmhm. And does that correlate with changes in herring stocks?

Alva: Oh yeah.

Byron: Well, between them and the rape of the herring, that pretty much done it in.

Consultant #13: You know, we got the bait fishing, we got the herring roe-on-kelp fishing and we got the whales. But the whales, I bet they take way more than we do eating all year round.

(Consultant #13, Byron Skinna, Alva Perotrovich)

Sea lions. Seagulls of course. Salmon [feed on herring]. (Elmer Carteeti)

Another way to bring back the king salmon, is to completely close down the Winter Bait Fisheries [sic]. When there was a lot of herring around our trolling areas (both commercial and sport trolling), there were a lot of king salmon to catch as a result, with herring being the salmon's feed. (Marvin J. George, 2008)

They [herring] move around a lot. Sea lions chase them around, whales and all that stuff, so they move... they [king salmon, seals, sea lions, orca whales] follow the herring in, the sea lions do and then the orcas will be right behind them, following them in. (Jeff Trimmer)

Yeah. You can always hear when the seagulls come in you know, before the spawn. The people used to listen to the seagulls that fly in search. And sometimes they'll sit and they all make noise, you know, squawk. You can hear when they're full. Their voice sounds different when they're cheering. They say, 'It's got herring sound in its mouth. It sounds like it ate herring.' So they start searching. Sure enough they see the herring moving in. (Clara Peratovich)

Yeah, but ...the [humpback] whales pretty much killed that [herring population] off. ...sea lions. (Byron Skinna)

### **Shtax'héen Kwáan: Wrangell**

Shtax'héen Kwáan territory extends north on the mainland toward Frederick Sound to include Farragut Bay and encompasses that entire coastline southward to include the Cleveland Peninsula. The territory expands westward to include the northeastern region of Prince of Wales Island the eastern half of Kupreanof Island. Included in the boundary are Wrangell, Etolin, Mitkof and Zarembo Islands. We conducted one individual interview in Wrangell although participants from Ketchikan, Petersburg, and Kake also were able to comment on the area.

Shtax' Héen Kwáan territory is centered on the Stikine River (Shtax' Heen), which provided access and a profitable trade corridor to the Interior. Building this trade allowed the Shtax' Heen Kwáan to accumulate great wealth. The kwáan appears to have been formed at an early date by groups that migrated down the Stikine River, and their territory was among the largest of any group in Southeast Alaska in terms of population, geographic area, and coastline. The Shtax' Heen groups controlled not only the large mainland rivers but also the major inland marine waterways in central Southeast Alaska. Historically, a good portion of their territory supported herring spawning, helping to sustain among the largest aboriginal settlements in the region. Although Shtax' Heen people were tenacious and largely successful in defending their territory and trade from encroachments by the Russians and the Hudson Bay Company in the early nineteenth century, smallpox, measles, and tuberculosis epidemics, combined with the ill effects of the American military occupation and the Cassier mining boom in the 1870s, reduced the population to several hundred by 1890.

The Alaska Department of Fish and Game (ADFG) manage three separate commercial herring fisheries that fall within the Shtax'héen Kwáan territory: Ernest Sound, Bradfield Canal and a portion of the West Behm Canal (see Figure 6.3).

The first of these, Ernest Sound (District 7), lies entirely within the Shtax'héen Kwáan territory. It has operated as a winter food and bait fishery at variable locations such as Deer Island since 1969. The area was closed to winter bait fishing in the 1970s, but reopened in 1992 through 1999 for five seasons though only 25% of the GHL was landed. Any herring not harvested for bait is reallocated to the spring spawn-on-kelp fishery. The first spawn-on-kelp fishery to open in Ernest Sound was 2004, the second occurred in 2007 with spawning activity concentrated around Vixen Point. According to ADFG documentation, the first herring spawn occurs in Ernest Sound around April 5 and the last day of spawning occurs around April 26. "Traditional" spawning areas identified by ADFG include the following: Cleveland Peninsula between Union Bay and Emerald Bay, Point Eaton, and Ship Island (ADFG 2009a).

Bradfield Canal is an area in District 7 that is managed by ADFG as a bait pound fishery. It appears on the map as a separate management area, but is managed as an appendage to the Ernest Sound area.

The third management area that partially resides in the Shtax'héen Kwáan territory is the West Behm Canal (Section 1-E and 1-F), a gillnet and purse seine fishery that has been closed since 2005. For additional information regarding the West Behm Canal, see Sanyaa Kwáan.

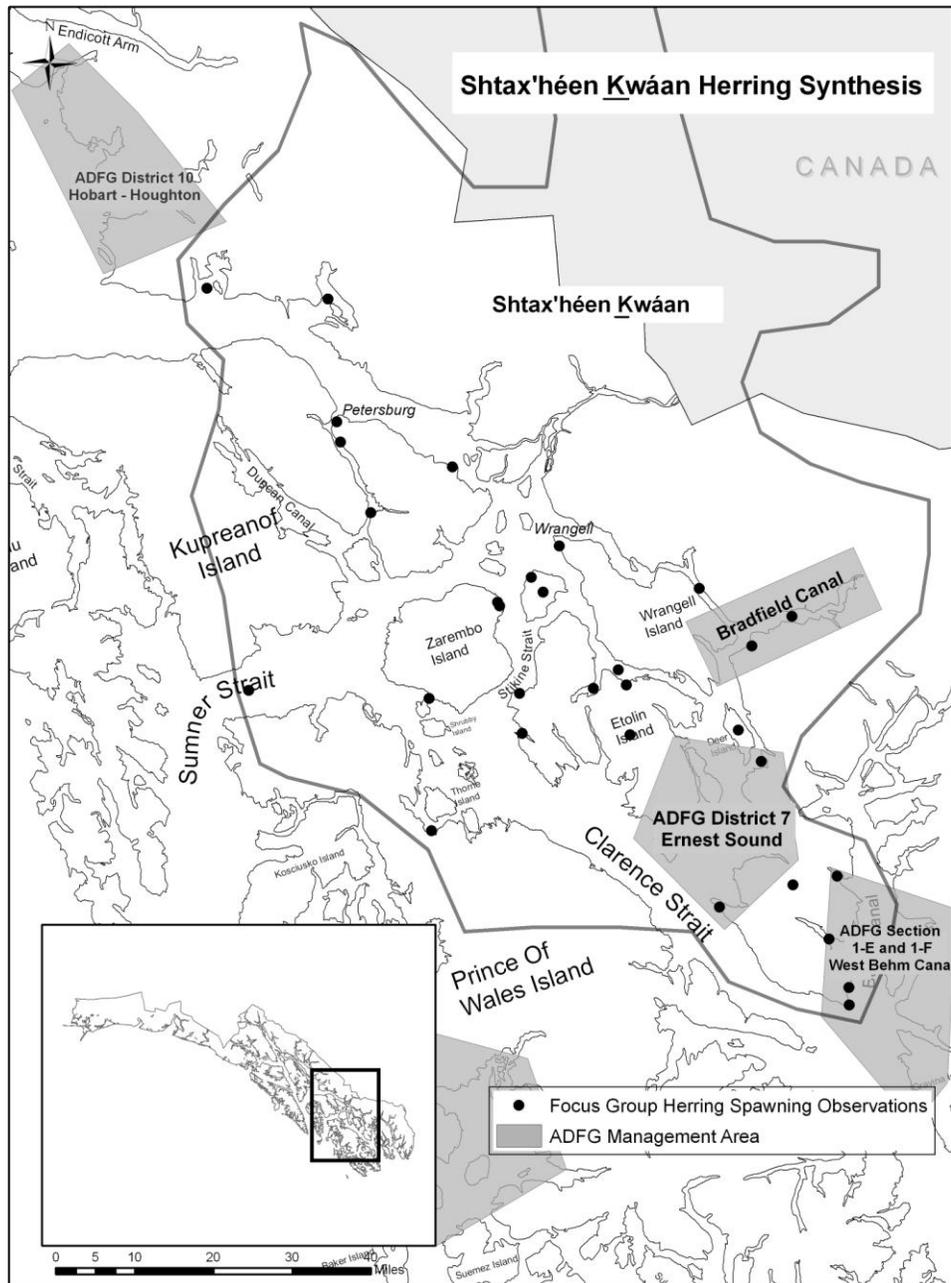


Figure 6.3: Overview of Herring Spawning Areas and LTK Observation in Shtax' Héen Kwáan

The following is a list of locations within the Shtax' Héen Kwáan that were identified as notable herring spawning and massing areas during individual interviews and focus group interviews conducted during this synthesis project and in previously documented research efforts:

Anan Creek, Anita Bay, Blake Channel, Bond Bay, Bradfield Canal, Caamano Point, Cleveland Peninsula, Deep Bay, Deer Island, Elephants Nose, Etolin Island, Farragut Bay, Helm Bay, Ideal Cove, Meyer's Chuck, Olive Cove, Petersburg, Point Stewart, Quiet Harbor, Roosevelt Bay, Scow Bay, Snow Pass, Steamer Bay, Sumner Strait, Sunny Bay, Thomas Bay, Totem Bay, Union Bay, Woronkofski Island, Wrangell Harbor, Wrangell Narrows, Zimovia Straits

### **Regional Comments**

We have, in the past had herring spawn in Roosevelt Harbor, Deep Bay and it was on Zarembo Island. We also had it at Steamer Bay on that one and Anita Bay, on Etolin Island. And then farther on down, across from Wrangell, across from Wrangell Island, on Deer Island the northern part, there's a little bight in there: it used to be just loaded with herring. We also had herring spawn at Point Ward. (Dick Stokes)

### **Anan Creek**

Anan Creek was once the site of a village owned by the Kaach.ádi and the Kiks. ádi.

Franklin James, Sr. identified Anan Creek as a herring spawning location:

Then there's spawn here in Anan. Just like your yellow spots [referring to spawning locations on a map]. There's no kelp. This is all deep shoreline that in fact, it comes up to this little, back just by the end of the road here, by the driveway, it should go down 200 fathoms. So she had to spawn all here on the cliffs. Right here and the strong tide. (Franklin James, Sr.)

Anan has never been utilized as a commercial fishery, though attempts have been made to harvest sac roe at this location: Consultant #23 explains:

I mean, we never connected with the spawning sequence and we also tried to get something [a sac roe fishery] going in Anan, Anan Creek, Deer Island. What do you call that? Anyway. Down below Wrangell there ... And that never, we never managed to make that connect either. (Consultant #23)

### **Anita Bay**

A seasonal camp utilized by the Wrangell people is located in Anita Bay. According to Willis Hoagland (#68) in Goldschmidt and Haas (1998:157), “We got herring eggs on a little bay up Anita Bay, and also sometimes on a point. Now there are few herring spawning in there...” Dick Stokes also identified a decline in the herring spawning population at Anita Bay.

Yeah, there were several places where you could always go to get them [herring eggs] like Anita Bay I imagine. That was where they would get a lot of them. (Dick Stokes)

Interviewer: 1974. So, what happened to those other spawning areas that you mentioned [like Anita Bay]? Are they all still active, they're just smaller? Or are they all gone? ...

Dick: The gillnet fisheries just cleaned everything out ... (Dick Stokes)

Anita Bay is location that has also been utilized by commercial fishermen:

Anita Bay was a place where we went a lot [to fish for herring commercially]. (Dick Eide)

### **Blake Channel**

Dan Roberts of Ketchikan described the abundance of herring in the areas around Blake Channel:

There used to be schools of herring that would cover acres in the surrounding areas.

(Dan Roberts, 1993)

### **Bond Bay**

Bond Bay was identified by some participants as a location where herring both spawned and massed:

[There were] big spawns up on Bond Bay going across the Cleveland Peninsula, Helm Bay, as you're going up. (Franklin James, Sr.)

We'd go over to Bond Bay over here and fish in the evening and the sun would go down behind the hill and the whole bay would lift in there [referring to herring rising to the surface]. Floyd, you'd know about that. And the king salmon would be swimming through them and stuff like that. Those days are kinda gone. (Dennis Diamond, 1993)

### **Bradfield Canal**

Bradfield Canal, currently managed as a bait pound fishery by ADFG, belongs to the Naanyaa.aayí people (among others) (Goldschmidt and Haas 1998:76). Dick Eide related how, when fishing for bait herring in Bradfield Canal, the herring would rise to the surface in the evenings:

You find them [herring] in strange places sometimes with no sign at all. And I can give you a for instance. We—I was a partner with a friend from Wrangell. He says, “Well, you know there used—guys tell me there used to be herring over here.” So you went [to Bradfield Canal] and there was herring. We got a load. With the market I

had we had to wait a couple days to get everything froze and everything taken care of. I think we could fish every two days or something. And we went back down there. Same place. And we knew the fish were there. Well, we'll just find them during the day and catch them. We couldn't find them [during the daytime]. And we went miles on either side of where we had fished it. And so we went back and we were all sitting at the galley table and I heard my sonar make two hits on a target. And I went up to the wheelhouse and the whole bottom came up [referring to herring rising to the surface]. (Dick Eide)

### **Caamano Point**

Herring, once plentiful at Caamano Point, appear to be depleted or have disappeared altogether:

This observation was made on our first day out between Gravina Island and Caamano Point on Cleveland Penn. In 1981 ... Salmon slicing through seals and sealions churning up the water while from above, eagles were diving and grabbing claw fulls of herring which would just squirt out and fall back into the boiling mass of silver herring below. (Dan McQueen, 1993)

I think we truly lost, and I mean from my perspective, the channel in front of town [Ketchikan], that herring mass that used to be in there. It's gone. I just don't think it's there anymore. I think the one over by Grendel that I used to see when I fished over there, it's just like Dennis mentioned, we'd fish over there and you'd see herring, Twenty Fathoms Bank, I think that's all gone. It's just-it'll never come back. Same way Caamano. I fished that as well too. I think Caamano, it will never come back. I think it's gone. Now there is inside Behm there is some areas there down toward Port

Steward, Spacious, some areas there that are spotty, but I think probably can grow but Clover Pass, I don't think it will ever be the same again. (Lloyd Gossman)

All that being said, of course I'm kinda the young one here. But I know what I've seen in my time, when we used to sport fish. You know, knowing all the herring that used to be around in Clover Pass and Caamino shoreline and Gravina, all that in there, you just don't see them like you used to. (Dennis Diamond)

### **Cleveland Peninsula**

Franklin James, Sr. described the heavy herring spawns that used to exist around the Cleveland Peninsula:

Southside of Cleveland Peninsula from Caamano Pt. to Helm Bay used to be heavy herring spawns; I really have no comment on why those areas have poor herring spawns in the last 30+ years. (Franklin James, Sr.)

### **Deep Bay**

Herring once spawned at Deep Bay:

In fact, when we first started [commercial fishing] over in Sitka, we had quite a few schools of small herring. We had pilots. I remember one year he put us on a school and they were all small herring ... I think it was down by Deep Bay. That was only one time I can remember that real small herring there. (Nels Otness)

### **Deer Island**

Deer Island is used by the Wrangell people for hunting. "Our people wouldn't camp there so as not to chase off the game (Thomas Ukas #69 in Goldschmidt and Haas 1998:76). Herring also spawned at Deer Island and had been a location utilized by the commercial

winter bait fishermen in the past. (see additional comment by Consultant #23, Anan Creek).

Ah, there is a spawning area not far from it [Deer Island]. ... A couple of them.  
(Dick Eide)

Interviewer: Ok, alright. So in '49 then, where did you start fishing for herring in your earliest memories?

Nels: Well, we went like Boca de Fines. That's down toward Craig.

Interviewer: And, where else?

Nels: Deer Island. (Nels Otness)

Prior to the 1950s they allowed the boats to commercial fish herring all along that whole area, especially right the north end of Deer Island. And they would come up in the wintertime and they'd be there. And now it's gone. (ADFG and STA, 1993)

### **Elephants Nose**

Ralph Guthrie described how one winter bait fisherman affected the herring stock at Elephants Nose, across from Wrangell Harbor:

Ralph: First he [a winter bait fisherman] started fishing in Wrangell, and he kind of cleaned up that stock of herring that was there in Wrangell Harbor there and over at Elephant Nose ... Well, he fished out the winter stocks and I don't know where they summered, but that winter stock was gone ... and it's never come back, you know. It went—when they're gone, sometimes they're gone, you know ... but he was fishing

them in Wrangell and Petersburg during the 50s and 60s. ... Elephant Nose is right across from Wrangell. (Ralph Guthrie)

### **Etolin Island**

Franklin James, Sr. described how his sister-in-law once harvested herring roe at Etolin Island:

There's spawn real heavy here. This is ... Etolin right here ... My sister-in-law and them used to go in there and, you know, by Etolin Island and that area and they used to bring eggs about that thick, but they had it on the ... kelp you know. Short little healthy kelp I guess but not our way of eating but it was thick. ... Mmhm. Boy, I mean it was thick. You could nearly slice it when you're cooking. (Franklin James, Sr.)

### **Farragut Bay**

Willis Hoagland (#68) described how Farragut Bay was a place where Wrangell Natives "got goats, beaver, bear, mink, marten otter, seal and berries" (in Goldschmidt and Haas 1998:73). Farragut Bay was also location where herring spawned (see additional comment: Bond Bay, Franklin James, Sr.):

Farragut Bay. A lot of spawn in that area. (Marvin Kadake)

Then of course there's a big one [herring spawn] in Farragut Bay. ... Yeah, you have that marked [on the map]. (Clarence Jackson)

Dick: I suppose we looked at Farragut, but I know we looked in these bays [for bait herring].

Interviewer: With success? Or not?

Dick: No. (Dick Eide)

Nels Otness once owned a herring pound (also referred to as a herring pot) in Farragut Bay:

Well, in this time when I started longlining there was a bait pound we would get bait out of in Frederick Sound ... In Farragut Bay. (Dick Eide)

Anyway, you know, those schools were just little schools ... in Farragut, you know, there was enough herring there for him to, Nels [a winter bait fisherman], get a—it wouldn't be all that much. Maybe one hundred barrels of herring, you know, and he'd sell it to the halibut fleet and then he'd fish it, you know. (Ralph Guthrie)

That was really Nels Otness': his herring pot [also known as a herring pound]. He used it for fresh bait so we could have fresh bait in our pot while we were fishing. It was really deadly: good bait, fresh bait. Every day, boy we had fresh bait on our hook. (Leonard Skeek)

Well, it was for the—there again, I don't remember the first year I had the pond in there. It was for fresh herring for the halibut fishermen is what it was. And them guys used to come in there and—trollers used herring for trolling. And I kept them in a—four logs and then a line that was webbed had a door on one end brought the herring up to the door of the pond. Open the door and let the herring swim in there. We kept them live. And Farragut Bay was always a funny place because you could never come in there and see one big school like you do in a lot of places. You come in there and

you'd see a small school come in one day and then it would spawn and leave. Three, four days later, another school would come in and spawn and leave. That's why you could never get an estimate of how much herring actually came in there. Every place had its own little quirk. Just about every place was different, like Juneau for instance. It'd never see any spawn to amount to anything, yet there's a tremendous amount of herring in that Juneau area. (Nels Otness)

When I was young, you know, I watched a handful in these smaller bays, like Thomas Bay and Farragut Bay and up in Port Houghton and Hobart and Windham, you know, and power trolled a little bit up in Seymour Canal: all up and down the Admiralty shore. And there was just little batches of herring except Seymour Canal had a bigger, bigger school. ... Oh, there was never enough herring eggs in and around Petersburg. The only herring eggs that ever came out of it, came out of the pot [also known as a herring pound] in Farragut Bay and that was Leonard Skeek. (Ralph Guthrie)

### **Helm Bay**

Helm Bay was once utilized as a commercial sac roe herring fishery, but is no longer a viable source of herring.

Interviewer: Yeah. So every [commercial sac roe] opening you were there up until they closed it.

C: Yeah. We had Sitka, we had Auke Bay, we had Seymour Canal and then we also had Helm Bay down by Ketchikan ... (Consultant #23, 1970s)

We started off, ok, when I first started fishing here, we had seven areas to fish. We had Helm Bay, Kassaas Bay, Kah Shakes, Sitka, Lisianski Inlet. ... I believe we had a little bit at Tenakee—no, no—Seymour Canal, and Juneau. And through my part of fishing these things, we've lost every area with the exception of Sitka. (Charlie Skultka)

That was that there—that stock of herring. And then the other stock used to spawn along Cape Caamano and, what the heck—that bay in there: Helm Bay. (Martin Perez, Sr.)

### **Ideal Cove**

Ideal Cove was once the site of a cannery:

There was a saltery or something down at Olive Cove I think. Another one at Ideal Cove which is on the backside of Mitkof [Island]. I haven't seen these, but I do know. (ADFG and STA, 1993).

### **Meyer's Chuck**

Herring populations have declined at Meyer's Chuck:

Having lived and fished in Meyers Chuck in the summers for the past 25 years, I have noticed the dwindling supply of herring, especially over the last few years. There was a lot of herring in the Back Chuck and now there's hardly any to be found. (Chester V. Thomas, 1993)

### **Olive Cove**

Olive Cove was the site of a summer village that belonged to the Xook'eidí. A consultant who participated in the "Xaat to Naayadi: Salmon Database" (Turek et al 2009) identified Olive Cove as the location of a saltery:

There was a saltery or something down at Olive Cove I think. (ADFG and STA, 1993)

### **Petersburg**

Herring populations were once so abundant at Petersburg that the local residents could jig herring from the immediacy of the harbor. While spawning levels have never quite reached the levels that Sitka currently experiences, there has been a notable decline in herring populations in and around Petersburg harbor.

When I first moved up here to the Petersburg area there was an abundance of herring around the harbors and bays [1978]. Now that has declined rapidly. (Laurie Bender, 1993)

In areas around Juneau, Petersburg, Wrangell and Ketchikan there was several really good populations of herring that have gone below this healthy level, and they have been held down, and do not have the opportunity to bloom when conditions are good. (James Parker, 1996)

For years I could jig all the herring I wanted right in the boat harbor of Petersburg and if you anchored in any of the bays around here during the night it would sound like you were near a waterfall with all the herring flipping. (Marvin Janssen, 1993)

You could go down jig a herring here just about any time. They don't seem to be a good—I wouldn't—not a good share of the time, but seems like they show up here when they start grinding the scraps up [referring to the gurry produced by a cannery]. (Dick Eide)

Yeah, [the herring arrive to spawn] about the same time as Sitka only on lot smaller scale, you know. We never had the herring that they have over at Sitka. (Nels Otness)

### **Port Stewart**

Port Stewart was identified as a herring spawning location:

A couple [spawning locations] here is Helm Bay and there's Port Stewart where I'm talking. Used to spawn the shoreline. (Franklin James, Sr.)

### **Quiet Harbor**

Quiet Harbor is used as a campsite by the people of Wrangell (Thomas Ukas #69 in Goldschmidt and Haas 1998:76). Herring used to be plentiful here:

Quiet Harbor used to be good [for herring fishing]. ... Yeah. I used to fish with my uncle all the time. And there would be so many herring there that instead of using a gillnet, or a net to do it, we just used a wool blanket. We got down and pulled it. (Dick Stokes)

### **Roosevelt Bay**

Roosevelt Bay was identified as a herring spawning location:

And at Deep bay, Roosevelt used to have a terrific run of herring there. And the spawn would be great. (ADFG and STA, 1993)

### **Scow Bay**

Scow Bay was identified by consultants as a place where herring can be found in both the winter and summer months. Many commented about the noticeable decline in the herring population within this area:

I have a home on north of Scow Bay and between my house and Beachcomber Inn (old Scow Bay Cannery) 30 years ago used to see 30 boats fishing for kings and doing

good. Now you never see 4 or 5 boats on the week end which is normally the most active. (Stanley Reid, 1993)

Scow Bay used to be a good place for King Salmon because we had a lot of herring spawning and otherwise. The last few years fishermen never allow any herring to build up here. The seining for roe should be stopped, if they have to fish for roe it should be a big gill net only. When I came here over 50 years ago, every spring the herring would be flipping from Scow Bay to the Mouth of the Narrows for weeks every spring. (Stanley Reid, 1993)

The last few years fishermen never allow any herring to build up here. Every year the end of August they seine out every herring at the docks and Scow Bay. They say its not commercial use but its for bait for crab, halibut and Blk. Cod. I call that commercial fishing use. Before spring halibut they are after it again, night after night cleaning all herring that shows. (Stanley Reid, 1993)

Well, my first memories of herring probably was 1950 on. We lived in Scow Bay and I could remember standing on the porch of the house and it sounded like rain out on the water, with the herring flipping. ... I have never seen the herring in that part of Scow Bay on the surface like they were when I was growing up there. (Dick Eide)

I have gone through Scow Bay in the wintertime and seen the herring in Scow Bay. (Dick Edie)

Oh, guys tried it [to fish for winter bait]. It was later on. One guy tried Scow Bay, but...I don't know. You know, I know he caught fish and sold it but I think it was for the return, it just didn't pay. (Dick Eide)

Interviewer: Scow Bay. Yeah, ok. Do you get spawn in there too?

Leonard: Yeah ... I don't know. It must be below ten fathom. And then where the ball begins, you know. They lay right at the bottom. Seem like they never hardly move either. (Leonard Skeek)

Interviewer: ... Did there used to be more herring that came in Scow Bay?

Leonard: Yeah.

Interviewer: So what do you think was the cause of the decline here?

Leonard: Well, we fished it one year, but it wasn't all that much, you know, and ever since, it's stopping ... And they've never really come back, real big, you know. (Leonard Skeek)

But you know, actually, if you want to see herring, the time to see herring is in the summertime of course. Because you can drive, what—you can just leave the harbor here and run for a half an hour down the Scow Bay and that place is wall-to-wall herring all summer. Actually it is all winter too. Real easy to see them there. (Consultant #23)

### **Snow Pass**

Richard B. Stough commented that herring once massed in Snow Pass, but no longer does so:

No longer are there large schools of Herring at Sunny Bay, Saginaw Bay, Point Baker, Snow Pass and many places in between. (Richard B. Stough, 1993)

### **Steamer Bay**

Steamer Bay is used as an anchorage point for the Wrangell people. The area currently used for salmon trolling (Thomas Ukas #69 in Goldschmidt and Haas 1998:76) but has also been a location of herring egg harvesting in the past:

Then Steamer Bay was another place that we used to get [herring spawn on macrocystis kelp]. (Dick Stokes)

The area that we had fish eggs here. (Name) and I were the last ones to go up to Steamer Bay (on the west coast of Etolin Island), and we set but there weren't enough, I mean, they'd (the herring) spawned, but not enough, and absolutely hardly any at that shoreline. (ADFG and STA, 1993)

### **Sumner Strait**

Andrea and Donald Hernandez, both residents of Ketchikan identified a lack of herring in Sumner Strait:

Now the waters of Sumner Strait are generally devoid of herring. This winter (1992-1993) I haven't seen any herring. Nor has anyone I have talked with. (Andrea L. Hernandez, 1993)

I know from people who have lived here a lot longer than I have that herring where once abundant in the waters of Sumner Strait (Donald Hernandez, 1993).

### **Sunny Bay**

A smokehouse was once located on the island in Sunny Bay (Thomas Ukas #69 in Goldschmidt and Haas 1998). Richard B. Stough of Ketchikan described the absence of herring spawn at this location:

No longer are there large schools of Herring at Sunny Bay, Saginaw Bay, Point Baker, Snow Pass and many places in between. (Richard B. Stough, 1993)

### **Thomas Bay**

Thomas Bay was once a herring spawning location:

Used to be awful heavy spawning in those areas [Thomas Bay] ... And that's where Petersburg got their herrings for halibut fishing, you know. ... Yeah. And they'd make pots [also known as herring pounds]. (Marvin Kadake)

When I was young, you know, I watched ... as I trolled in these smaller bays, like Thomas Bay and Farragut Bay and up in Port Houghton and Hobart and Windham, you know, and power trolled a little bit up in Seymour Canal: all up and down the Admiralty shore. And there was just little batches of herring except Seymour Canal had a bigger, bigger school. (Ralph Guthrie)

Like, there'd be a mile of beach in Thomas Bay, and that's where the herring was, you know. It wasn't a lot of herring. (Ralph Guthrie)

### **Totem Bay**

Ralph Guthrie identified Totem Bay as a location where herring once spawned:

Ah, you know, I don't know all that much, but I do know there was herring that spawned in Totem Bay. (Ralph Guthrie)

### **Union Bay**

Steve Schrum of Ketchikan identified Union Bay as a prime location for any future herring transplanting or re-stocking efforts:

Well, we need to get those herring on the Endangered Species list and then we need to figure out how we can go to the kelp fishery and move the kelp after the herring

have spawned on the kelp, move it still selling it—the kelp. Move it back down here to Kah Shakes and you know, Union Bay. That would be a good spot because Union Bay's got a lot of potential and you used to see a lot of spawn in there but you don't anymore. And put it up in Quadra in—and let the herring start coming back by transplanting them like you were talking about. Nobody's ever tried it. (Steve Schrum)

### **Woronkofski Island**

Dick Stokes described that herring used to be so plentiful at Woronkofski Island that all he and his uncle would need to secure enough herring was a dip net:

[They] came along with the gillnet and they'd set the net out and they'd put that—most of the time we would put that in Sunrise Bay. And another little bight on the other side of Woronkofski [Island]; it doesn't have a name on it. But, we used to, my uncle used a short net, about 10 feet long and he'd tie it on his main pole and drop it in. And it wouldn't be very deep. And he'd get all the herring he needed then. (Dick Stokes)

### **Wrangell Harbor**

Wrangell Harbor was once a very productive herring spawning location. Local residents recalled jigging herring from the docks in the past, but rarely see herring in the harbor now.

That is pretty similar though in a lot of other places because my dad's from Wrangell and he was talking about that the other day. Because I remember in Wrangell we'd go down to the docks and snag herring in the winter there as well and they don't do that any more as well either. (Mike Miller)

There were a lot of herring in there ... Well, whenever we could get them. It'd be year-round. We used to be able to get them year-round right in Wrangell. I remember as a little boy, growing up at the head of the bay before they dredged it and it was all tide flats. And I'd just take a bucket and just... throw them right on the beach. ... And right in Wrangell Harbor there used to be a lot [massing]. (Dick Stokes)

It's like in front of town here we used to have a lot of herring, lots of herring coming in boy you are lucky to see herring now. (ADFG and STA, 1993)

Intensive winter bait fisheries in the area are blamed for the population decline.

The Wrangell harbor used to have amounts of herring that the bait fishermen would seine them rite [sic] in the harbor. ... It is frustrating for me to know the herring stocks are down in this and other areas and read of taking of the herring eggs and vast overruns of quotas. (Dan Roberts, 1993)

During the early 1950s, in the winter, I was a crew member on Mike Lynch's boat, we seined bait Herring for the cold storage. We put in 1200 to 2400 barrels each year from the harbor here in town [Wrangell]. (Richard B. Stough, 1993)

Until 20 years ago we could see king salmon rushing herring in Wrangell Harbor, and today there are NO HERRING, no salmon and only a very small of school silver smelt. (Richard B. Stough, 1993)

In areas around Juneau, Petersburg, Wrangell and Ketchikan there was several really good populations of herring that have gone below this healthy level, and they have

been held down, and do not have the opportunity to bloom when conditions are good. (James Parker, 1996)

Yeah. Yeah, we did that—there was, we [commercially bait] fished out of Wrangell and Ketchikan and I think it's what you call Kah Shakes? (Leonard Skeek)

Pollution from the pulp mill was also named as a culprit of herring population decline.

And right in Wrangell Harbor there used to be a lot. But I think what killed them off more than anything, was that the mill took all their wood waste and dumped it up in the—one stream that fed into the harbor. And I think whatever was in all that wood waste, mixed with the water coming in and I think that killed them off. I mean, that's just my theory. (Dick Stokes)

### **Wrangell Narrows**

Ralph Guthrie described the disappearance of herring from Wrangell Narrows:

You know, but he was fishing them in Wrangell and Petersburg during the 50s and 60s ... Yeah, well, you know, it's like the herring in Wrangell Narrows that disappeared, you know. It didn't mean that all the herring were you know, but that particular school of herring that over-wintered in the harbor was gone and I don't know where they spend the summers but you know, when they fished it out, it didn't come back. (Ralph Guthrie)

### **Zimovia Straits**

Wrangell Natives have long utilized (and continue to utilize) the shores of Zimovia Straits for seasonal subsistence harvesting, hunting and fishing. Deserted Village on Wrangell Island “was a main village for the Wrangell people” (Thomas Ukas #69 in Goldschmidt and Haas 1998). Several smokehouses owned by the Kiks.ádi people were once located at Thomas Place. Ben Fleenor of Ketchikan remarked on the herring he spotted while salmon fishing in Zimovia Straits, near Thomas Place:

In those days, I was among a few boats that trolled king salmon year round. We almost always looked for sizeable herring stocks before putting the gear in the water. Just a few of the sites that I recall will be noted: Zimovia Straits - probably a square mile of herring laying off Thomas Place. They were so dense that the lines quivered when trolling through. (Ben Fleenor, 1993)

### Predation

Many factors were identified by consultants as the cause of herring population decline (commercial fishing, pollution, etc.). In addition to these place-specific observations, there were consultants who identified changes in herring predator behaviors and populations including halibut, salmon, sea lions, seals, seabirds, whales, and even bears, that may be effecting herring populations in and around Shtax' Héen K̄wáan. Both halibut and salmon follow herring as they migrate inward toward coastal waters in the spring (see the Life Cycle section for more information on this). Fishermen have learned to utilize herring behavior to locate both halibut and salmon as they prey upon large schools of herring:

Oh yeah. Halibut follows herring. The reason why an old-timer told me is when you're fishing halibut in the summertime, they all look first for schools of herring along the shoreline. That's all they did. And then we'd sit on the outside of the school of herring. Sure enough, there was halibut there. Yeah, they follow. They also follow the salmon. (Nels Otness)

So you've got these spawn-outs that are kind of weak in condition. The king salmon come up and into the Sound to feed on those and also to feed on the krill. So when we're targeting king salmon this time of year, the king salmon are feeding on krill and herring. They're changing from worms and an occasional herring and not eating much all winter, to they're starting to also feed on the krill and the herring. So you've

got this krill hatching this time of year. You've got the spawn-out herring starting to feed on that. You've got the king salmon coming in and feeding on the herring and the krill. So we're looking for these schools of herring and schools of krill this time of year from the line at the Cape in, all over the Sound. And wherever there's any concentration of those, we'll fish king salmon. So we're, as trollers, as salmon fishermen we're paying attention to where those herring are, everyday we go out. (Eric Jordan)

You know, I talked to Mike Miller and he said those little chum fries, he'd observed them eating the herring eyes. The little herring eggs that they come out. (Eric Jordan)

Increasing sea lion populations were also of major concern for many consultants since sea lions prey heavily on herring:

Sea lions. I think they're worse than whales [eating more herring]. ... Anyway, sea lions, yeah, we're—instead of one or two rookies on some of these islands, now there's five or six rookies on them: sea lion rookeries. (Nels Otness)

There are two things that are really obvious to those of us that have been around here a long time. The sea lion population is really growing. I mean there's way more sea lions than there used to be. And there's way more humpbacks. (Eric Jordan)

Well, there's a lot more sea lions than there were when we used to get to clink them you know. (Consultant #23)

Seals also follow the herring:

And the seal would come in, the harbor seal, there [especially during spawning time]. (Dick Stokes)

Seabirds, especially seagulls were often reliable indicators of herring spawn locations as they prey heavily on the roe:

Of course you always got the seagulls. They were always around. The seagulls would have a good time. (Dick Stokes)

I'm sure there was a good supply of seagulls [feeding on herring] and I don't remember sea lions being around, but then they weren't around in those days anyways. (Dick Eide)

Whales prey upon herring in large quantities as well. Increasing whale populations were a cause for concern for many consultants:

We used to have a lot of whale come in the spring too, when there were a lot of herring. (Dick Stokes)

...You know, it's more likely their [whale] numbers [are higher?] right now than it was 30 years ago, but we know there are an awful lot more. And those guys eat herring. They also eat humpies, little fry: we've been seeing them. And we're feeding them at Hidden Falls Hatchery: the chum fry. And it's going to be a big deal. They're eating a lot more fish than we're taking. Somebody needs to manage those whales if we're going to have any resources around here. (Consultant #23)

Even bears have been observed feasting on herring roe:

Dick: ...There used to be a lot of bears that would be feeding on the roe.

Interviewer: On the herring roe?

Dick: Mmhm.

Interviewer: Would that be both black and brown bears?

Dick: Yeah. And the brownies would be up forward and the black would be down here. And the—that's the same way when the humpies come in. You never did see a brown bear up by the falls. They'd always low tide—they'd always be at the tide flats. And then up by the upper falls, you'd find the brown bear. Blackies would be in between. (Dick Stokes)

### **Kéex' and Kooyú Kwáans: Kake/Kuiu**

Kéex' Territory encompasses the northern and eastern portions of Kupreanof Island as well as the western shoreline of Kuiu Island. It continues toward the north to include most of Frederick Sound as well as Pybus Bay on Admiralty Island in the northwest and Port Houghton on Alaska's mainland. We conducted one focus group in Kake in June of 2008. Six people were interviewed altogether.

Kooyú Kwáan territory includes the entire western shoreline of Kuiu Island, from Frederick Sound in the north to Sumner Strait in the south with the inclusion of Coronation Island and all of the islands along Kuiu that are located in Chatham Strait. Interviewees from Klawock and Kake, where most Kooyú Kwáan residents became dispersed, as well as other communities made comments on herring schools in this area.

Kuiu Island has long been used by the people of the Kake and Klawock territories. Northern Kuiu Island, including Saginaw Bay, Security Bay, Washington Bay and the Port Camden area are well known and well used by the people of Kake for hunting, fishing, gathering and other subsistence activities at seasonal camps such as drying fish. Washington Bay is known as Gakwyik and was utilized by Kake people to put up herring oil before the Washington Bay Cannery was established (Goldschmidt and Haas 1998:93). The central portion of the island, including Tebenkof Bay and Port

Malmesbury is utilized by the people of both Kake and Klawock, but was formerly the center of Kooyú . The southern portion of the island including Threemile Arm and Conclusion Island is designated as Klawock territory.

The Kooyú people are closely related to the Kéex' and Hinyaa Tlingit, and their kwáan boundaries overlap with those of both groups. Emmons (n.d.) states that the name “Kuyu” derives from the word “stomach,” a metaphorical association referring to the shape of Kuiu Island or some bay in which the people first settled. The name refers to Tebenkof Bay which is said to resemble a stomach or “cavelike opening.” Tebenkof Bay was the site of numerous settlements and forts. However, the population there was decimated by smallpox epidemics in the nineteenth century and the survivors moved to Kake and Klawock.

The Alaska Department of Fish and Game (ADFG) has managed a small portion (Hobart Bay- Port Houghton, District 10) of the Kéex' Kwáan, Kake Territory as a winter food and bait fishery since 1993 and as a sac roe gillnet fishery since 1997 when a regulation was passed to permit any unused portion of the winter food and bait fishery guideline harvest levels (GHL) to be transferred to the sac roe gillnet fishery that takes place in the spring (see Figure 1). Sac roe gillnet fisheries have occurred in the Hobart Bay-Port Houghton area in 1997, 1998, 1999, 2005, 2008 and 2009 (ADFG News Release: Hobart Bay/Port Houghton Sac Roe Herring Gillnet Fishery Guideline Harvest Level for 2009)

The first ADFG records of herring spawning activity began in 1984 and have continued nearly every year through 2009. For the past ten years, the first major spawning events have occurred as early as April 19 and as late as May 4 with a peak spawning date of April 30. (ADFG 2008 Southeast Alaska Sac Roe Herring Fishery Management Plan) Nautical miles of spawn documented during this same time period

(1984 – 2009) ranges from zero nautical miles to approximately 19 nautical miles (Marc Pritchett, personal communication).

There are no commercial herring areas managed by the Alaska Department of Fish and Game (ADFG) within Kooyú Kwáan territory.

The following is a list of locations within the Kéex' and Kooyú Kwáans, that were identified as notable herring spawning and massing areas during individual interviews and focus group interviews conducted during this synthesis project and in previously documented research efforts:

Affleck Canal, Big Creek, Big John Bay, Cape Bendel, Chatham Strait, Conclusion Island, Dakaneek Bay, Deep Cove, Frederick Sound, Gedney Harbor, Gil Harbor, Halleck Harbor, Hamilton Bay, Kadake Bay, Kake, Keku Islands, Kuiu Island, Monte Carlo Island, No Name Bay, Pillar Bay, Pinta Point, Point Barrie, Port Armstrong, Port Beauclerc, Port Camden, Port Conclusion, Port Herbert, Port Houghton, Port Lucy, Port Malmsbury, Portage Bay, Pybus Bay, Rocky Pass Inlet, Rowan Bay, Saginaw Bay, Salt Lake, Security Bay, Table Bay, Tebenkof Bay, Threemile Arm, Turnabout Island, and Washington Bay

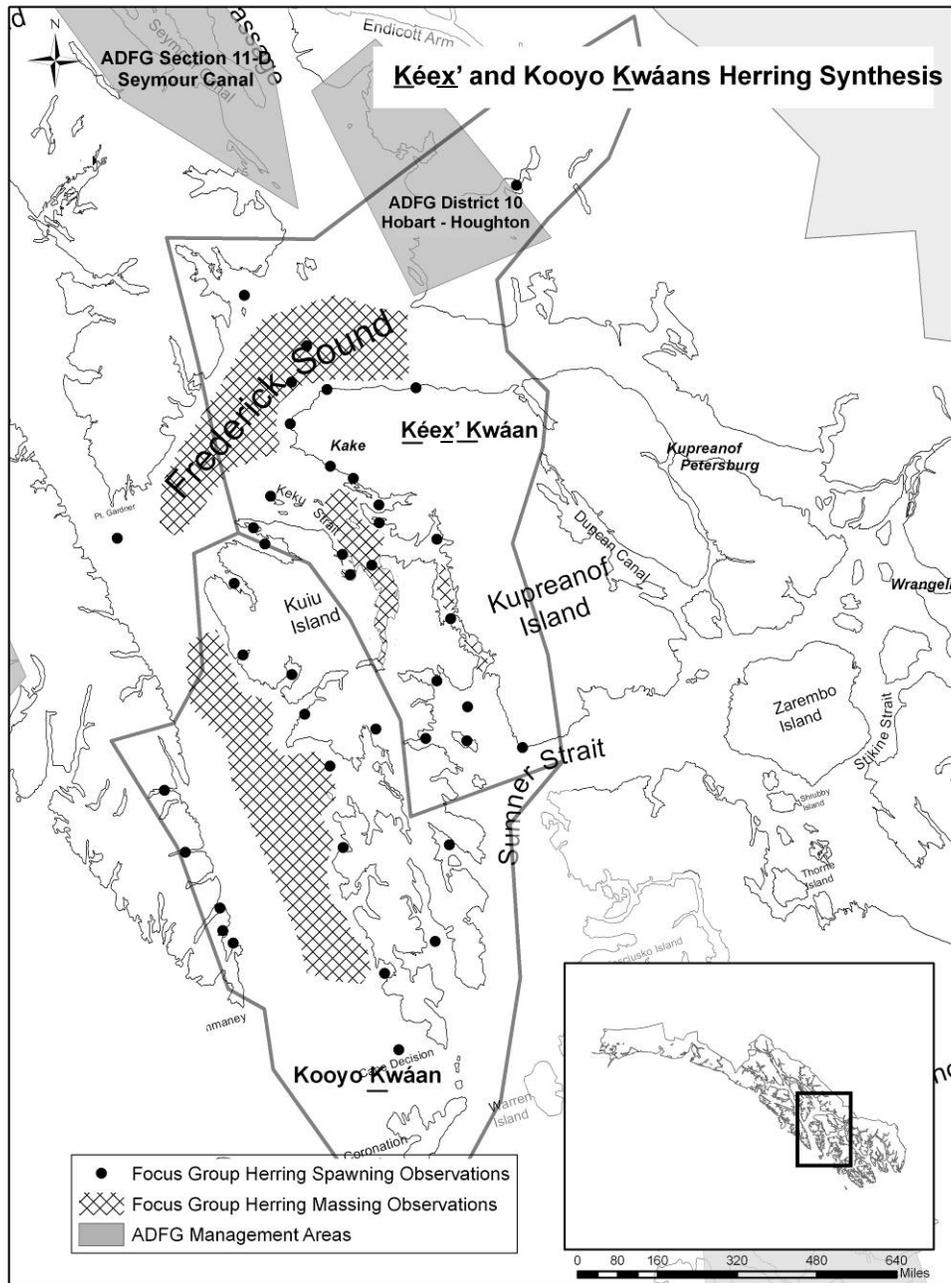


Figure 6.4: Overview of Herring Spawning Areas and LTK Observation in Kéex' and Kooyo Kwáans

### **Regional Comments**

Eastside of Kuiu; used to be one of the biggest spawning areas from No Name Bay to Conclusion Island, all around Monte Carlo Island, and from Three Mile Arm to No Name Bay; the big herring boats from South fished for the herring fertilizer plants in Chatham Straits for many years and that depleted our herring spawns; the spawns have been getting better every year since those big boats quit fishing in that area. This has never been opened for a sac roe fishery or a pond fishery, and we will fight the state in courts if they ever try to open that fishery (Franklin James, Sr.).

### **Affleck Canal**

Affleck Canal was identified as a minor herring spawning area:

There was —here. There was spawn here, but not a lot. (Consultant #13).

### **Big Creek**

Clarence Jackson remembered camping at Big Creek to catch and render herring oil:

And then in April they moved here someplace. Right here I think [Big Creek]. ... They moved there, the whole village and they rendered herring for the oil. The oil was real clear and they used it for cooking: cooking oil. (Clarence Jackson)

### **Big John Bay**

Big John Bay once supported a large spawning herring population:

Yeah, it used to be spawned all the way out in that area [Big John Bay]. (Mike Jackson)

Marvin Kadake identified Big John Bay as a location to be considered for any future herring restoration efforts:

Interviewer: Are there areas that you think would be especially important to restore or try to restore herring? ...

Marvin: Big John Bay. (Marvin Kadake)

### **Cape Bendel**

Cape Bendel was once utilized as a fish camp according to Harold Martin:

We used to have a fish camp up there for children, grandchildren. Guys still used it [herring rakes] in those days. I was just a young kid then.... It's never been the same. Like I said, you know, when you go through Cape Bendel anymore, there's little schools here and there. Where it used to be en masse all the way across the Frederick Sound. (Harold Martin)

Leonard Skeek remembered utilizing the area for commercial fishing:

Well, the herring get—we used to see plenty of once in a while the herring boats used to come out that way. It was about a Port McCartney and Cape Bendel, Turnabout Island. (Leonard Skeek)

### **Conclusion Island**

See Regional Comments

### **Chatham Strait**

They fished right around in this area [Chatham Strait]. ... See, the herring boats really concentrated right here [Chatham Strait] because the plant was right there. ... Yeah, the boats just went right around the corner and they went into the cannery there. But this is where I was telling you they would get tons of herring and they would have this long tube and they would dip the hoop into the seines of fish and they'd lift this hoop and they had it connect to the hatch and they would—literally

two or three tons of herring would pour into the boat and it was absolutely fascinating to watch that process. And the tenders, I mean the boats would fill up real quick and the seine would still be way out there, everything would be dead inside the net, and they would let it go. Day after day after day they did that, until one day in my time, the herring disappeared. And now, very, very seldom do you see herring stock. I saw it when I could almost walk across Chatham Straits to Baranof shore there was so much herring boiling. (Clarence Jackson)

Then they, like my sister was talking, they used to let the fertilizer [reduction] boats, after they wiped out Chatham Straits. ... come fish outside of Hole-in-the-Wall: inside of St. Joseph and outside of St. Joseph Island. ... Eastside of Kuiu; used to be one of the biggest spawning areas from No Name Bay to Conclusion Island, all around Monte Carlo Island, and from Three Mile Arm to No Name Bay; the big herring boats from South fished for the herring fertilizer plants in Chatham Straits for many years and that depleted our herring spawns; the spawns have been getting better every year since those big boats quit fishing in that area. This has never been opened for a sac roe fishery or a pond fishery, and we will fight the state in courts if they ever try to open that fishery. (Franklin James, Sr.)

### **Dakaneek Bay**

Mike Jackson recalled seeing very large herring at Dakaneek Bay:

See, and just like Dakaneek, there's that bight in there. Boy, they [the herring] were big. They'd go up and you'd still see some up in there. These are like those lakes, like in here. (Mike Jackson)

### **Deep Cove**

Mr. Jackson identifies Deep Cove as a herring spawning location:

I think there's a spawn in Patterson Bay and Deep Cove. (Clarence Jackson)

### **Frederick Sound**

Frederick Sound was noted as a place where herring massed in abundance:

Where it used to be en masse all the way across the Frederick Sound. (Harold Martin)

The whole Frederick Sound would be just boiling and all the way down the Chatham. You name it. It'd be spawning just real—flipping all over the place. (Marvin Kadake)

And they're getting a good build-up of herring in Frederick Sound, Chatham, Stephens Pass area and from Seymour Canal down to Tyee. (Ralph Guthrie).

### **Gedney Harbor**

Clarence Jackson remembered commercial fishermen in Gedney Harbor:

And they trawled out here. All along these shores [by Gedney Harbor]. (Clarence Jackson)

### **Gil Harbor**

Gil Harbor was identified as a herring spawning location:

Harold Martin: Wasn't there a spawn in Gil Harbor?

George Davis: Yes ... Yeah, I've seen it spawn there before.

(Harold Martin and George Davis)

But the whole area used to be all spawn, all the way from Kadake Bay, Gil Harbor, Saginaw Bay and all those places. (Mike Jackson)

### **Halleck Harbor**

Halleck Harbor was identified as a herring massing area:

Back in this area too, we used to get a lot of herring. It's real deep in here though. We used to—when we used to get big herring ... Yeah, we used to get a lot of herring in there for longlining. (Owen James)

I don't know whether with the tide or what they—whatever it is, the feeding ground or whatever they come in there for, but boy they come out thick right off those by the bluffs over here. (Leonard Skeek)

### **Hamilton Bay**

Hamilton Bay was often used for gathering and harvesting herring roe for subsistence, but spawning populations have been declining:

But I think there's a herring spawn right in here [Hamilton Bay] someplace too. We just don't check it. This place [near the boat harbor] there's a herring spawn. A very small one right here. And I've been dumping herring here forever. (Clarence Jackson)

Yes, in places like Port Camden, and Saginaw Bay, little—a little was done there in Hamilton Bay also. But the first place that spawns was in Saginaw Bay during the first big tide in April. ... They were bigger in the olden days. Now they're getting less and less and less, especially Camden and Hamilton Bay area. (George Davis)

But I do recall, in our area, when I was a boy, we used to go up to Hamilton Bay and Port Camden. We didn't have to wait for Sitka to spawn. We'd go up to Hamilton Bay and Port Camden and put our branches out, and we'd get herring eggs. (Wilbur Brown)

Yeah, but it was something to see because right about this time too, we'd go up to Grandpa's Garden—it's still called that—Grandma's Garden, up in Hamilton Bay. And we went up there first with my father and his uncles and aunts and we'd have a big picnic and make it a lot of fun. We'd go down on the beach at low tide and pick all this kelp with herring spawn on it and bring it up to the garden. (Mike Jackson)

Interviewer: Are there areas that you think would be especially important to restore or try to restore herring? Habitats that would be good for restoring herring spawns where there aren't? I mean if not every place could be rehabilitated, would there be some that would be good candidates?

Marvin: Probably like, just in this area again. .. Camden and Hamilton Bay. Wherever the herrings were thickest then I'd move it there, you know. And just fill up the pot [also known as a herring pound] and would put branches in there and let them spawn out and pass it out to the town. So that was part of the program there. (Marvin Kadake)

Oh yeah. Hamilton Bay. Let's see now. All along this here, this shallow here. We used to set branches in there back this way. (Leonard Skeek)

Yes, right up inside of the—I wish I knew the name of the islands by Hamilton. Before you get to Seal Point there's a bay back inside there before you get to Seal

Point. There's a bay back in there, a lot of herring out of there: a lot of herrings. They do a lot of spawning in there too. (Owen James)

Even in Seymour Canal when the guys set there, you know, that school isn't big enough to get enough spawn in one spot, you know. So, and that was the same, like, guys get a little bit of herring eggs in Hamilton Bay. Right across the bay there. (Ralph Guthrie)

### **Kadake Bay**

Kadake Bay was noted as a herring spawning area:

But the whole area used to be all spawn, all the way from Kadake Bay, Gill Harbor, Saginaw Bay and all those places. (Mike Jackson)

That's another place. This is—Port Camden is where—that's Kadake Bay is here. (Owen James)

### **Kake**

A minor herring spawn was identified in Kake:

I have a dip net that I made up to fish for herring, and in the winter/spring would take it to the local docks to dip out some herring that were schooled there. All I would have to do was to stomp my foot on the dock, dip the net in and pull out enough herring to fill my needs for bait and for eating. There are no more herring to that anymore ... While growing up I remember my father, mother and brothers moving to a fishing camp at a place between Petersburg and Kake, where our family would spend the summer commercial fishing. I remember seeing mile upon mile of herring, so much herring the water seemed to boil. My grandfather Adam James use to fish

herring using a herring rake. In order to use a herring rake there has to be a lot of herring otherwise it won't be effective. (Johnathan Dewitt, 19993)

But everywhere we have a spawn in May, up in Port Camden and May and right in the village there: Kake ... C: It spawned at different times. This might have spawned a bit earlier here, but our spawn in the harbor usually occurred around May, just before Memorial Day. (Clarence Jackson)

I never actually went after herring eggs up around Kake. We used them for trolling bait. We used to eat it when it was in season, you know: fried herring, boiled herring. The old man used to cook it. ... Well, it's just a small spawn around Kake. It's not like the Sitka area. (Harold Martin)

Now it's turning later here because maybe the temperature's changed. Because we're three degree difference now from the early times. (Marvin Kadake)

### **Keku Islands**

Leonard Skeek observed herring massing at Keku Islands in the wintertime:

I don't know if just to keep body warmth or what it is, but that one out at Kake there it's out by Southeast Cove. And they winter out there. You can get herring out there. ... I know wintertime, when we're trolling, when we're trapping rather. We used to run down that Southeast Cove and jig for herring out there; catch fresh herring. (Leonard Skeek)

### **Kuiu Island**

Herring have spawned at Kuiu Island according to Franklin James, Sr.:

Eastside of Kuiu; used to be one of the biggest spawning areas from No Name Bay to Conclusion Island, all around Monte Carlo Island, and from Three Mile Arm to No Name Bay; the big herring boats from South fished for the herring fertilizer plants in Chatham Straits for many years and that depleted our herring spawns; the spawns have been getting better every year since those big boats quit fishing in that area. This has never been opened for a sac roe fishery or a pond fishery, and we will fight the state in courts if they ever try to open that fishery. (Franklin James, Sr.)

### **Monte Carlo Island**

Franklin James, Sr. commented on herring spawn at Monte Carlo Island (also see Regional Comments):

Yeah Monte Carlo. And Monte Carlo there's a reef runs out this way and that spawns all over that reef right here. (Franklin James, Sr.)

### **No Name Bay**

See Regional Comments

### **Patterson Bay**

Clarence Jackson spoke about herring spawn in Patterson Bay:

I think there's a spawn in Patterson Bay and Deep Cove. (Clarence Jackson)

### **Pillar Bay (Cannery)**

Pillar Bay was once the site of a cannery. Both herring spawn and reduction boats were observed here:

Pillar Bay had a reduction plant right where this green dot is. (Clarence Jackson)

Before I forget, I need to say something. That is the fact that we need to call Kake and confirm the fact that there used to be a lot of herring in the Kake area, Tebenkof, in that area, and they put that [reduction plant] in Pillar Bay for herring and they used it for fertilizer or something. But they ah...and that was 1938 I think. They killed it off. And what we need to look at is that once the herring are killed off, they don't come back. You would think that 1938 that it'd rebuild itself by now but it didn't. That's what we have to look at. When we try to protect Sitka Sound, we need to use that as an argument. (Fred Hope)

Interviewer: Yeah. And also had spawn? Pillar Bay? All around?

Marvin: Yeah.

(Marvin Kadake)

I remember that there. I was still learning the country, you know, but it's one of the things that kind of stays in your mind when you're growing up, when you're first learn about some place. And that's where we saw some of the herring [reduction] boats again, down there. (Leonard Skeek: recalling when he was eleven [1942])

### **Pinta Point**

Pinta Point had abundant herring spawn:

But, I recall there was so much herring you could hear it. You could hear—it sounds like a heavy shower in the water and like Marvin said, you know, the people out at fish camp knew when to come out. (Wilbur Brown)

### **Point Barrie**

Clarence Jackson identified Point Barrie as a herring spawning location:

Some [herring spawn] there, there and Point Barrie right in here someplace.  
(Clarence Jackson)

### **Port Armstrong**

Sonny Deegan notes the locations of many reduction plant fisheries and the concern felt by the local residents regarding the depletion of the herring stocks:

In the 30s, 40s and 50s there were herring reduction plants in Port Armstrong, Port Conclusion, Port Lucy Port Herbert, Big Port Walter, Washington Bay, Rowan Bay and these are the ones I can remember off the top of my head. These plants operated for many years and all of the herring were caught right out in Chatam Straights [sic]. At this time, fisherman and others knew that if this fishery wasn't stopped or slowed down greatly that the native herring stocks would be depleted. And now they are. This was a warning 30 years ago. (Sonney Deegan, 1993)

### **Port Beauclerc**

Marvin Kadake commercial fished in Port Beauclerc:

All the way out over here [Port Beauclerc]. We trolled; all the way through these areas here. There's just mass of herrings. (Marvin Kadake)

### **Port Camden**

Port Camden belongs to the Sukteeneidí clan (Goldshmidt and Haas 1998). Many identified Port Camden as a place where exceptionally large herring could be found:

No, there is places where you'd usually would find big herring. Port Camden out by Kake is known for big herring. (Dick Eidie)

It is also recognized as a herring spawning area, although populations are declining noticeably:

Yes, in places like Port Camden, and Saginaw Bay, little—a little was done there in Hamilton Bay also. ... But the stock in the Port Camden stayed there. ... They were bigger in the olden days. Now they're getting less and less and less, especially Camden and Hamilton Bay area . ... In the early times, the spawn used to be pretty heavy, and as the years went by, it was getting less and less. Now, I talked to these people around Kake. If the herrings still spawn up in Camden, then a lot of them told me, "No, they don't spawn up there any more." (George Davis)

But I do recall, in our area, when I was a boy, we used to go up to Hamilton Bay and Port Camden. We didn't have to wait for Sitka to spawn. We'd go up to Hamilton Bay and Port Camden and put our branches out, and we'd get herring eggs... And years ago, I think it was probably over thirty years ago, maybe longer, there—herring fishing was allowed in Port Camden. And this was in the winter. They called it bait fishing because it was the big maybe eight, six, seven year old herring. And they did their fishing at night because that's when the herring came up ... in Port Camden, you used to hear them at night [the herring]. They would come up at night. During the day, you couldn't see them. They were down deep. (Harold Martin)

Right now, we don't even get a spawn up there. A lot of people from here used to go to Port Camden to get their herring eggs. (Wesley Brown)

But yeah, we used to go up Port Camden—Robert Davis, he was just here and we were reminiscing because Gilbert and I ... were out there waiting for the herring to spawn and we're camped out by that waterfall. Boy, that was the coldest camp I ever had: that little waterfall where you said they were spawning. ... Yeah, right on that beach side: the east side there. (Mike Jackson)

Interviewer: In places like, was it Port Camden and places like that?

Leonard: Yeah, there was placed there they spawned, yeah. ... Oh this—there was at Port Camden in there. Hamilton Bay, geez! There was spawn quite a ways, way up in there, Port Camden. (Leonard Skeek)

Port Camden. ... Yeah, we fished there off-and-on. There was herring there. Actually, we liked to get—go to the places that were closest to town and then at the same time we didn't want to clean those places out. That didn't make any sense. (Nels Otness)

That's another place [where herring spawned]. This is—Port Camden is where—that's Kadake Bay is here. (Owen James)

Marvin Kadake identified Port Camden as an ideal place for herring restoration:

Interviewer: And so you would also see masses in...Port Camden?

Marvin: Yeah

...

Interviewer: Are there areas that you think would be especially important to restore or try to restore herring? Habitats that would be good for restoring herring spawns where there aren't? I mean if not every place could be rehabilitated, would there be some that would be good candidates?

Marvin: ... Camden and Hamilton Bay. Wherever the herrings were thickest then I'd move it there, you know. And just fill up the pot [also known as a herring pound] and would put branches in there and let them spawn out and pass it out to the town. So that was part of the program there. (Marvin Kadake)

Clarence Jackson has attempted to transplant herring spawn here:

And this one [herring spawn] disappeared for no reason. And for all I know this still going because there's no commercial herring fishing in this area.... But everywhere we have a spawn in May, up in Port Camden ... About four or five years went by and then they [the herring he transplanted] showed up. And the guys told me, "Your herring came back," and they're saying that to me again this year. The big herring are back again. I haven't seen one ... And they [the herring he transplanted] were up in Port Camden. The whole bay was just boiling with herring like in February. They showed up. (Clarence Jackson)

### **Port Conclusion**

See comment for Port Armstrong, Sonny Deegan.

### **Port Herbert**

Mr. Jackson notes the presence of a reduction plant at Port Herbert (see additional comment: Port Armstrong, Sonny Deegan):

[There was a reduction plant at] Port Walter-Port Herbert I think. Port Herbert.  
(Clarence Jackson)

### **Port Houghton**

Port Houghton belongs to the Taneidí clan. The Kake Natives once occupied the cabins that still remain here (Goldschmidt and Haas 1998:177). Clarence Jackson remarked on this:

We came here to Port Houghton ... That's where the people lived in April. And they dried herring there on branches in the trees. (Clarence Jackson)

Other consultants remembered commercial fishing at Port Houghton:

Been in Tenakee, Port Houghton. I mean I—we looked at a lot of area [when commercial fishing] ... You know, it wasn't a big amount of fish there. There never was. (Dick Eide)

When I was young, you know, I watched a handful in these smaller bays, like Thomas Bay and Farragut Bay and up in Port Houghton and Hobart and Windham, you know, and power trolled a little bit up in Seymour Canal: all up and down the Admiralty shore. And there was just little batches of herring except Seymour Canal had a bigger, bigger school . ... But, you know, Hobart had just a tiny little school and Windham had tiny—so was Port Houghton. (Ralph Guthrie)

### **Port Lucy**

See comment for Port Armstrong, Sonny Deegan.

### **Port Malmsbury**

Port Malmsbury was utilized for the herring bait fishery:

You know, like there's a—I trolled in Chatham Straits [for bait] you know a lot of winters, you know. And there was a pretty good bunch of herring that lived in Malmsbury and Tebenkof, you know. Those were the ones I'm really familiar with because I spent a lot of time there all by myself, you know. (Ralph Guthrie)

Because we're trolling in here with our grandfather and he'd point these places out. There was a fish blind down here, but we went into Port Malmsbury, and he said all along this north end area was all spawn. (Mike Jackson)

## **Portage Bay**

Herring spawn was observed in Portage Bay:

In the early times, the spawn used to be pretty heavy, and as the years went by, it was getting less and less. Now, I talked to these people around Kake. If the herrings still spawn up in Camden, then a lot of them told me, “No, they don’t spawn up there any more”. ... And the same with Portage Bay and Hamilton Bay. (George Davis)

Oh, all of Portage Bay [had herring spawn]. (Mike Jackson)

All those places spawned. All of them. ... Portage [Bay]. (Marvin Kadake)

Right around Hamilton Bay and right outside the village: south end there. We called it Portage Bay. ... The herring spawned over there and we fished there too. Just like any other place where the herrings age, you know. I forget how old these herrings we were after. Quite, pretty old: big herring, you know. ... Yeah, even right up the Portage Bay. Right there where this boat harbor is. There was spawn all the way up in that way. (Leonard Skeek)

Portage Bay, the logging camp was there, they just diminished it [the herring spawn] too. (Owen James)

We left real early in the morning, you know, on a seining trip. We were going to go to the fisheries up in Icy Straits for salmon. And you could run through the herring from Portage Bay clear to Warm Springs Bay, you know, because they [the seine boats] hadn’t worked on it heavily on this end. (Ralph Guthrie)

Well the only area I would say is the big spawn when I was a kid was Portage Bay, in Tenakee. (Al Martin)

### **Pybus Bay**

Pybus Bay was identified as a herring spawning location:

Ah. I know Pybus Bay and Gambier [had herring spawn]. (George Davis)

No matter where we went, there was herring everywhere. And then later in the spring we'd end up at Pybus Bay [to collect herring]. (Wilbur Brown)

Clarence Jackson has attempted to transplant herring eggs here:

But I've been bringing herring eggs almost 39 years from Sitka and planting them around [Pybus Bay]. (Clarence Jackson)

Lots. The whole bay [was filled with herring]. (Marvin Kadake)

### **Rocky Pass Inlet**

Rocky Pass Inlet once supported a spawning herring population.

[Herring spawned] In Kuiu. And the North entrance of Rocky Pass. (Franklin James, Sr.)

Yeah, that's the area that used to spawn [Pybus Bay]. (George Davis)

### **Rowan Bay**

A herring reduction plant once operated in Rowan Bay according to Sonny Deegan:

In the 30s, 40s and 50s there were herring reduction plants in Port Armstrong, Port Conclusion, Port Lucy Port Herbert, Big Port Walter, Washington Bay, Rowan Bay and these are the ones I can remember off the top of my head. These plants operated

for many years and all of the herring were caught right out in Chatam Straights [sic]. At this time, fisherman and others knew that if this fishery wasn't stopped or slowed down greatly that the native herring stocks would be depleted. And now they are. This was a warning 30 years ago. (Sonny Deegan, 1993)

Clarence Jackson remembers herring spawn here:

[H]ere in Rowan Bay there has to be a herring spawn sometimes. There has to be. Maybe not on that flat spot, right in here. (Clarence Jackson)

### **Saginaw Bay**

Saginaw bay is known as Skanáx and belonged aboriginally to the Tssagweidí clan (Goldschmidt and Haas 1998:93). The area is primarily used by Natives for trolling but was also identified by many consultants as a herring spawning location:

No longer are there large schools of Herring [sic] at Sunny Bay, Saginaw Bay, Point Baker, Snow Pass and many places in between ... I might mention that Big Port Walter, a herring reduction plant, was operating at this time, receiving most of the catch from Saginaw Bay to Tebenkof Bay. (Richard B. Stough, 1993)

Interviewer: And there was never any in Saginaw or Security?

Clarence: Oh, I'm sure there was up here. Up here in the little harbor. (Clarence Jackson)

But they [herring] seined all the way up in here by Saginaw [Bay]. Where's Saginaw?

Yeah, right here. (Clarence Jackson)

But you know, my mother said they would stop in Saginaw Bay when we were migrating to Pillar Bay. We lived here every year, every year. Let me mark that spot.  
(Clarence Jackson)

Yes, in places like Port Camden, and Saginaw Bay, little—a little [seining] was done there in Hamilton Bay also. (George Davis)

And then we'd go to Saginaw Bay [to collect herring] in June I think it was. (Wilbur Brown)

Mike: But the whole area used to be all spawn, all the way from Kadake Bay, Gil Harbor, Saginaw Bay and all those places....

Interviewer: And Saginaw Bay also had spawn?

Mike: A lot of spawn, yeah.

Interviewer: Even in the deep?

Mike: Yeah—no, way up in the bay.

(Mike Jackson)

Especially around Saginaw here [there was herring spawn]. Between Saginaw and Tyee. (Wesley Brown)

T: Ok. Did they [the reduction fishery vessels] ever come up any closer to Kake?

L: No. Not real close. No, the closest they came was Saginaw Bay ... Well, they come into Saginaw Bay.

(Leonard Skeek)

Leonard: Because it was one of those places where they the current picks 'em up and takes them all the way in along the shore of Security Bay up inside the channel and come out. Geez! It used to just be noisy all the herring boiling up. Yeah.

Interviewer: So the current would bring them in from the outside...?

Leonard: Yeah.

Interviewer: ... into Security Bay and into Saginaw Bay?

Leonard: Yeah. We don't see that there anymore.

(Leonard Skeek)

### **Salt Lake**

Salt Lake was identified as a herring spawning area:

Salt Lake, right up in here [had herring spawn]. (Mike Jackson)

Yeah. Trying to think of the names of other places, like here is Salt Lake. They go up into that lake and they also go back up in here to the right too. I used to a lot. I used to get herring. (Owen James)

### **Security Bay**

Security Bay (Kúchx'w) belongs to the Kooshdaa Hít house of the Kaach.ádi clan. It was identified as a herring spawning location (see additional comment: Saginaw Bay, Clarence Jackson):

All the way up. Right from the mouth, all they way in [there was herring spawn].  
(Marvin Kadake)

Because it was one of those places where they the current picks em up and takes them all the way in along the shore of Security Bay up inside the channel and come

out. Geez! It used to just be noisy all the herring boiling up. Yeah ... We don't see that there anymore. (Leonard Skeek: when I was eleven [1942])

### **Table Bay**

Ralph Guthrie recalls herring massing at Table Bay:

You know, like there's a—I trolled in Chatham Straits you know a lot of winters, you know. And there was a pretty good bunch of herring that lived in Malmsbury and Tebenkoff, you know. Those were the ones I'm really familiar with because I spent a lot of time there all by myself, you know. And down in Table Bay, you know, there was a little batch of over-winters. And those are, you know, fully adult herring. ... That stock of herring that was in Table Bay where I have the most experience was starting to build, you know. And what I get worried about is when these stocks start building; the next thing you'll see is a commercial fishery on it. (Ralph Guthrie)

### **Tebenkof Bay**

Gap Point (Kalhéen Aan), on the north side of Tebenkof Bay, was once occupied by the Kuiu people. Herring massing was noted here, as were reduction and commercial fishing fleets (see additional comments: Table Bay, Ralph Guthrie).

I might mention that Big Port Walter, a herring reduction plant, was operating at this time [1950s], receiving most of the catch from Saginaw Bay to Tebenkof Bay. (Richard B. Stough, 1993)

Clarence: Tebenkof, you know, all this area here. ... Everywhere there was big populations. Right in here. And they said this goes really good in April here.

Interviewer: But today you won't find it?

Clarence: No

Interviewer: So when did it disappear?

Clarence: It disappeared a long time ago (laughing)

Interviewer: Before your time?

Clarence: No, this one disappeared in my time.

(Clarence Jackson)

We used to go to Seymour Canal [and] Tebenkof Bay [commercial fishing in 1949].

(Nels Otness)

Yeah, the Tebenkof area. They're talking about the herring schools down there. It seems like those populations are building at the Flats again. (Eric Jordan)

### **Threemile Arm**

Threemile Arm (Tlaxánk'oo) belongs to the Was'eeneidí. It is currently used for commercial purse seine fisheries (Goldschmidt and Haas 1998:177). It was identified as a herring spawning location (see also, Regional Comments).

Yeah, they'd go in there, same as the Salt Chuck up here at Threemile Arm. Yeah, right there. You already have it marked. (Mike Jackson)

And then there was, you know Reed Bay, Threemile Arm area. You know, there was a big stock of herring that used to spawn there and they were fished out by that group of herring seiners, you know, that was finally—like I told you, was finally coming down about 1957 was probably the last year that they fished there. (Ralph Guthrie).

Threemile Arm on Kuiu was one of the biggest spawning areas ... It still spawns real heavy there in Threemile Arm. (Franklin James, Sr.)

## **Turnabout Island**

Turnabout Island was noted as an area used by commercial fishermen:

They [herring] were on Turnabout Island. (Harold Martin)

[A] lot of them [commercial herring seiners] used to fish around Turnabout Island.

(George Davis)

And the halibut, they're flat, right? You think they chase the herrings this way? No. They come up sideways like this. And they feed on the herrings this way. And we witnessed that over in—how many times out Turnabout Island. It'd just be boiling out there and we used to go out there and watch them and watch all the halibut. It'd be just thousands, millions of herrings just all over the place. And you could see the eagles just diving: no end, you know. (Marvin Kadake)

Well, the herring get—we used to see plenty of once in a while the herring boats used to come out that way. It was about a Port McCartney and Cape Bendel, Turnabout Island. (Leonard Skeek)

[I've seen herring at] Turnabout Island, near Pinta Point. (Ralph Guthrie)

## **Washington Bay**

According to Fred Friday (#87), “ Washington Bay is called Gakwyík. All Kake people used to go there to put up herring oil nearly on the site of the present cannery... The area belonged to the Shangukeidí people” (Goldschmidt and Haas 1998:93).

In the 30s, 40s and 50s there were herring reduction plants in Port Armstrong, Port Conclusion, Port Lucy Port Herbert, Big Port Walter, Washington Bay, Rowan Bay and these are the ones I can remember off the top of my head. These plants operated for many years and all of the herring were caught right out in Chatam Straights [sic]. At this time, fisherman and others knew that if this fishery wasn't stopped or slowed down greatly that the native herring stocks would be depleted. And now they are. This was a warning 30 years ago. (Sonny Deegan, 1993)

Washington Bay had one [a herring reduction plant]. (Clarence Jackson).

...Washington Bay and Point Adolphus ...[had] really humongous herring. (John Martin).

Right outside by Washington Bay [the reduction plant herring seiners fished].  
(Leonard Skeek)

### Predation

Many factors have been identified as the cause of herring population decline (commercial fishing, pollution, etc.). In addition to these place-specific observations, there were consultants who identified changes in herring predator behaviors and populations that may be effecting herring populations in and around Kéex' and Kooyú Kwáans. Salmon and halibut are identified as predator species that are dependent upon herring populations for survival:

But along with the disappearance of the herring the big king salmon runs disappeared. And so there's a direct tie to the feed that the fish come in ... (Clarence Jackson).

And the halibut, they're flat, right? You think they chase the herrings this way? No. They come up sideways like this. And they feed on the herrings this way. (Marvin Kadake)

I know that the halibut used to jump out of the water too, trying to get herring. They were always playing with the herring. You see humpies jumping now, but you see halibut jump, it's there. (Wesley Brown)

### **Xutsnoowú Kwáan: Angoon**

Xutsnoowú territory stretches along the entire western coast of Admiralty Island along the shores of Chatham Strait and continues south to encompass the entire eastern shore of Baranof Island to include Port Alexander. The territory also includes the southwestern tip of Chichigof Island and travels northward to encompass a portion of Peril Strait and the entire southern shore of Tenakee Inlet. We conducted one interview with an individual who lived in Juneau, but had grown up in Angoon and one interview with an individual living in Angoon. All other herring observations were made by individuals from other areas.

Killisnoo Harbor was the original location of the village of Angoon but the people then moved to Turn Point, Stillwater Anchorage, Sullivan Point, and finally, Angoon (de Laguna 1960:36-51). Although settlement eventually became centered in Kootznahoo Inlet, people continued to move between Killisnoo Island and Angoon. According to de Laguna:

In 1878 the Northwest Trading Company established a trading post on Killisnoo ('Kenasnow') Island. The following year the company began in an experimental way

the extraction of herring oil and the manufacture of fertilizer ('guano') from the fish remains. In 1880 a whaling station was opened here, because of the presence of many fin-backed whales that fed on the herring, and apparently some of the Angoon people began to settle on Killisnoo Island (1960: 162).

She also remarks that:

Killisnoo was first established as a whaling station, but after difficulties with the natives the catch was changed to herrings, which are much more easily secured and managed. During the winter season schools of herrings filled Chatham Strait for miles, and a steam tender towed scows to and from the seining grounds, even bringing the fish from Peril Straits and Sitka Sound (1960: 174).

De Laguna describes the abundance of herring at Angoon: "Schools of herring used to crowd so tightly into the bays that a strong arm was needed to drive the fish rake through the mass of their bodies. With them came the harbor seals, porpoises and whales" (1960: 26).

The head of Favorite Bay was, and continues to be a place used by the people of Angoon to harvest herring. Houses and fish smoking houses exist there (Goldschmidt and Haas 1998:148). Favorite Bay was called Wank'a Geeyí (Bay on the Edge) and describes "An abandoned 'Fishing Village,' marked on the charts on the southwest shore, is Féeshwan Aaní, translated as 'Fisherman's Town.' The bay was formerly a famous locality for herring" (de Laguna 1960: 46).

Natives from Angoon use the area including Mitchell Bay, Favorite Bay, and Kanalku Bay for hunting, trapping and fishing. Herring Bay (Takuwóox') is where Angoon people came to render herring oil. Another fish camp existed on Chapin Bay where herring were both smoked and rendered for oil. The remnants of this camp still remain (Gamble in Goldschmidt and Haas 1998). De Laguna also documents how

Wilson Cove (Katakáw) was the site of a camp near the creek on the north shore where herring grease was made by the Natives (de Laguna 1960: 58).

The Alaska Department of Fish and Game (ADFG) currently manage two separate commercial herring fisheries that fall within the Xutsnoowú Kwáan territory: Tenakee Inlet and a Hoonah Sound (see Figure 6.5).

The first of these, Tenakee Inlet (Section 12-A) has operated as a winter food and bait fishery since 1978 and as a spawn-on-kelp fishery since 2003. The first herring spawn activity recorded by ADFG was in the 1970s using aerial survey methods and supplemented with hydroacoustic surveys from 1979 through 1986. In 1987, hydroacoustic survey was replaced by spawn-deposition dive surveys. According to ADFG documentation, the first herring spawn occurs Tenakee Inlet in the last week of April and continues through the first week in May. A decline in spawn activity has been noted by ADFG since the 1998 season. The fishery did not open in 2008. The following locations have been identified by ADFG as herring spawning areas: south shoreline of Tenakee Inlet between Saltery Bay and Trap Bay, Kadashan Bay, East Point, Wachusett Cove, South Passage, Basket Bay, Tenakee Springs and Cannery Point (ADFG 2009a).

The second area commercial herring fishery managed by ADFG within Xutsnoowú Kwáan territory is Hoonah Sound (Section 13-C). The department has recorded herring spawning activity within Hoonah Sound since 1971. The area has been managed as a herring spawn-on-kelp fishery since 1990. Since this time, the average miles of spawn have been 11.3 nautical miles. ADFG identifies the following locations as “traditional” spawning areas: Hoonah Sound, Vixen Island, Emmons Island, Fick Cove to Ushk Point, Peril Strait along Chichagof Island from Finger River to Broad Island, False Island, and along the Baranof Island shoreline from Nismeni Point to Point Benham (ADFG 2009a).

The following is a list of locations within the Xutsnoowú Kwáan that were identified as notable herring spawning and massing areas during individual interviews and focus group interviews conducted during this synthesis project and in previously documented research efforts:

Admiralty Island, Angoon, Cedar Point, Chatham Strait, Danger Point, Distant Point, East Point, Eliza Harbor, Favorite Bay, Graveyard Island, Gut Bay, Hood Bay, Kelp Bay, Killisnoo Island, Kootznahoo Inlet, Mitchell Bay, Murder Cove, Peril Strait, Point Gardner, Point Samuel, Pond Island, Sitkoh Bay, Tenakee Inlet (Long Bay, Saltery Bay, Seal Bay), and Tyee,



## **Admiralty Island**

Walter Soboloff, a resident of Juneau who grew up in Angoon, recalls seeing the reduction boats fishing at Admiralty Island:

And in the years [19]20, the '20s they [the reduction boats] were getting their herring from along the eastern Baranof shores and the southern part of Admiralty Island: it's where they were hauling their herring from. (Walter Soboleff)

## **Angoon**

Although herring were plentiful, according to Walter Soboleff, their eggs were not commonly harvested around Angoon:

Walter: Yeah. I believe the existence of herring is quite a noticeable part of the community.

Interviewer: But it wasn't spawning herring, it was just regular adult herring moving around?

Walter: It's very strange that they were never aware of the spawn. It probably spawned right inside there and people were never aware of it. Strange. ...

Interviewer: ... and then after say, after 1929 or after 1940 do you see a difference in the amount of herring that's in the area, either Angoon area or Chatham Straits area?

Walter: I believe it increased. (Walter Soboleff)

Gabriel George describes how many Native elders in Angoon became concerned about the declining herring abundance as early as the 1960's when motions were made to stop commercial herring fishing:

[T]he elders in Angoon as much as that common sense that they had, they shortly after I was there in the late 60s, they tried to stop herring fishing. At least around Angoon. ... If they put any resolutions into the ANB or I know that they called Fish and Game and asked them to stop. But they wouldn't stop. They had their biologist

and all that. Knew what they were doing ... that's when Angoon you know, was concerned. Or some elders in Angoon, I shouldn't say 'Angoon.' Some elders you know and all. It wasn't a whole. Everybody in Angoon didn't stand up and say 'stop,' but the fishermen that were fishing in that area did. Because we changed also. We changed from a seining community to a hand troll community and our permits left.  
(Gabe George)

### **Chatham Strait**

Participants describe the abundance of herring that used to be found in Chatham Strait:

[I]n those days, the herring would flip up onto the beaches to get away from their predators. (Mark Jacobs, Jr., 1996)

When we first started fishing we would run across Catem [sic] Straits and watch herring flip all the way across. (Ruth M. Zieske, 1993)

I can remember—my knowledge of herring, my first memories of herring come from fishing in southern Chatham and the massive schools of herring there in June that would be boiling up off what we call the 'flats' between Point Ellis and Denny Harbor, all over Tebenkof. And you'd just see schools of herring boiling on the surface. And then every day at that time I think there were 14 herring seiners left. Every day they'd come down and round-haul those schools of herring off the flats and load their boats and go back. And it just went on day after day until there weren't very many herring.  
(Eric Jordan)

After here and then much later [the herring spawned] in ... Chatham Strait. (Jake White)

Many participants describe the decline of herring in Chatham Strait as a function of commercial fishing, especially by the reduction plants:

In Chatham Straits they killed it [the herring] off ... (Walter Moy, 1996)

But, I fear that the herring eggs are going to go. We can't get 'em over here let's go over to Chatham, let's get them out of Chatham, you can't. They're not going to be there. (ADFG and STA, 1993)

Two participants thought the herring levels had increased in Chatham Strait since their nadir in the 1940s:

And they're getting a good build-up of herring in Frederick Sound, Chatham, Stevens Pass area and from Seymour Canal down to Tyee. (Ralph Guthrie)

Walter: I never saw...oh, I saw one make a set on the Chatham Strait side, probably a thousand yards from the village. I saw them make a herring set there. ...

Interviewer: ... and then after say, after 1929 or after 1940 do you see a difference in the amount of herring that's in the area, either Angoon area or Chatham Straits area?

Walter: I believe it increased. (Walter Soboleff)

### **Danger Point**

Danger Point was a place where people could jig for herring and acquire herring bait:

I've really only seen them fishing around Danger Point. They call it jigging for herring. (Walter Soboleff)

Ah, yeah, they were huge because I couldn't, I mean—they were good eating. Hard to use for bait and all. ... Oh yeah, yeah. After the 60s, yeah, the size went smaller and

we no longer had the humongous—at least I never caught the humongous herring like I used to when they came up. And you know, that’s like water for feeding, you know. But there’s still a lot of herring. They were actually good sized for plug-cuts and—which is all I knew how to bait at the time. And I learned how to strip bait, you know, whole herring. But there was a lot of herring. (Gabe George)

### **Distant Point**

Mr. George, a salmon fishermen describes the sound of massive herring schools moving through Distant Point:

Yeah. Distant Point is also the place where we went to king salmon fish and it’s shallows. And the secret is, right at dawn, get up just before dawn, you can’t even see the tip of your rods and you go through that—you can hear the herring and salmon going through the herring schools going [makes whooshing noise]. (Gabe George)

According to Matthew Kookesh (pers. comm. 2008), Distant Point was also a place where herring spawned in the past.

### **East Point**

Mr. Jack identifies East Point as a herring spawning location:

Right around East Point used to have it [herring spawn] the most concentrated part of it right there. (Charles Jack)

### **Eliza Harbor**

Eliza Harbor was identified by many participants as a herring spawn location, but also as a wintering area:

Well, there was a heck of a spawn in Eliza Harbor. (Clarence Jackson)

Tyee. Eliza Harbor I heard them say [the reduction boats would fish there]. (Walter Soboleff)

Eliza Harbor: same thing [had lots of herring spawn]. (Mike Jackson)

Eliza [had herring spawn]. (Marvin Kadake)

We fished for herring with Nels Otness and that's how I got to know some of these places, even this herring in Eliza Harbor. That's another spot too where they winter. But we try to keep this Native knowledge away from those guys that like there, you know. (Leonard Skeek)

### **Favorite Bay**

The head of Favorite Bay was, and is continued to be, used as a place used by the people of Angoon to harvest herring. Houses and fish smoking houses continue to exist there (Goldschmidt and Haas 1998).

And they tried to get them to stop herring bait fishing in Favorite Bay. ... If they put any resolutions into the ANB or I know that they called Fish and Game and asked them to stop. But they wouldn't stop. They had their biologist and all that. Knew what they were doing (Gabe George).

### **Graveyard Island**

Ah, yeah, they [the herring at Graveyard Island] were huge because I couldn't, I mean—they were good eating. Hard to use for bait and all. ... After the 60s, yeah, the size went smaller and we no longer had the humongous—at least I never caught the

humongous herring like I used to when they came up. And you know, that's like water for feeding, you know. But there's still a lot of herring. They were actually good sized for plug-cuts and—which is all I knew how to bait at the time. And I learned how to strip bait, you know, whole herring. But there was a lot of herring. (Gabe George)

### **Gut Bay**

Gut Bay is identified by Wilbur Brown as a herring massing location:

And then, going down further, as the summer goes on: Tebenkof, Gut Bay going out there. No matter where we went, there was herring everywhere. (Wilbur Brown)

### **Hood Bay**

The north arm of Hood Bay belongs to the Deisheetaan clan of Angoon and is an important fishing and subsistence area. The remainder of the bay belongs to the Dakl'aweidí clan. Participants made various comments about the location, identifying it as a herring spawning area, and as an area utilized by commercial fisherman:

Some people thought at one time that herring will spawn in other areas like Kelp Bay and Hood Bay; it's not the same spawn. (ADFG and STA, 1993)

Hood Bay. Yeah. So, but they were deep on our sonar. So, we anchored there, waited until it really got dark and we went out there. It was pitch dark. We turned on all our lights: deck lights, crab lights, everything. And the herring came up for the light (laughing). We made good set again, you know. We loaded two tenders down that time. They took it to Petersburg. (Frank White)

We never fished so much in North Arm or Middle Arm, but I know Kelp Bay in that area, there was humongous amount of herring. And so did in Hood Bay area. (John Martin)

Interviewer: And just to –I just want to make sure—you said that in your time, you could collect spawn in South Arm of Hood Bay?

Gabe: I did. ... Well, it was different because it was in a stream and so it was freshwater. ... In the fresh water. So when I brought it back to Angoon expecting to eat some really good herring eggs, it was bland. There was no salty taste (laughs). (Gabe George)

### **Kelp Bay**

Many comments were made identifying Kelp Bay as a herring spawning area:

Some people thought at one time that herring will spawn in other areas like Kelp Bay and Hood Bay; it's not the same spawn. (ADFG and STA, 1993)

There's an awful lot of places that they'll spawn basically one day [like Kelp Bay]. (Harvey Kitka)

John: And this up in Kelp Bay, quite a few years ago there used to be herring spawn up in there too ...

Interviewer: Have you ever observed juvenile herring in areas around Sitka Sound?

John: The only place is up in Hoonah Sound and Kelp Bay. (John Nielsen)

We used to go down there weekends and also Kelp Bay and we noticed that Kelp Bay was one of the notorious herring [runs] –it was like a herring pond in that area. ...

We never fished so much in North Arm or Middle Arm, but I know Kelp Bay in that area, there was humongous amount of herring. (John Martin)

I see them spawn here, [Kelp Bay]. (Raymond Howard)

### **Pond Island**

Pond Island is identified by Mr. Nielsen as a productive herring spawning area in Kelp Bay: Ok, Kelp Bay when you get in there there's Pond Island right there ... And that there, that was the majority of the spawn there. (John Nielsen)

### **Killisnoo Island**

I know for one thing it was for lack of funds too [the closing of the reduction plant on Killisnoo Island]. And that may have reflected a shortage of the product too: a shortage of herring. (Walter Soboleff)

Also in Killisnoo, in Angoon. ... I fished there in 1949 with Charlie Willis (Al McKinley).

### **Kootznahoo Inlet**

Mr. Soboleff describes reduction fishing in Kootznahoo Inlet, the site of a whaling station that was converted into a herring reduction plant:

And perhaps there's a herring stock up there yet. I don't know, because the whales come in there often. ... I never did know. But they [reduction boats] made regular hauls from in there probably until my coming, that I was aware of anything at my age. It was through my childhood days and before my birth. (Walter Soboleff)

### **Mitchell Bay**

Mr. Jack describes the decline of herring in Mitchell Bay:

Same thing with Angoon, up in Mitchell Bay. Go up there any time of the year you'll get enough. ... Because I know when we used to go visiting in Angoon, my grandpa used to take us up so we can have a feed of herring in the wintertime. We'd run up there and jig herring. ... Now, I talk to guys from Angoon, they say that don't happen anymore. They do get some but not as much as they used to. (Charles Jack)

### **Murder Cove**

Murder Cove is identified by Mr. Kadake as a herring spawning location:

Baranof. Murder Cove [had herring spawn]. (Marvin Kadake)

### **Point Gardner**

Mr. Greenwald describes the reduction boats that would fish at Point Gardner:

Well, I seen them fish there at right in Point Gardner [reduction boats]. There was a lot of herring there. Right off of Tyee and...I think, you know, most will be down at Point Gardner--would be the biggest collection of [herring] that I know of ... just loads of herring there. (Karl Greenwald)

### **Point Samuel**

Mr. Soboleff describes the massive amount of herring he witnessed at Point Samuel:

I saw from Angoon on the fall [in the 50s and 60s], and they had the western tip of Killinsoo Island called Point Samuel, six or seven whales feeding and the bay just looked like it was boiling: herring just boiling. ... Yes. Huge schools of herring. I had

never seen that in all the years I lived in Killisnoo. Vast amounts of schools of herring and whales were there feeding. (Walter Soboleff)

### **Sitkoh Bay**

Mr. Kitka describes the interaction of the herring and salmon in Sitkoh Bay:

They seemed like they got to be full-sized. How I found that herring is kind of a strange fish cuz I've find that some places the king salmon don't like the ones outside and they'll be up closer to the beach. The bigger ones [herring] will be down deeper, go down deeper. I found an awful lot of the bays, they'll start coming more to the surface after May and June. Basically when the little salmon fry are coming up. They feed on the salmon fry. Especially the pinks. The pinks are basically about that big [an inch or two?]. ... Oh yeah. It'll sound like rain when they're feeding. You'll look at the bay and it's just a mass of herring feeding. And I was amazed in the beginning that salmon would come back after something like that. ... Up through that, over in Nakwasina and then over in Ushk Bay and up here in Hoonah Sound, as well as in Sitkoh Bay, where I was basically raised in the summer time. We used to spend three months of the year there, every year. (Harvey Kitka)

### **Tenakee Inlet**

Tenakee Inlet was a notable location utilized by many herring bait fishermen:

Same here with this area like Pt. Adolphus was a major seining area too ... But like in May when I was a child growing up, the herring would move into Tenakee it would sound like a wind storm coming in. It would be so much coming in. That was before the reduction of the seines that they have now. And you couldn't believe it. But the spawn wasn't very thick in Tenakee because they spawned the whole inlet and that's a big inlet you know. (Charles Jack)

And all of the sudden they started quitting in Tenakee, and we couldn't get any from there either. (George Dalton, Jr.)

It was after the—we were fishing with my brother-in-law—went out, we went in there [Tenakee Inlet] to fish for bait herring they call it. They don't have no roe already. (Frank White)

Tenakee was a kind of a traditional [herring] bait area. (Consultant #23)

[H]erring there used to spawn pretty thick, not only in Port Frederick, but Tenakee also. (George Dalton, Jr.)

I've seen herring spawn up in Tenakee. (Fagan Skafalstead)

Tenakee Inlet: This used to be a big herring spawning area, and that place has been opened and closed from season to season; as soon as it looks like it's going to build they open it for herring pond fishery. (Franklin James, Sr.)

Been in Tenakee [commercial fishing], Port Houghton. I mean I—we looked at a lot of area. (Dick Edie)

I'm aware that there's a herring stock in Tenakee Inlet ... in the 60s or 70s I moved to Tenakee and a boy who was visiting me in Tenakee, we were sitting in the living room I said, 'Tom. I think herring are spawning here!' (Walter Soboleff)

Yeah, Tenakee Inlet was another bait fishery. (Leonard Skeek)

I know in Tenakee there used to be lots way up in the bay there. After spawning, you see them around in front of Tenakee. After that, I don't know where they go. ... Mmhm. Used to see salmon breaking water right there at Icy Straits Point chasing herring all the time. You don't see that no more on account of all the herring disappearing. That's the same way it was in Tenakee too. ... I don't know about Juneau. I only know what's happened around here. I know in Tenakee there has to be herring there. (Raymond Howard)

I fished bait herring up here in Tenakee Inlet. Bait herring, that's not sac roe. (Bob Kirkman)

I've seen all the herring at Tenakee Inlet, you know just in the mouth there. (Karl Greenwald)

They [commercial fishermen] cleaned out Point Adolphus and Freshwater Bay and Tenakee. (Walter Moy, 1996)

Interviewer: Doug, I had a question for you from yesterday, when you were talking about how your dad moved around with his [herring] processing boat. Where did he go besides Auke Bay? I mean, did he kind of have a circuit that he did with that? ...

Doug: Well, it was. It didn't last a long time. It's had more time now as a floating hotel than anything else. But it was at Auke Bay, Hawk Inlet, over by Hoonah. I know we were in Tenakee a few times. (Doug Chilton)

### ***Long Bay***

Mr. Jack describes the herring spawn at Long Bay in Tenakee Inlet:

And we got some [herring spawn] from Long Bay along the—because it's a rocky shoal out in front of Long Bay. ... We used to get some from there. And mostly just up and down—some years it's different in different spots, but Crab Bay always had the best spawn and Long Bay always had the best spawn. But the whole inlet would just be alive. You can't believe it. You had to see it. (Charles Jack)

### ***Saltery Bay***

Mr. Jack notes the presence of herring in Saltery Bay in the winter:

There was a lot of winter herring in Saltery Bay. (Charles Jack)

### ***Seal Bay***

Seal Bay is identified as a place where herring both spawn and winter:

The heavy spawns were Long Bay and Seal Bay and Crab Bay I think. Mostly at the entrance of all those places. (Charles Jack)

Oh, Seal Bay [is another place I've observed herring spawning]. (Floyd Peterson)

Interviewer: Seal Bay, ok. This is Long Bay. So also--was Seal Bay also a place where you used to get spawn?

Raymond: Mmhm. ... All year round they used to be up here.

Interviewer: So up at the head of the bay was an important massing area?

Raymond: Mmhm. Until they starting fishing out in there. They all disappeared. (Raymond Howard)

## **Tyee**

Tyee was once the site of the Native camp Kúchx'a Héen. It was an important site for many subsistence activities including the harvesting of herring and was associated with the Aanx'aakhittan clan (See additional comment: Eliza Harbor, Walter Soboleff). Some participants commented on the presence of reduction boats in the area in the 1940s and how herring abundance has declined in the area as a consequence:

You'd see the seiner out there in a school of herring occasionally. ... And you know if—I can only remember seeing one at a time. You'd never see a fleet ... 75-80 footers.  
(Dick Eide)

It's [the herring is] almost all but gone. I hand trolled up until mid-60s or late 70s—no early 70s. I hand trolled until the early 70s: until 1968 is the last time I went hand trolling and I noticed the herring just not like it used to be. I told them about when—how it used to look at Kein Séet [place near mouth of Keku Strait], when the herring came up all the way across to Tyee. It looked like just you could just run across on top of it. Sounded like a big waterfall. (George Davis)

In later years, I went down to Cornwallis [Point] and Redoubt. We had camp there. That's when all the herring boats were out there. Everyday all the boats were loaded to the guardrails there. ... I guess, even Tyee at that time. (Wesley Brown)

Herring plants-used to be one in Tyee. ... (Mike Jackson)

### **Sheet'ka Kwáan: Sitka**

Sheet'ka Kwáan territory encompasses the Pacific coast of Chichagof and Baranof Islands and the many islands that lay off the coast, from Point Urey in the north to Cape Ommaney in the south. It continues inland to include Peril Strait and portions of Hoonah Sound and Patterson Bay (Goldschmidt and Haas 1998). We conducted individual and group interviews at Sitka Tribe of Alaska (STA) headquarters with the assistance of Robi Craig in March of 2008 and conducted additional interviews in September 2008 and March and April 2009. PI Thornton also attended the 2008 herring dinner, sponsored by STA in March 2008. Nineteen people were interviewed altogether. In addition, interview data collected from the Makhnati Island herring study undertaken recently by STA were made available to the researchers as were affidavits from herring fishers collected by or for STA.

Herring roe has been a staple food item for local Natives since their settlement at Sitka thousands of years ago. Winter herring runs were harvested with herring rakes (*yaaw xídlaa*). Herring oil (*yaaw eexi*) was rendered each winter and early spring as a substance in which to store or dip foods into (Jacobs, n.d.). Returning herring are the first fresh fish of the spring. When the herring come to Sitka Sound to spawn at the end of March, the Tlingit people tell of a storm that will arrive each year called *loox eeti oosk'* or 'cleansing the waters.' (Jacobs, n.d.; see also Herman Kitka, Sr. interview) Hemlock branches are set in the water (*aawalaak*) on which the herring deposit their eggs (*gaax'w*) in layers that can be inches thick (*haaw*). Locations that have naturally occurring broad macrocystis kelp (*daaw*) and hair seaweed (*né*) are prime herring egg harvesting locations. The herring will deposit their eggs on these substrates and the Tlingit people will gather them to be eaten fresh or to be dried and stored for later consumption. Herring eggs are also an important trade item within and without the

Sheet'ka community: "The Sitka herring egg exchange is a long standing cultural tradition with herring eggs being traded with residents of the Yukon Territory" (Schroeder and Kookesh 1990; see also Appendix D).

*Yaaw T'eiyí* (Herring Rock), an important cultural landmark claimed by the Kiks.ádi clan, is where herring came to spawn each year and where the Tlingit people came to rely on herring roe harvesting. Each year, the herring returned to Herring Rock and from there spread among the neighboring islands and beaches to spawn (Littlefield n.d.) In the early 1970s, this rock was partially destroyed by construction of the wharf and hotel near the ANB (Alaska Native Brotherhood) Harbor. Herring and Herring Rock are both crests of the Kiks.ádi clan, which also have a clan house named *Kaxátjaa Hít* (Lively [Herring] House, or Shattering House: derived from the image of herring swimming and breaking the water's surface).

The first herring spawning events were recorded in Tlingit oral history. In one story a young girl sitting by Herring Rock lets down her hair for the herring to spawn on. The girl was transformed into one of the herring and became known as *Kaxátjaa Sháa* (see Esther Littlefield, n.d.), Shattering Girl or Flipping Girl. In another story a daughter-in-law became too greedy when gathering herring. It grew late but she refused to come inside. As a consequence of her greed, she was transformed into an owl and flew into the woods. When a storm approaches you can hear her calling for others to join her to sit in the woods: "Aas gutu yee gaakí!" (Jacobs n.d.).

The first commercial spawn-on-kelp fishery in Sitka began in 1964, but was closed by the State of Alaska's Board of Fish in 1974 (see Appendix D). There are currently two areas within Sheet'ka *Kwáan* territory that are managed by the Alaska Department of Fish and Game (ADFG).

The first is Sitka and Salisbury Sound (Section 13-B, though Section 13-A has been included in this area by emergency order in 1989, 1999, 2002, and 2006). The Sitka Sound purse seine sac roe fishery opened in 1976 (see Appendix D). As the sac roe fishery continued to increase its take, the Sitka Tribe of Alaska (STA) began to voice a growing concern regarding the impact of the commercial sac roe fishery on subsistence activities. STA sought more input and better communication with management, and a Memorandum of Agreement (MOA) was negotiated between ADFG and STA on November 4, 2002 and accepted by the Alaska Board of Fisheries on December 17, 2002. The MOA provides for tribal consultation prior to each commercial opening to assess potential impact on the subsistence activities for that year. In 2002, STA also began working with ADFG Subsistence Division to conduct yearly household subsistence surveys, rather than relying on the previously used permit system, to evaluate the needs of STA members for subsistence herring roe harvest. Surveys were not conducted by ADFG in 2004 and 2005 due to budget constraints. STA did, however, conduct herring egg harvest surveys during these years. If a negative impact to the subsistence harvest is voiced by STA, 5 AAC 27.190 Herring Management Plan for Southeastern Alaska provides for the following mechanisms of consideration for distribution of commercial harvest:

- 1) Limiting harvest in the highest frequency spawning areas along the Halibut Point Road shoreline in proportion to historical use patterns established by past commercial competitive fisheries (50-55% of the GHL),
- 2) Choosing dispersal of time and area by selecting appropriate in-season options.
3. Considering recommendations from in-season task force members (ADFG 2009a)

The second commercial herring fishery area managed by ADFG within Sheet'ka Kwáan territory is Hoonah Sound (Section 13-C). The department has recorded herring activity within Hoonah Sound since 1971. The area has been managed as a herring spawn-on-kelp fishery since 1990. Since this time, the average miles of spawn have been 11.3 nautical miles. ADFG identifies the following locations as “traditional” spawning areas: Hoonah Sound, Vixen Island, Emmons Island, Fick Cove to Ushk Point, Peril Strait along Chichagof Island from Finger River to Broad Island, False Island, and along the Baranof Island shoreline from Nismeni Point to Point Benham (ADFG 2009b).

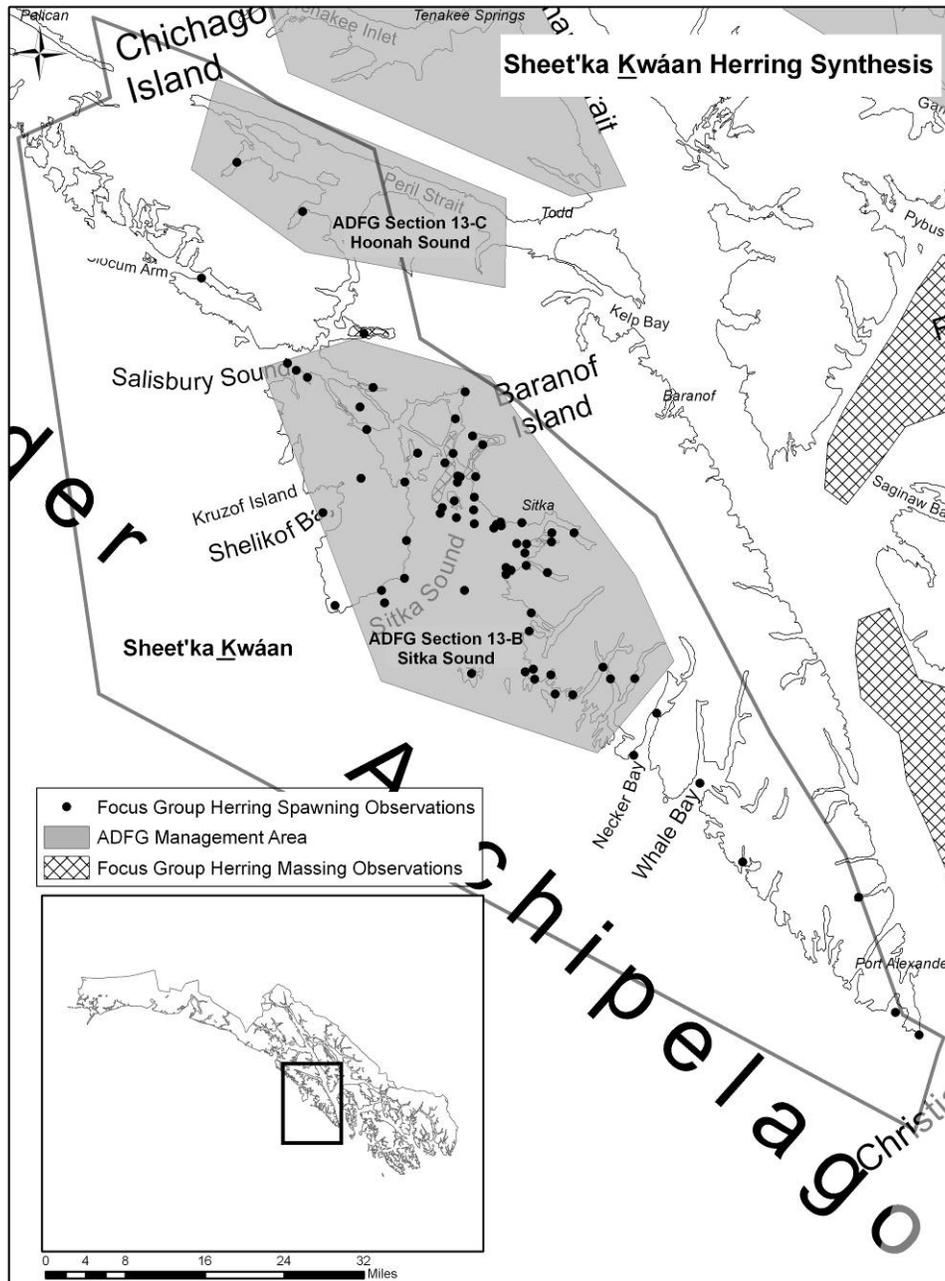


Figure 6.6: Overview of Herring Spawning Areas and LTK Observation in Sheet'ka Kwáan. Note: Massing was observed in most bays in Sitka Sound as well as most areas of the Sound itself, especially the trough northwest of Middle Island.

The following is a list of locations within the Sheet'ka Kwáan that were identified as notable herring spawning and massing areas during individual interviews and focus group interviews conducted during this synthesis project and in previously documented research efforts:

Aleutkina Bay, Apple Islands, Bieli Rocks, Big Bay, Big Port Walter, Biorka Island, Camp Coogan Bay, Cape Edgecumbe, Cape Ommaney, Cedar Cove, Cedar Pass, Chaichei Islands, Crawfish Bay, Crawfish Inlet, Crow Island, Deep Inlet, Dog Point, Dorothy Narrows, Fish Bay, Freds Creek, Gagarin Island, Gavanski Islands (Big and Little), Goddard, God's Pockets, Halibut Point, Herring Rock, Howard Strait, Hot Springs Bay, Jamestown Bay, Japonski Island, Kasiana Islands, Katlian Bay, Krestof Island, Kruzof Island, Larch Bay, Lava Island, Leesofftskaia Bay, Middle Island, Nakwasina Bay, Nakwasina Sound, Necker Bay, No Thorofare Bay, Parker Group, Partofshikof Island, Patterson Bay, Peril Straits, Pirates Cove, Point Brown, President Bay, Promisla Cove, Redoubt, Saint Lazaria Island, Salsibury Sound, Samsing Cove, Sandy Cove, Sealing Cove, Shelikof Bay, Shoals Point, Siginaka Islands, Silver Bay, Silver Point, Sinitsin Cove, Sinitsin Island, Slocum Arm, Sitka Area (the Cove Dock, the Cape Area, Sitka Sound, Sitka Harbor, in front of Sitka Village, Old Sitka), St. John Baptist Bay, Sukoi Inlet, Three Entrance Bay, Ushk Bay, West Crawfish Inlet/Windy Passage, Whale Bay, Whiting Harbor, Windy Pass, and Yamani Island.

### **Regional Comments**

What I've seen is like out here, this is San Lazaria, so I've seen them come in and they start spawning Shoals Point, they just move in, go up into Krestof and they come across. Might hit a little bit by Nakwasina in there and sometimes they spawn right up into Nakwasina and back out. But Katlian, I've seen them all the way in there.

Seen them all the way down through the Sitka road system on into Silver Bay. Out through the islands and down as far as Big Bay, south of Dorothy Narrows. And then, when I used to do my flying, I'd see herring leading out of West Crawfish Inlet, down the shoreline toward Dorothy Narrows, then they'd come through at the Narrows or go around the island there, and come around the outside up toward Redoubt in there. (Charlie Skultka)

My name is Wade Martin. I live in Sitka, Alaska. I started collecting herring roe when I was a child in Sitka. When I moved back to Sitka in 1979, I resumed the activity and have been collecting herring roe ever since. Since 1979 I have seen a decline in the number of herring and the spawning grounds as a whole. (Wade Martin, 1996)

Sitka area: From the Eastside Kruzof Island, Nakwasina Sound to Silver Bay, Deep Inlet, Hot Springs Bay and all surroundings[sic] Islands and bays around Sitka was a big spawning grounds for herring: the sac roe fishery is now taking its toll in that area; this year they said there was over 70 miles of herring spawn, it was only milk from the males and hardly any females; my comment; its just like putting 70 men on an island and see if they can have kids. (Franklin James, Sr., 2007)

And the other thing that happened was, that whole coast used to be our main area for finding our branches for herring eggs and they quit coming there. (Fred Hope)

Ok. [Herring spawned at] Gavanski, Little Gavanski. Crow Island. Gagarin Island in there. Starrigavan Bay. The Siginaka group. Promisla Bay. Some up here- Lisa Creek one here. ... Along that shore and all the shores there. (Nels Lawson)

### **Sitka Point to Jamestown Bay**

Right in Sitka Channel there would be a mass of herring spawning but we considered that polluted so we didn't bother with it. And then we'd get to Jamestown Bay and it was a continuous spawn all the way from Sitka to Jamestown Bay and there was hardly anybody living there so we didn't worry about pollution there. (Fred Hope)

### **Sitka Sound to Vitskari Rocks**

They're [herring] in the gully like Sitka Sound proper all the way out to like St. Lazaria Island. Well, not St. Lazaria, but Vitskari Rocks. And they pretty much coat the bottom out there in the wintertime. (Charlie Skultka)

### **Middle Island to Dog Point**

Middle Island used to be full, clear up to Dog Point. (Walter Moy, 1996)

### **Middle Island to Sitka Sound**

...the herring spawn is getting so small I am afraid the herring stock will be all gone and all animals, birds and salmon spawn will disappear with it for lack of food. (Herman Kitka, Sr.)

### **Middle Island to Vitskari Rocks to Cape Edgecumbe**

From Middle Island out to Vitskari Rocks and out to Cape Edgecumbe used to be full of herring. (Walter Moy, 1996)

### **Freds Creek to Shoals Point**

Yeah, I went over here a couple times [in the 1960s]. A couple times they had the opening over here on this shore for fishing kelp. (Bob Kirkman)

### **Halibut Point to Old Sitka; right to the entrance of Katlian Bay**

They spawned Halibut Point all the way into Old Sitka. Right to the point entrance to Katlian Bay ... They start moving back in and spawning down here and on the points. They start spawning in the pools. When they opened the herring roe fisheries, wiped them all out. (Herman Kitka, Sr.)

### **Dorothy Narrows to Sitka Sound to Low Island**

It spawned from Dorothy Narrows all the way to Sitka Sound and all the way out to Low Island. (Herman Kitka, Sr.)

### **between Silver Point and Cape Vernon**

I think it's just a personal opinion, I'm not a biologist, but the herring came in to feed on the krill and that's where they settled between Silver Point and Cape Vernon. (Al Wilson)

### **between Edgecumbe and Biorka**

And I don't understand it. And Mo alluded to it too. It used to be for a few years here, six, seven years ago, that in October, about October 15th we'd go out and there'd be lots of herring—or October 11th is when our winter king troll season opens. We'd go out in the Sound off of Lazaria Island and out there toward the Cape between Edgecumbe and Biorka and there'd be huge school of herring and it'd be full of king salmon. We'd have big bites and the last, I think, three years or something? Those herring haven't been there like that. (Eric Jordan)

### **between Crow Island and Middle Island**

The only place where we get the eggs from [now] is around Middle Island. And that pass that goes out there: [between] Crow Island and Middle Island. (Herman Kitka, Sr.)

### **Three Entrance Bay to Sitka Sound**

Herring spawning would start here in Sitka in the spring of the year around Three-Entrance Bay and then move through the whole of Sitka Sound. By the whole of Sitka Sound I mean every beach and every bay would have some kind of a spawn on it. All the way from Three Entrance bay, up into Sitka, all the islands around Sitka, then continue north in through the islands there, Summit, Nakwasina, and then along the shores of Kruzof Island. (Nels Lawson)

### **Sitka to Starrigavin**

When I first moved back here, we used to get a spawn from President Bay all the way up to town, and then from town north up to Nakwasina. Now the only areas I see with thick spawn are from town to Stargaven [sic]. (Wade Martin, 1996)

### **Aleutkina Bay**

Aleutkina Bay was once the site of seasonal camps utilized by the Sitka Natives to catch herring and to collect herring roe, though subsistence users have noticed a decline of herring spawning populations in the area:

Yeah. Oh there's one thing that I need to mention. Straight across from Sitka is Aleutkina area and there used to be a camping ground for Sitka Natives. And they used that for trolling for king salmon and then when the herring moved in, they just moved a little bit and they would be right where the herring is next. ... Camp Coogan, yeah. It'd have spawn in there, all through...Aleutkina too had...there was rocks in

front of that area and all inside of the rocks there was herring spawning. And all the way up to Pirates Cove. (Fred Hope)

All of Aleutkina had many good places to set your branches ... An area that I traditionally utilized for collecting my herring eggs are not being used by myself or others because there has been no spawn in this area. I kept my ears open last year (1995) for anyone to tell me that they set branches down anywhere in Aleutkina. No one I know did. No one I know set branches 'south' of Sitka. (Gary Olsen, 1996)

[Referring to the location of a herring pound] Grant Miller came out of Leesoffskaia Bay and he put a pot [also known as a herring pound] right on the south side of Kasiana Island which caused a small war. And he said, well, I guess Fish and Game let him do that. Well he moved out of there, but he had to move because there's no herring in Aleutkina Bay any more. (Al Wilson)

The area spawn seems like it's less now than I've ever seen it. And ... where we set our trees for us to pull them back up and have a good set of eggs on them usually we have to have like three days of spawn on it. And we set trees in areas that just spawn one day and no more after that. And these are areas that I notice are almost always what I would consider good spots. We would always get good eggs there and now we don't. And that was in the last three years. This past three opens. That's been reducing and last year was just like we were setting trees everywhere it was like if they started spawning somewhere we'd set there and hope they kept on spawning, but if they didn't those were lost. Very little eggs on the trees. (Philip Charles Nielsen)

My favorite islands [to collect herring roe] were out there in, at ah, right off of Aleutkina and those areas and then Middle Island by boat. Those two. That's the only place we've ever harvested. Not close to town but further away. (John Nielsen)

But see in them days the—what you call 'going across the bay' you know, you're going to what we call T'ooch Aaní, you know. They told me all the herring is spawning at Aleutkina. Aleutkina? Hell, they've been here all my life. I never heard of Aleutkina. I had to go down and look at a chart. That T'ooch Aaní across the bay, you know that's all the Indian names, you know, called T'ooch Aaní. (Duck Didrickson)

I think I remember getting branches and stuff in this area. Aleutkina Bay down here. (Mike Baines)

As I, as I grew up anyway, it was in the early to mid 70s and going out the first places I remember getting eggs were ... of town and they were areas that seemed to come through every year. Like Aleutkina Bay and Samsing Cove and Pirates Cove and that always seemed to be where we went. (Mike Miller)

### **Apple Islands**

The Apple Islands are another place favored for herring egg collection:

Bob: And there was kelp all along all these spots [in 1965].

Interview: Ok. All the inner islands: Apple Islands, Kasiana?

Bob: Yeah.

(Bob Kirkman)

And over time there was few spots where there was really consistent at least some spawn every year like Kasiana Islands and Apple Islands, Parker Islands group out here. (Eric Jordan)

### **Bieli Rocks**

Bob Kirkman identified Bieli Rock as an area where he would pick kelp:

Middle Island area was good. We'd go out here by Bieli Rock. Here we'd pick kelp.  
(Bob Kirkman)

### **Big Bay**

John Littlefield commented on herring spawning in Big Bay:

Do they have that area marked down there in Windy Pass and Big Bay as herring spawning location [referring to a map of herring spawn]? Where am I here? Yeah they do. Right in this area here. And up West Crawfish. (John Littlefield)

### **Big Port Walter**

Big Port Walter was the location of a herring reduction plant in the 1900s:

In the 30s, 40s and 50s there were herring reduction plants in Port Armstrong, Port Conclusion, Port Lucy, Port Herbert, Big Port Walter, Washington Bay, Rowan Bay and these are the ones I can remember off the top of my head. These plants operated for many years and all of the herring were caught right out in Chatam Straights [sic]. At this time, fisherman and others knew that if this fishery wasn't stopped or slowed down greatly that the native herring stocks would be depleted. And now they are. This was a warning 30 years ago. (Sonny Deegan, 1993)

## **Biorka Island**

Biorka was once utilized by the Sitka Natives to trap seal and sea otter. The area is now a naval base and closed to hunting and trapping (Goldschmidt and Haas 1998:65). Fred Hope describes the impact of a pulp mill and the pattern of herring spawning at Biorka:

...the fur seals were out at Biorka in the beginning and they were run out and then the herring were run out. And the whole time the pulp mill was saying they didn't do it. (Fred Hope)

Interviewer: So what was the time period of the whole spawning, from when they started up by Halibut Point and Middle Point all the way down? How long would that take for the whole spawn?

Fred: I would just be guessing, but I would say a month ... They would start there and then pretty soon they're down at Biorka. Goddard, Goddard, that's the name I'm trying to remember. (Fred Hope)

## **Camp Coogan Bay**

Camp Coogan Bay is identified as a herring spawning location:

No Thorofare Bay was one and Camp Coogan was another and Pirates Cove, that whole area was all spawn area [in the late 1960s]. And all the sudden they quit coming to that area because it was polluted and they moved over to the Mount Edgecumbe shore and they were experimenting it looked like because each year they would be somewhere in this area, and they settled into this area for a short time. (Fred Hope)

Up in to Silver Bay, by the road system and over in Camp Coogan and Deep Inlet and all those islands across there; there was spawn everywhere. Now you don't even see

it. They hardly come in at the south end in the last couple years I've been over there setting branches. ... I think it was over-fished. ... Well, they're like on a four-year cycle: four years ago, five years ago. (Bob Kirkman)

### **Cape Edgecumbe**

Herring once spawned from Sitka to Cape Edgecumbe:

We used to see the whole Sitka Sound turn milky [in the 1980s]. Now that was a big spawn. That one year I ran down in my skiff past Goddard and Windy Pass, and out to Yamani Cove on the outside where you go up into Crawfish. Everywhere it was milky. That was one spawn from there to Cape Edgecumbe where I ran my skiff there. ... But then, they kept increasing the quota and they're taking more and there's no more. They don't give it a chance to build up. (Bob Kirkman)

### **Cape Ommaney**

Herring spawned all the way down to Cape Ommaney.

Interviewer: You said [herring spawned] all the way down to Cape [Ommaney]...below Whale Bay? ...

Harvey: Mmhm.

(Harvey Kitka)

Mr. Guthrie related a story told by a friend's father regarding the wastefulness of the reduction fisheries:

Well, he tells about—his father kept going down to Cape Ommaney [in the 1940s], you know and all of the sudden, you know, as they got closer, they could see the birds working. And what they were working on was dead herring. You know, the *City Seattle* [a herring seine boat] loaded all three of the boats up plus himself and they still had, you know they caught the bulk of the herring that was in Larch Bay. And

when they let them loose, they were all dead, and that's what was floating on the surface. (Ralph Guthrie)

### **Cedar Cove**

Mr. Kitka described the winter bait fishery that once took place in Cedar Cove:

I think it was last year, or the year before, they used to do a big fishery in February. Some of the bait fisheries that took place were in, well they took place almost anywhere from Whale Bay, all the bays all the way up, as well as in Silver Bay, and Katlian Bay. The little cove up here on this side always seemed to have a lot-they call it Cedar Cove-There was always a body of herring there and we could always catch a king salmon amongst them. Not any more. (Harvey Kitka)

### **Cedar Pass**

Mr. Martin described the herring spawn in Cedar Pass:

But in the spring of the year I know that the herring were spawning in most of the bays in that area. So a lot of research hasn't gone through to actually talk about those bays along the coast like I see like down in Cedar Pass. (John Martin)

### **Chaichei Islands**

Mr. Littlefield described his frustration in trying to collect a sufficient amount of herring roe to satisfy his subsistence needs:

Gagarin, I think is the name of that one. And Chaichei. ...And I fished that. I put four sets in that stuff [herring roe] and tried...But it was crap. I ended up leaving those [branches] there four days. (John Littlefield)

### **Crawfish Bay**

Crawfish Bay was identified as both a herring spawning and wintering area (see additional comments: Cape Edgecumbe, Bob Kirkman):

So many places had their own big bodies of herring. Crawfish Bay was one of the places that had a—that's a very deep trough; some of these bays--and Crawfish was notably one of the other places where they stayed all the time. It was one of the wintering places for the first tail, but when they were migrating by they'd stop and feed there along with Silver Bay. (Harvey Kitka)

I think so. Yeah, I think you can go into a lot of the bays and our readers [fish finders] are getting so sophisticated now you can see some of the stuff down there. There were times that we wouldn't see anything, but at a certain time, like when the salmon fry are washing out of the—into the deep, there'd be millions and billions of salmon. Little tiny fry and the herring just seem to come off the bottom and to begin feeding. But before that you'd never even know they were there. (Harvey Kitka)

I think it was last year. I saw a bunch of herring spawning after the main spawn down there in the area by Windy Passage. Up there by Craw[fish]. (Eric Jordan)

### **Crawfish Inlet**

Mr. Eide described catching herring at Crawfish Inlet:

And you know, the fish were—I caught fish down in Crawfish Inlet. And there was fish everywhere. (Dick Eide)

### **Crow Island**

Crow Island was identified as a productive herring spawning location in the past (see comment on Kasiana Island, Al Wilson).

## Deep Inlet

Deep Inlet is claimed by the Kiks.ádi people (Goldschmidt and Haas 1998) and is currently utilized extensively by many commercial fisheries, including commercial herring fisheries. Many consultants noted a substantial herring population decline in this area:

In recent years I've seen herring spawning areas decline. The herring spot-spawn here and there, but in the last couple of years I haven't seen a major spawn south of here: Sam Sing [Samsing] Cove, Three Entrance Bay, Deep Inlet. There really hasn't been a major spawn down in those areas in years. (Phil Nielsen, 1996)

And over here. You got herring roe in this area here [in the 1970s, early 1980s]. Right in Deep Inlet. All in here. And some places there's ... né [hair kelp] in here. High quality. (Al Wilson)

Late 60s it [herring spawn] was still kinda on the south end more: more around Deep Inlet than Samsing Cove and Pirates Cove area. We'd get them around there. (Harvey Kitka)

Then they fished the south end so hard [in the 1970s] that they wiped out the herring that used to sit in Redoubt, Deep Inlet, Silver Bay. (Harvey Kitka)

Every time it starts to build a little bit, they fish it. Last year they caught, the majority of the fish came out of Deep Inlet and they didn't spawn over there. I think they would have, but they fished it pretty hard. (Harvey Kitka)

With the family, we used to get it from across the—outside Deep Inlet. And they used to spawn pretty heavy in that cove, Silver Bay, Kook' [Herring Cove] they call it, Jamestown Bay and also where the boat harbor is built on the island [Japonski]. (Herman Kitka, Sr.)

The ones that were south of here would've ended up, a lot of times up in like Deep Inlet and Silver Bay. And there's definitely seems to be a delineation for which ways they end up. Right about where the airport is and so... Yeah, they spend the first winter they spend growing up protected in little bays up in these bays I guess. (Mike Miller)

But the other part I want to say is that run didn't build by itself. There was about 15 of us guys that were fishing roe herring and we worked together with the Department and made sets, test sets whenever they asked us to. And we spent a lot of time there. It was all—the thinking behind this was someday we're going to get a fishery here. And while all this is going on, the Natives were there. They never said, when the run was small, we never had any trouble with them. Not one bit. They never said a "boo." Nowadays we have lot of trouble with them because the run is tremendous. But the run didn't build by itself. There was a lot of work put into it and the fishermen were right there helping the Department. ... We didn't go much to Salisbury. Most of the test fishing that we did was right around Sitka like out in Sitka Sound and those different places. Deep Bay [Deep Inlet?], that's another one. Anyway, it was right around Sitka proper where we did our test fishing. And it was building so much from year to year it was really interesting seeing what was happening, you know. (Nels Otness)

Up in to Silver Bay, by the road system and over in Camp Coogan and Deep Inlet and all those islands across there; there was spawn everywhere. Now you don't even see it. They hardly come in at the south end in the last couple years I've been over there setting branches. ... I think it was over-fished. ... Well, they're like on a four-year cycle: four years ago, five years ago. (Bob Kirkman)

Some years they're just over here at Deep Inlet and Samsing. (Eric Jordan)

### **Dog Point**

Roby Littlefield identified Dog Point as a herring spawning area:

Yeah, so it was like three years in a row that Dog Point had some lovely spawn and in fact I remember just throwing branches off the edge of the dock [at their homesite on at Dog Point]...and pulling in some really nice herring eggs. Just hanging off the dock and up, right about there. (Roby Littlefield)

### **Dorothy Narrows**

Dorothy Narrows recently has had poor herring spawning:

I used to start my herring roe season by putting my sets up in Dorothy Narrows, but I don't see herring spawn there anymore. (Wade Martin, 1996)

I've been here for, since '90. And I was here before that, you know, fishing here and gathering eggs. And the fisheries was always conducted down below, you know, from Dorothy Narrows, this way. And it wasn't conducted up here. So, you know, all the sudden there was a bloom out here of herring and it lasted a lot of years. But there's no bloom down in Dorothy, you know from Brunof to Dorothy Narrows. It's been really poor spawn, you know. And again, we hear the story is that the herring swam

away. And for me, who's not a biologist, I don't believe that B.S. Anyway so, that's what I see. (Ralph Guthrie)

### **Fish Bay**

Fish Bay (Koowisk') belongs to the Chookaneidí clan (Goldschmidt and Haas 1998). Two consultants commented on the presence of herring spawn in Fish Bay:

Well, right along the shore here, but you know, mostly it's kind of deep there so for our branches we'll hang right along ... our island here. And across Chichagof area. But you don't see too much spawn in here any more. (Consultant #25)

Even in Fish Bay you'll see some spawn in the very head. (Harvey Kitka)

### **Freds Creek**

Nels Lawson identifies herring spawning at Freds Creek:

Yeah. [Herring spawned at] Freds Creek on into probably Point Brown. (Nels Lawson)

### **Gagarin Island**

Gagarin Island was identified as a herring spawning location (see Regional Comment, Nels Lawson and Chaichei Islands, John Littlefield).

### **Gavanski Islands**

Along with Middle Island, Big and Little Gavanski Island are important herring sites. The large trough just beyond these islands in Sitka Sound is an important massing place, where herring collect in the winter and early spring before moving toward the surface

and into the spawning areas (Harvey Kitka). Subsistence users continue to find suitable herring spawn at Big and Little Gavanski Islands:

Yes, there's still a good [spawn], it's a good collection point in between the two islands: in between Big and Little. (John Littlefield)

Gavanski Island? Yeah, that was a good spot for herring. (Bob Kirkman)

The last five years it hasn't been good at the Gavanskis. Not really. But there's hair kelp that grows at the, between the big and little Gavanski Islands. Right in here. Right in here. And I remember this one year when it was so low and I think there was (...?... ) all that we had we went out and checked the hair kelp beds and it was thick, just thick. You couldn't see the hair kelp and it was such a low tide that we got out of the boat and picked up big hunks of hair kelp and put it in the boat. We filled up the boat just by hand. We didn't have to wade or use a rake. And we had our high boots on—actually we went in a little deeper and got wet, we didn't care. Just armfuls and put them in the boat. We have a flat bottom boat so it works pretty good that way. And I've never seen that happen again, but that was very, very nice. And it was years ago ... maybe eight years ago. Maybe nine. And that's what I call a good harvest, where I don't have to spend a whole bunch of gas and I don't have to spend a whole bunch of work to get eggs. And that's, that's the way it should be. (Roby Littlefield)

Big Gavinski and Little Gavinski, in between them two islands [herring spawn because] it's nice and protected. (Nels Lawson)

The change I have observed in the Sitka area spawn has effected [sic] my subsistence herring egg harvesting. For the last five years my friends and I have been going near

the Middle Island/Big Gavanski group to get our eggs. Last year, 1995, there seemed to be only a few good spawning spots in the areas I was familiar with. So the whole small bay we set in was completely lined with sets, of which three were my own. Due to overcrowding, I even set one out in the pounding surf, which I had never done before. Tidal action carried away my whole set. But that was the last available slot to set any branches in this bay. Then, not to have all my branches in one place, I found another spot that was looking pretty good. I put my branches down. For the first time two people, two different harvesters, put their sets directly on top of mine. This has never happened before to me in the 17 years that I have been putting branches down. This tells me that there are fewer and fewer places with more and more people desiring subsistence herring eggs. (Gary Olsen, 1996)

What I saw yesterday, there was quite some big schools in Old Sitka area Old Sitka rocks by the Gavanski Islands and between Gavanski and Middle Island there's must have been a huge mass there because there was a lot of whales working that area. And by Little Gavanski Island there was whales right up to the beach. So, there in the shallows so. Any time you have herring in the shallows you're going to have spawn pretty quick. So, and there's all kinds of sea lions working the area now. Towards the beaches. So, there's got to be small schools just ready to come up. Once they do that, ... we'll have a major spawn. (Phil Charles Nielsen)

The other side of Middle Island, Big Gavanski was supposed to be our, what we called né [hair kelp]. You know. (Duck Didrickson)

## **Goddard**

Goddard is identified as a herring spawning location, but some commented that herring roe was often abundant enough that traveling that far south was not required (see additional comment: Biorka Island, Fred Hope and Cape Edgecumbe, Bob Kirkman):

Although there was a lot of areas that had spawn, we mostly by boat, would just go so far. There was no need to go like up in Salisbury Sound or further down south like by Goddard. There was just not a need to. But the spawn I know it did extend all the way up and all the way down those areas. (Phil Charles Nielsen)

[W]hen I was growing up, we did harvest more on the southern side and in between that time from the late 70s to the, to the late 80s, we did occasionally harvest all the way down to Redoubt and down toward Goddard at times especially for kelp. (Mike Miller)

## **God's Pockets, Lisianski Strait area**

Mr. Didrickson comments about God's Pockets:

And [herring spawn would] go all the way into God's Pockets, what they called God's Pockets. There, on the other side of Pelican [by Lisianski Strait]. (Duck Didrickson)

## **Halibut Point**

The Halibut Point Road System in front of Sitka is heavily fished by the sac roe commercial fishery. Subsistence users have noticed a decline in herring spawning populations in this area:

As time has progressed, the herring fishery area has grown smaller and smaller. Fact of the matter is, there are only very few areas that they do spawn in today. And you can't pinpoint those because they spawn today, then they'll move and will be someplace else tomorrow. So while you could depend upon a certain area in the past,

you can't do it now. As to why the areas are smaller, I feel they have over-harvested in different areas. We used to be able to fish right here in the channel. We used to fish just this side of Halibut Point. (Ted Borbridge, 1996)

They spawned Halibut Point all the way into Old Sitka. Right to the point entrance to Katlian Bay...They start moving back in and spawning down here and on the points. They start spawning in the pools. When they opened the herring roe fisheries, wiped them all out. (Herman Kitka, Sr.)

[Herring spawn] All along Halibut Point Road. (Nels Lawson)

Anyway, so now they're in a quandary. They didn't get a return on, you know, the main spawn forever since I've been here has been on the Halibut, Halibut Point Road system. They didn't have anything there. They says--well, a lot of times the males will squirt. And you'll get good color in the water, but you don't get females. So, they mark that as a spawn. They say, "Well, we got this much spawn." And so then they, you know, manage to come up and say, "Well, we had 57 miles, or 47, or something like that: around 30 miles of spawn." And that's not true! You know, because you know, the squirts weren't a spawn, they were just milky water, see? (Ralph Guthrie)

That's where we set some branches and he showed me how to stay out of the sand from a stream that came down and to look for eel grass and don't set there. Stay away from there. So we went down at low tide and we dragged down some branches, tied rocks to them and let the tide rise. That year, and I can't remember what year it was, but it was a long time ago...maybe 1980, early, early 80s, we got some edible branches out of there and he took them to Juneau and I brought some up for my

family and that really hooked me right there. It was so easy that we could just wait until we saw the seagulls and the herring coming in and then we'd go and chop some branches, and drag them across the road and throw them in. (Roby Littlefield)

Yeah. Oh, [they commercial fished for sac roe] right on Halibut Point Road. And they had been doing that for a couple of years [in the early 1980s]. That's why the bottom fell out of it, for a number of years, and everybody's so happy to say, 'Look at all those [commercial fishing] boats. They're so entertaining.' And then all of the sudden, those of us who are actually harvesting subsistence eggs, we're starting to struggle to get our eggs close to town. (Roby Littlefield)

Yeah, we fished out here three days into the spawn at Halibut Point. (Charlie Skultka)

Because everybody in the tribe claims that Kasiana is the number one place for spawning. That doesn't necessarily really jive with what [I] have here. Here we finally saw a spawn on Halibut Point on the 8th [of April]. But look what happened to it. That was still there on the 9th: we had little spots here. This was on the 10th. It's gone. It's gone. And then they moved out in here. So they only had two days right at Halibut Point. (John Littlefield)

I mean there's—you know, and I usually go out. I have pictures of one out by Magic Island. It was just—I don't know if you'd be interested. If that's part of your thing, but I have pictures of my son- and daughter-in-law shoveling huge quantities of herring eggs that they put in garden here. (Eric Jordan)

## **Hayward Strait**

Bob Kirkman commented about gathering herring roe in Hayward Strait:

Sometimes the herring are over here. Like, I've gotten them over in Hayward Straits.

Set my branches over there. (Bob Kirkman)

## **Herring Rock**

Herring Rock (*Yaaw T'eiyî*) is an important cultural landmark claimed by the Kiks.ádi clan.

If the people around here would stop and think:, the Herring Rock, right out here in front of Sitka used to be known for its herring spawn. That doesn't happen anymore.

It has been years and years since there has been a spawn in that area. Also, the duration of the spawn is much shorter now. (Roy Bailey, 1996)

I used to play on that rock: me and Duck James and my brothers. When the tide was coming up we used to jump in the water. It was a good diving place ... When the herring came in there, we knew it was time. And my grandmother and them they had legends of the Herring Maiden ... And that story about the Herring Rock are very true. Many, many, many moons ago. We've known them for thousands of years. The Herring Maiden, she'd go down there when the tide would be coming up. She had real long hair. About that time the herring would start coming in. They'd mill around her hair and they'd start spawning in her hair. Then they found out after that, hey there's some food value in that. So they start gathering, what you call it...on the hair kelp. And then we start setting branches too. (John Nielsen)

But Herring Rock was, had the power to draw everything in, everything we wanted, you know. The *gawakan* in the *xoots*, you know, deer and the bear, it's all there. In the river's our fish. Down here we had Herring Rock to draw everything in. Draw the herring and everything else: the salmon, the halibut, the seaweed, gumboots, everything. That was our—in the old days, that was our calendar. Herring spawned down there, you know spring is sprung, you know. (Duck Didrickson)

Why do salmon go to their natal streams, I mean these herring are probably up some reason they go to the same place too. They always came to Herring Rock. (John Littlefield)

Things change, so I don't know if, for example for thousands of years the herring spawned every year right here in the Channel area, the Herring Rock area. And the increased activity in the processing plants going earlier in the spring with all of the halibut and black cod and all that effluent and the increased traffic have changed things. (Eric Jordan)

Because when I was a kid I used to see that rock and that was one of the places that herring did come in to spawn. We called it the Herring Rock. (Consultant #25)

### **Hot Springs Bay**

Franklin James, Sr. identified Hot Springs Bay as a herring spawning location (see Regional Comments, Franklin James, Sr.).

## **Jamestown Bay**

Herring spawn was once abundant at Jamestown Bay (see additional comment: Deep Inlet, Herman Kitka, Sr.)

I was born in 1926 and raised in Sitka. I remember the herring in Jamestown Bay, eastern side of the bridge. The area was a good place for herring egg collection. The herring have since moved over to the other side of the bridge. ... During the past five years I have seen the most change in the herring spawn location and duration. After they moved out of Jamestown Bay, the herring sac-roe fishery moved into Sitka Sound. They are getting their quota right in here now. And since they've jacked up their quota, it's taking them longer and longer to get their quota. They were chasing the herring down to Salisbury Sound before they finally got their quota. I know they need to make a living, but they may be cutting their own throats as well, by over-fishing the herring stock. From my years of being a fisherman, I know what it is to need to make your living that way. But I think that there is a difference between making a sensible living and raping the countryside for more money. In our town there are only two boats that have herring sac-roe permits, the rest are from out of town, out of State. We get boats from Washington and California. They don't leave much money here, in Sitka, they take their money and run. (Herbert Didrickson, 1996)

Jamestown Bay used to be full of herring. (Walter Moy, 1996)

Right in Sitka Channel there would be a mass of herring spawning but we considered that polluted so we didn't bother with it. And then we'd get to Jamestown Bay and it was a continuous spawn all the way from Sitka to Jamestown Bay and there was hardly anybody living there so we didn't worry about pollution there. (Fred Hope)

Oh, the mid 70s. Somewhere in there. Actually, we had a big die-off of herring early 70s. Something happened at the pulp mill. The herring around Totem Park in that area had a big flat area, you could almost, it was almost that deep (motions 5" with hands) with dead herring along the beach. (Harvey Kitka)

But I can remember when Jamestown Bay used to be one of the favorites [for collecting herring roe in the 1940s] because there was barely any housing there at the time. The whole bay used to be covered with spawn, milky. And not false spawn either. Just before they even harvested sac roe. (John Nielsen)

Well, they're getting a lot more miles now anyway, backtracking and all that stuff. You know it's interesting all the changes that have happened. Especially in the last you know two--like five or six years we're going through some kind of real change because now you know, even like last year and I'd say since maybe the probably the early 90s we just don't see any spawn south of the bridge in any big numbers. There's some occasionally around the park in Jamestown Bay but the bulk of it has been in the northern areas. (Mike Miller)

### **Japonski Island**

Japonksi Island was once a place where herring spawned in abundance:

When—a story I always remember even to this day is during school [in the 1960s] the herring were running and I skipped school to go down and get some herring from the, from the beach and I was picking up herring in my hand that's how abundance they were. That was over at Japonski Island which is called Mt. Edgecumbe. (Phil Charles Nielsen)

It used to be big. You know, they—sometimes they'd spawn, you know on where the Island [Japonski] is ... (Jake White)

Mr. Kitka cites the reconfiguration of the Japonksi Islands during World War II as a cause of herring spawning habitat destruction:

Interviewer: Ok. And what effect did the whole World War II you know, reconfiguration of Japonski Islands and the islands in front of town? What impact did that have on the herring? Was there any?

Herman: They started grouping in together when the Japanese attacked Pearl Harbor. Prior to that they were only building the Navy Station. They were supposed to train pilots on that island. In front of the hangar, they laid it out like a—the size of a carrier. And those pilots were taught to learn to land on that area. After the Japanese attacked, then the army came in. That's when they tied all those islands together. ... And that's where we lost all the spawning area on that side. (Herman Kitka, Sr.)

### **Kasiana Island**

Many consultants identified Kasiana Island as a herring spawning location (see additional comments: Apple Islands, Bob Kirkman):

The only place I can put out my branches anymore is Kasiana Island and the cove out in front of the Fish and Game building, out the road. (Wade Martin, 1996)

It is becoming more difficult for myself to obtain the herring roe in the traditional manner, which is setting out hemlock branches. It is becoming more difficult by trying to guess where and if the herring will spawn in areas that they once always

spawned. I used to go to Kasiana Island a lot; that is becoming unusable. (Nels Lawson)

That's the way we'd harvested herring roe on hair kelp, né also. And ... around Crow Island and Middle Island, Kasiana Island and then most of the time that's where I ended up setting my branches. So I have an early history with the outside of Middle Island. I've noticed the decline of spawn in those areas seems little by little. It's not like they decided to move some place else. They diminished in number and pretty soon, very light spawn that's not suitable for use as food. (Al Wilson)

Well, I come here [Sitka Sound] and we go get a bunch of trees and if there's a little spawn going some place, we'll drop the trees in about 25 feet of water, tie a rock on the bottom of the tree. And sometimes it will stand up like that. And the herring spawn all up and down no matter what depth. ... Right in here [Kasiana Islands]. We usually set here and here. All these little islands around here. There's a pass in there somewhere between the islands that is really good. And then it starts to spawn all the way up into here and they talk about little patches in here. But over here there's gotta be a lot of spawn in here. A lot of spawn in this area, but nobody—you'll have to talk to Herman about that. (Clarence Jackson)

On the 3rd it spawned at Kasiana and then kept spawning there. (John Littlefield)

And over time there was few spots where there was really consistent at least some spawn every year like Kasiana Islands and Apple Islands, Parker Islands group out here. (Eric Jordan)

And when you get in here, say Middle Island, Kasiana Island, those two, they seem to hit virtually every year. (Charlie Skultka)

Like, this year, the herring weren't there [at Kasiana]. Like I went out and set branches where I usually set them and then I kept moving them. (Bob Kirkman)

Last year the window was a couple days. From Middle Island and Kasiana Island. If you didn't set there, you didn't get any. (Nels Lawson)

It seemed to be the case last year that we tried and I for probably three weeks actually chased spawns. They'd spawn for a day, or a day and a half and or maybe even just one tide cycle in a lot of areas so when I knew that my initial sets in the Middle Island, Kasiana Island area weren't being as productive as I'd hoped. ... They're looking for the right conditions. Granted you know in the last 15-20 years there have been some real consistent places, Kasiana Island being one of them, but I don't know if it's like they say, specific that they go back to that because they were born there or if it's just because the conditions as of late have been the right conditions there for them. (Mike Miller)

### **Katlian Bay**

“There were once smokehouses at Katlian Bay, which belonged to the Kiks.ádi” (George Lewis #55 in Goldschmidt and Haas 1998:64). Katlian Bay has been utilized as a subsistence area for herring eggs, but has also been utilized more recently by the commercial fisheries. Some consultants commented on a notable decline of herring in the area (see additional comments: Regional Comments, Charlie Skultka):

We used to go from here up north to Katlian and Nakwasina, especially at really low tide and use a rake to pick up herring roe on Angel Hair kelp. This sort of herring roe type was believed to be better than that deposited on branches and you could get a clump the size of a basketball in the old days. You don't find that kind of herring spawn anymore. (Ted Borbridge, 1996)

Seiners wiped them out and they, in Katlian Bay the ferry boats used to have a hard time trying to get them [the herring] to move out of the way. (Herman Kitka, Sr.)

In the early 70s when this herring died out on the Silver Bay side, the herring fishermen moved out into Katlian and Old Sitka and they fished there. And then they wiped out this bunch and this bunch and this bunch [moving in a northward direction]. (Harvey Kitka)

Well, I started, I'll say in the 70s, or even the 60s. I'll say 60s and Merle—I was thinking when we were fishing up in Katlian Bay. We had a big set there and no technician so we had to get someone in a skiff to run to town from Katlian Bay to find a technician and there were no technicians there: no Japanese there. Well, he rounded up one and he came out there and looked at the herring. And he said they weren't ripe enough yet, but our seine was just completely covered in spawn where they'd been spawning on the web. I don't know how much riper they could have got. So we turned them loose. We had about, probably 300 ton of herring in that set. ... Well, I believe in the way Merle Enloe—a lot of my deals were made on his judgment. He said that the herring were always here: up at Katlian Bay down in the deep, up at Silver Bay down in the deep. (Bob Kirkman)

Ok, like through the 60s we used to go and fish winter herring but we would concentrate on what they call firecrackers now. They're like the little one-year-olds to two-year-olds. ... Well, we used to have that [commercial] fishery like we'd fish them in Silver Bay and Katlain and Nakwasina. Real low volume fishery but a good price on the fish. And we'd catch 10, maybe 15 tons a night. ... When we got in over the 40-fathom hump in front of Mosquito Cove and started down into the deep. When it reached 40 fathoms, or yeah, 20 fathoms in there, this is like you go down in 40 and then it goes and it goes all the way down to 80. After we'd break over that hump and we'd get down there'd be literally a 20 fathom blanket of herring in there, perfectly. All the way around the whole bay. ... It was, and some years they'd winter in there and some years they wouldn't. (Charlie Skultka)

### **Krestof Island**

Charlie Skultka identified Krestof Island as a herring spawning location (see additional comments: Regional Comments, Charlie Skultka).

### **Kruzof Island**

Kruzof Island was the location of a Kiks.ádi settlement, occupied at the time of Russian arrival (Goldschmidt and Haas 1998). The island is used for hunting, trapping and smoking fish. According to observations, herring may have migrated toward Kruzof to spawn during the 1960s and have been followed by the commercial fishing fleets (see Regional Comments, Franklin James, Sr.):

Interviewer: So when you said they moved, is that around the same time? In the late 60s when they [herring] began to move over to Kruzof?

Fred: Yeah.

(Fred Hope)

Well, I know there's a whole island, it used to be all around both sides [in the 1960s], Kruzof. And then up towards Hoonah Sound, there used to be spawn up there too. Right up Peril Straits, up in that area. (John Nielsen)

They're clear out into Kruzof Sound now. We never fished there. We used to take the fish right basically in Sitka. Although they did fish there the other day. But I mean that's a huge area but they felt they could expand it and keep going outwards you know, pull in more area. (Lawrence "Snapper" Carson)

I have fished in the Sitka area for many years and from this experience I share the following views and observations with you. I know there was a lot of herring out in the Cape area two years before last. Last year we did not see much. For this reason, I was surprised to hear that the quota had been tripled. I was surprised because of the small amount of herring that I observed last year. (Moses Johnson, 1996)

### **Larch Bay**

Consultants commented on the utilization of Larch Bay by reduction boats (see additional comments: Cape Ommaney, Ralph Guthrie):

Mmhmm. Well, actually toward the end they [the reduction plant fishers] started fishing way out here in Larch Bay. (Clarence Jackson)

My dad used to tell me that they used to go all the way down to Larch Bay to set their first branches. Some of these people used to use canoes back then. They had to be tremendous ocean people. ... It was always an earlier spawn [at Larch Bay]. (Harvey Kitka)

Larch Bay. That's the one he [my father] talked about when he was fishing halibut on the outside. He would see those herring boats coming from Larch Bay. And that's where—you probably got the records on how much herring was caught there. ... Yeah, I don't know if it was exactly in the summer but he mentioned seeing the big herring boats coming from Larch Bay: swamp loaded, going to Washington Bay. (Nels Otness)

### **Lava Island**

John Littlefield describes his frustration at being unable to harvest a sufficient amount of herring roe as a gift for his aunt's birthday:

So I wanted to get her [my aunt] macrocystis kelp so I also went to—this is a Lava and Leisnoi Island. And I went out there and I could find—I spent hours there and found enough to give her one little box of macrocystis kelp. None of it very good. And not enough for anybody else. In other words, a couple hours out there, I should have had enough for everybody at her birthday party, but I had one little tiny plate for her. And I said, “I have to apologize. I can only give this gift to you.” You know, because I don't have enough to share. (John Littlefield)

### **Leesofftskaia Bay**

Leesofftskaia Bay is described as an area utilized by commercial fishermen herring pounders:

In the early to mid-eighties, Sam Sing [sic] and Pirate's Cove were very prolific, as was Sandy Bay, and Leesoffskia Bay. (Gary Olsen, 1996)

We stopped at Leesofftskaia Bay [to search for herring]. (Mike Baines)

Yeah, Leesofftskaia Bay. Right in here was the herring pot [also known as a herring pound] and at the time Bret Miller bought that and started operating it. I think he bought it from Moe Enloe, Merle and Moe. He operated it up for two or three years and maybe going on four. He moved out and in the mean time I had taken a complaint to the STA Council that the hatcheries were killing off the herring in that area. And they found against me; they found for the hatchery people and the next year, Grant Miller came out of Leesofftskaia Bay and he put a pot right on the south side of Kasiana Island which caused a small war. And he said, well, I guess Fish and Game let him do that. Well he moved out of there, but he had to move because there's no herring in Aleutkina Bay any more. (Al Wilson)

### **Middle Island**

Middle Island is identified by many consultants as a location to gather subsistence herring roe (see additional comments: Kasiana Island, Al Wilson and Charlie Skultka; Gavanski Islands, Phil Charles Nielsen; Crawfish Bay, Harvey Kitka):

The change I have observed in the Sitka area spawn has effected my subsistence herring egg harvesting. For the last five years my friends and I have been going near the Middle Island/Big Gavanski group to get our eggs. Last year, 1995, there seemed to be only a few good spawning spots in the areas I was familiar with. So the whole small bay we set in was completely lined with sets, of which three were my own. Due to overcrowding, I even set one out in the pounding surf, which I had never done before. Tidal action carried away my whole set. But that was the last available slot to set any branches in this bay. Then, not to have all my branches in one place, I found another spot that was looking pretty good. I put my branches down. For the first time two people, two different harvesters, put their sets directly on top of mine. This has never happened before to me in the 17 years that I have been putting branches down.

This tells me that there are fewer and fewer places with more and more people desiring subsistence herring eggs. (Gary Olsen, 1996)

The difficulty being experienced by harvesters of getting herring spawn is also noted by thinner spawn on the branches. Last year the heaviest Sac Roe fishing was near the new breakwater and around Middle Island. (Roy Bailey, 1996)

I gather my eggs around Middle Island. We have a special place there. Here we are, we have our branches out and we know the fish are going to come in there, but the herring fishermen are sealing off that bay to catch their load, which then forces the herring to move away from my subsistence area. (Herbert Didrickson, 1996)

Middle Island is our really great spawning place. You know, I hate to see them get close to, that's where they [herring seiners] destroyed it a couple years ago. (Clarence Jackson)

And then they start to, the pulp mill stopped polluting the water, they started storing their sewage so the herrings started to show up in the Sitka area next, like they were trying to come back to this area; In the Middle Island area. And it seems like they're still there, but what they did was they moved from this area over to this area and then they, over the years, it looks like they're trying to come back but I don't know why they would need to come back unless it's more secure for their eggs once they're laid there along the shoreline. (Fred Hope)

All the areas they spawn in, Middle Island, all the beaches have that [firecracker seaweed]. (Herman Kitka, Sr.)

Today [1996], like last year, the herring spawn was Around Middle Island in Sitka Sound only. (Herman Kitka, Sr., 1996)

My favorite islands were out there in, at ah, right off of Aleutkina and those areas and then Middle Island by boat. Those two. That's the only place we've ever harvested. Not close to town but further away. (John Nielsen)

Middle Island used to be full, clear up to Dog Point [as was] Middle Island to Vitskari Rocks to Cape Edgecumbe. (Walter Moy, 1996)

It seemed to be the case last year that we tried and I for probably three weeks actually chased spawns. They'd spawn for a day, or a day and a half and or maybe even just one tide cycle in a lot of areas so when I knew that my initial sets in the Middle Island, Kasiana Island area weren't being as productive as I'd hoped. (Mike Miller)

Last year [2007] the window was a couple days. From Middle Island and Kasiana Island. If you didn't set there, you didn't get any. (Nels Lawson)

Middle Island area was good. We'd go out here by Bieli Rock. Here we'd pick kelp. (Bob Kirkman)

### **Nakwasina Bay**

Nakwasina Bay is utilized by both commercial fishermen and subsistence users (see additional comment: Katlian Bay, Ted Borbridge):

Might hit a little bit by Nakwasina in there and sometimes they spawn right up into Nakwasina and back out . ... Ok, like through the 60s we used to go and fish winter herring but we would concentrate on what they call firecrackers now. They're like the little one-year-olds to two-year-olds. ... Well, we used to have that fishery like we'd fish them in Silver Bay and Katlain and Nakwasina. Real low volume fishery but a good price on the fish. And we'd catch 10, maybe 15 tons a night. (Charlie Skultka)

It got harder and harder to catch the spawn because they just are so fragmented. So I ended up getting more and more experience with looking for spawn, going into Nakwasina. There was about three years in a row where there was really nice spawn in Nakwasina too. I remember somebody cut down—who was it? I can't remember (laughter). I think it was my kids, yeah. Cut down this huge tree for me in this one place where it was a kind of steep bank and they just toppled it over in the water, it was a hemlock tree. It looked really, really good. And when we came back to check on the next day and the next day it was incredible spawn: just really thick on it. And to get it we had to go at low tide because we couldn't pick it up. ... But I think the second time we went back to harvest eggs off of it, it was gone. And it was pulled up by some seiner, the whole tree, and taken. So that's another issue with branches. We figured we were pretty safe with a big heavy tree if that just stayed there and all of that lovely set just evaporated. (Roby Littlefield)

I mean aside from the BC to Kah Shakes to Craig to Sitka, they would spawn first at Samsing and places like that and then they would work further north and a lot of the last spots were all the way up in Katlian Bay and Nakwasina Bay further up. (Mike Miller)

### **Nakwasina Sound**

Herring spawn in Nakwasina Sound (see Regional Comment, Franklin James, Sr.).

Some years they spawn at my camp. Looks like they may this year, if they don't fish out. They had 11.5% roe there today right there in Nakwasina, just in the mouth. (John Littlefield)

I've always known herring back in the back end of Nakwasina in that area. Sometimes they'd wash back and forth in the tide and behind it. (Harvey Kitka)

### **Necker Bay**

Necker Bay is claimed by the Kiks.ádi (Goldschmidt and Haas 1998). Fred Hope comments on the presence of herring in the area:

But what we have is--there's a lot of rumors going on around right now that we've had herring as far as Necker Bay. It was already gone when I came around. We fished in there but we didn't see any herring. (Fred Hope)

### **No Thorofare Bay**

Nels Lawson comments on herring in No Thorofare Bay (see additional comment: Camp Coogan Bay, Fred Hope):

No Thorofare Bay in the late 40s some [herring] was in there. (Nels Lawson)

### **Parker Group**

Eric Jordan and Nels Lawson identified herring spawn in the Parker Group Islands (see additional comment: Apple Islands, Eric Jordan):

And all them islands in front of Sitka [had herring spawn]. Parker group. (Nels Lawson)

## **Partofshikof Island**

John Nielsen commented on herring at Partofshikof Island:

Yeah. Every bit of that island including Partofshikof and all those other islands [had herring spawn]. (John Nielsen)

## **Peril Straits**

Mr. Nielsen described herring spawning in Peril Straits:

Well, I know there's a whole island, it used to be all around both sides, Kruzof. And then up towards Hoonah Sound, there used to be spawn up there too. Right up Peril Straits, up in that area. (John Nielsen)

## **Pirates Cove**

Pirate's Cove was mentioned by many consultants as a herring spawning area that is no longer productive (see additional comment: Camp Coogan, Fred Hope; Samsing Cove, Gary Olsen):

Pirate's Cove was once a good location but I haven't gone in there in 7-8 years because the herring don't spawn in there anymore. (Wade Martin, 1996)

South of here, Sam Sing [sic] Cove, Pirate's Cove area, becoming illusable [sic] [for hemlock roe]. (Nels Lawson, 1996)

Yeah, and the area that we used to, that we don't know more because there hasn't been spawn there for quite some time, that we used to really consider really, really good where we got really good eggs from is around Pirate's Cove area and we used to be able to get all types on branches and kelp. (Phil Charles Nielsen)

Late 60s it was still kinda on the south end more: more around Deep Inlet than Samsing Cove and Pirates Cove area. We'd get them around there. (Harvey Kitka)

That area, Three Entrance and the Baranof Point and the Pirates Cove, Samsing: we used to get eggs out of there all the time. That was—we used to run across there and just get tons of eggs in that area because it was productive for other types of herring substrate as well. In other words, we could get our, as you talked about, né. You could get né. And you could get the macrocystis kelp as well as set your branches in there and you could have all three types all aboard. (John Littlefield)

Yes, yeah. Like I said, there's abalone and stuff along that beach and maybe something will show up again like it used to be at that Samsing, Pirates Cove. That used to be primo. (John Littlefield)

Like, nobody goes to Samsing Cove anymore because they don't spawn in there anymore. Or Pirates Cove. I haven't been down to Redoubt in a couple of years but the last time I went there was hardly any. (Nels Lawson)

### **Point Brown**

Nels Lawson commented on herring at Point Brown (see additional comment: Fred Creek, Nels Lawson).

### **President Bay**

A late herring spawn was identified by Charlie Skultka:

Ok, as far down as President Bay, I've seen the herring spawning down there like May 10<sup>th</sup>. (Charlie Skultka)

## **Promisla Cove**

When traditional herring egg subsistence areas have failed, Natives have often found herring spawn at Promisla Cove, but results have not been consistent:

But the problem with Promisla Cove, is we were there, we set in heavy spawn on the first day of spawn. I came back the next day and they had quit spawning on that side of the bay and they had moved to the south side. We had put down every set we had, pull them up as far as we could with block-and-tackle and drug them across the other side and set them and they heavy spawned and we got, so we got good eggs out of there. But the people who left their branches on that side, they were one day spawn. They looked like that blue green you know. They were unusable to us, so we drug them across the bay. That's unusual to have to sit there and pull up. (John Littlefield)

I spent quite some time running, quite a bit further out into Magoun Islands and... yeah, and Promisla Bay on Krestof Island and then the outer shores of Middle Island. Essentially chasing these spawns and actually none of the sets that I put in any of those places turned out any good. (Mike Miller)

Yeah. And going into Promisla Cove has saved us the last couple of years. Just terrible harvest the last couple of years in the local, you know, close by traditional places and then the small school or something will hit in Promisla Cove. So last year and the year before we were able to finally put enough in our freezers by gathering from Promisla Cove. Although last year they hit strong and they were spawning and we set our branches and we came back at close to low tide, came back the next day, the next morning at the next low tide and they moved over to the other side of the cove (laughing). It was a small cove you know. But it was nice you know, a good start. So everyone was working on that one so we all said ok, let's just pull them out

and take them over there. So we did. And they spawned there for about a full day. So we got a half a day's spawn, or 12 hours spawn on one side of the cove, took it over there and they spawned for another day. We actually got some pretty thick eggs out of that but we had to move our set. It was a small cove. It was just weird. (Roby Littlefield)

### **Redoubt**

Redoubt (Kuná) is claimed by the Kiks.ádi and was once a settlement (Goldschmidt and Haas 1998). Some subsistence users commented on collecting herring spawn in the area in the past, but note a decline in spawn abundance attributed to commercial fishing:

They used to be able to fish for herring in Kanga Bay, around Redoubt. Not anymore. Why? They've over-fished those particular areas. Given the opportunity, they will eventually fish the fishery out of existence. I don't have any formula to advance to them, but I think that they need to reevaluate the formula that they do use to decide if the fish are ready to harvest or not. (Ted Borbridge, 1996)

. ... but at the time [1950s], when the herring spawned in that time, he didn't really set the branches anywhere near a town. It was more toward the south end out around Redoubt and behind the rocks. They weren't disturbed out there. Set some pretty good-sized branches in the water, pick 'em up. (Harvey Kitka)

Then they fished the south end so hard [in the 1970s] that they wiped out the herring that used to sit in Redoubt, Deep Inlet, Silver Bay. (Harvey Kitka)

But yeah, definitely since for when I was growing up, we did harvest more on the southern side and in between that time from the late 70s to the, to the late 80s, we did occasionally harvest all the way down to Redoubt and down toward Goddard at

times especially for kelp. ... I went down there and harvested some kelp and then actually in the last couple years we've gone a couple times down there. But it's really hit-and-miss there now because there's been years where there's just absolutely no spawn down there. And it has been interesting because we've tried to set down there a few times when there was lots of herring staging like in Redoubt. And probably as recently as I think 4 years ago there was huge schools of actual fisheries that happened down in Redoubt so we set a lot of branches there with the assumption there would be some spawn there but there wasn't any at all. (Mike Miller)

Personally observed herring spawn in Redoubt, there. ... I haven't been down to Redoubt in a couple of years but the last time I went there was hardly any. (Nels Lawson)

Yeah, they'd come from Redoubt [in 1964] and we'd catch them out—oh I don't even know the name of the island, but it's behind the green marker there, in front of Redoubt. ... The herring pound was on an island there. (Charlie Skultka)

I've seen herring spawn one time I notice it. It was in July down in Redoubt Bay. And it was a little small spawn, only an acre or so, but it was definitely herring. I went over and looked and it was definitely herring and it was way later. It was in July. (Eric Jordan)

### **Saint Lázaria Island**

See comment between Edgecumbe and Biorka, Eric Jordan.

## **Salisbury Sound**

Subsistence users comment that they are now being forced to move further south from the Sitka area along the coastline to places like Salisbury Sound to find herring eggs:

Now. Although there was a lot of areas that had spawn, we mostly by boat, would just go so far. There was no need to go like up in Salisbury Sound or further down south like by Goddard. There was just not a need to. But the spawn I know it did extend all the way up and all the way down those areas. (Phil Charles Nielsen)

We had little tiny herring all over Salisbury and Shelikof in numbers—I'd seen numbers like that before in the Sound, like in Vitskari and stuff but I hadn't seen them like that in the ocean off of Shelikof and off of Salisbury where the biomass was, instead of seeing herring in a small area. You know, little herring of the year, we were seeing them in a huge area. Now, whether they survive, those are real still vulnerable, but we did see quite a few of them as two-year-olds last year too. (Eric Jordan)

Six years in a row, they've gone to Salisbury now. Where they only went there like eight times in the previous 39 years. So, all this fishing is—the herring are just moving out is the way I look at it. They're moving out of the Sound. They've disappeared on this side. They went over here along this here. Now, they're just moving them out. So, what the tribe says, this core area [in Sitka Sound] is pretty important to try to maintain I think. (John Littlefield)

## **Samsing Cove**

Samsing Cove is another location that was once favored by the Sitka Natives for herring roe harvesting, but has been unproductive in recent years (see additional comments:

Deep Inlet, Phil Nielsen, Jr. and Harvey Kitka; Pirate's Cove, Nels Lawson and John Littlefield; Aleutkina Bay, Mike Miller):

The herring spawn has changed in my years of observation. When I first started collecting herring eggs, Sam Sing [sic] and Pirates Cove were my favorite spots. I have learned many tricks of hiding my sets from seiners who come here for the fishery, but don't take the time to set their own branches. In the early to mid-eighties, Sam Sing and Pirate's Cove were very prolific. ... It used to be a pretty tough choice, should I set branches 'north' or 'south' during the spawn? In the early to mid, and even late, eighties the choice I always made was the Sam Sing [sic] area. Then that began to change. For two or three years they had big fisheries in Aleutkina. The spawn never was the same, it didn't seem 'thick' milky white as it does when you know you are setting your branches in the best spot. (Gary Olsen, 1996)

The rock piles outside of Samsing used to be good [for collecting herring spawn]. (Wade Martin, 1996)

Before they developed housing and everything, that was one [herring spawn location] at the Favorite Bay Inlet. Then across from Samsing was another spot. Aleutkina. And then all around Middle Island and that area. Siginaka Island. We never had to go very far then. (John Nielsen)

And finally we got it up there. A seine boat came by and used a double-block to hoist that tree out of there. ... There was more than enough for two boats: just the one tree. (John Nielsen: when a teenager [1950s])

That area, Three Entrance and the Baranof Point and the Pirates Cove, Samsing: we used to get eggs out of there all the time. That was—we used to run across there and just get tons of eggs in that area because it was productive for other types of herring substrate as well. In other words, we could get our, as you talked about, né. You could get né. And you could get the macrocystis kelp as well as set your branches in there and you could have all three types all aboard. (John Littlefield)

We planted branches there about nine years ago ... And the whole place was so thick in milk you couldn't believe how thick it is in Samsing out. (Franklin James, Sr.)

We were just on one of them little isolated islands there and the herring used to hit there and they'd loop around the island and then we'd catch them and pound them up there, run them in to Sitka. We also had a herring pound in Three Entrance Bay. We had one in Samsing Cove. (Charlie Skultka)

Some years they're just over here at Deep Inlet and Samsing. (Eric Jordan)

### **Sandy Cove**

Sandy Cove no longer hosts a yearly herring spawn:

No, it's a, there's a place called Sandy Cove and it's in front of that you don't want to get in the sandy areas you stay on the rocky points. You do really well. We did really well. (Al Wilson)

My feeling is that the herring are under a lot of stress that they weren't under in the past. Sandy Cove used to be called the "Herring Pot," and you could depend on that area having a fantastic herring spawn, but not anymore. (Ted Borbridge, 1996)

I used to go into Sandy Cove [to gather herring spawn]. (Wade Martin, 1996)

### **Sealing Cove**

Consultants commented on the decline of herring spawning populations in Sealing Cove:

From that, the water there was, really strong Sealing Cove. The entrances were kind of wiped out on the beach and we'd have those herring. (Phil Charles Nielsen as a kid, first grade)

Sealing Cove has eelgrass in it. And there was lots—they used to spawn in there all the time. It was just a nice round bay with a nice beach and everything. And as kids, I remember, they had a bridge going across that they built. (John Littlefield)

Today, in 1996, I don't see the numbers of herring going into that area anymore [Sealing Cove]. (Phil Nielsen, Jr.)

In the local area, before the commercialization of herring fishing, the herring spawned heavily right along Sitka's shore. Sealing Cove is now a small boat harbor and no longer attracts herring spawn. (Roy Bailey, 1996)

### **Shelikof Bay**

Shelikof Bay belonged to the Teikweidí clan and in the past was utilized as a sea otter and fur seal hunting location. Currently, it is mainly used as a trolling area specifically for halibut, but many consultants commented on the presence of herring spawn as well (see additional comments: Salisbury Sound, Eric Jordan):

Shelikof Bay used to be full of herring, but not anymore. (Walter Moy, 1996)

Shelikof is a much later spawn [that] happens out there. (Phil Charles Nielsen)

And we scooped some [herring] out last summer out in Shelikof Bay. You know where the big schools were coming up? We just dip-netted in there and were pulling it aboard for bait. (John Littlefield)

### **Shoals Point**

John Littlefield commented about herring spawn at Shoals Point (see additional comments: Regional Comments, Charlie Skultka):

And then there are years like last year, even though this shows that March 31st last year they had their last opening. But there was no spawn observed anywhere in the sound, major spawning, other than Shoals Point until the [April] 3<sup>rd</sup>. (John Littlefield)

### **Siginaka Islands**

Consultants described the herring pound once located in Siginaka Islands (see Regional Comment, Nels Lawson and Samsing Cove, John Nielsen):

When the herring move in here, they would what you call lead. They go to the beach and they follow the beach around. I used to herring fish out here, used to put our pot [also known as a pound] out there. We'd have to wait until the herring are leading before they opened the pot, let them come inside. Then it'd be pretty close to a month before they'd spawn, you know. We used to get the herring just for bait at the cold storage prior to burning, you know. It was always out on the Icy Queen outside—inside let's see what did they call—Siginaka there. Siginaka Islands. That was the best place for them to lead, you know. There was always a calm in that narrow bay, you know. They'd come in there and they'd see the pot sometimes they'd lead outside you

know. But when they're leading there on the beach they'd come circle back before they spawned, you know. (Duck Didrickson)

The herring ran here [Siginaka Islands]. Where we used to get bait. (ADFG and STA, 1993)

### **Silver Bay**

Silver Bay is claimed by the Kiks.ádi people (Goldschmidt and Haas 1998). It was identified by many consultants as an important herring spawning and wintering area (see additional comments: Regional Comments, Japonski Island, Herman Kitka, Sr.; Deep Inlet, Harvey Kitka; Cedar Cove, Harvey Kitka; Katlian Bay, Charlie Skultka).

Silver Bay used to be the starting point [of the yearly herring spawn] and I mentioned it last night but I'll just repeat myself. (Fred Hope)

What we had was in January, the last week in January, the herring would show up in Silver Bay, not the herring, the whales would show up in Silver Bay and they were there for the plankton and the herring. Then ah. The whole entrance of the area eastern channel would have herring. Then in February, the fur seals would come to the Sitka area and they would be first spotted at Biorka. From Biorka they would work their way in. (Fred Hope)

You know they build a whale park in Silver Bay because before the herring roe fisheries, the whales used to feed on those herring—that local herring, that's there ... After they put that whale park so tourists can watch the whales there. They wiped out the herring stock that used to hang around in Silver Bay. Now no whales hang around there. (Herman Kitka, Sr.)

It was one of the wintering places for the first tail, but when they were migrating by they'd stop and feed there along with Silver Bay. (Harvey Kitka)

We used to get ours from Silver Bay and now I don't even see herrings there any more. (George Dalton, Jr.)

The ones that were south of here would've ended up, a lot of times up in like Deep Inlet and Silver Bay. And there's definitely seems to be a delineation for which ways they end up. Right about where the airport is and so... Yeah, they spend the first winter they spend growing up protected in little bays up in these bays I guess. ... I think it's pretty essential that they make it up into one of those protected bays. Also, I think the predation out in the, when they get split up and out, and beat up out in the open is the survival rate is really low I guess on that. So these fish need to get up in those areas. And traditionally, I guess that, the way I understand it is that Silver Bay, the name Silver Bay comes from the young herrings that winter up there. ... That's the way it's been told to me, that they would just look like silver on the water up there. So. And it's interesting talking with Department of Fish and Game as they've done a lot of their sampling and surveys in the winter, that there does seem to be a line. They were saying at the mouth of Silver Bay that there would be adult herring and then after that line which is right about where the mill was I guess. From up, further up they'd only catch little juveniles. (Mike Miller)

Well, I believe in the way Merle Enloe—a lot of my deals were made on his judgment. He said that the herring were always here: up at Katlian Bay down in the deep, up at Silver Bay down in the deep. ... Up in to Silver Bay, by the road system and over in

Camp Coogan and Deep Inlet and all those island across there; there was spawn everywhere. Now you don't even see it. They hardly come in at the south end in the last couple years I've been over there setting branches. ... I think it was over-fished. ... Well, they're like on a four-year cycle: four years ago, five years ago. (Bob Kirkman)

Seen them all the way down through the Sitka road system on into Silver Bay. (Charlie Skultka).

Yeah, the younger herring, like they call them firecrackers, they're the one-year-olds, the two-year-olds. They winter in there [Silver Bay] and like when there's ice in there, they'll get up underneath the ice and it's just to avoid their predators, whatever. But this time of the year you'll see them—well even February—they'll start coming out of there like in small schools. They call them doughnuts. You see them on the surface on a nice day, you can look into the water and see them. And they just come out of there slowly and integrate themselves to the Sound, you know. They kind of like stick close to the beaches, whatever. And as they grow older they join these older fish. (Charlie Skultka)

The mouth of Silver Bay. ... So Silver Bay was given the name Silver Bay because there was so many herring in there that if you looked at it in the moonlight you'd see the backs of the herring, the moonlight shining off of them and it would look silver. (Nels Lawson)

Silver Bay was once good for herring, but herring no longer go into Silver Bay, it is no longer available. As the stock is depleted, the areas that I traditionally went to are no

longer producing the roe on branches that myself and others enjoy as a subsistence food. (Nels Lawson, 1996)

### **Silver Point**

Silver Point was described as both a herring spawning area and a massing area:

And actually around Silver Point in '89. I distinctly remember that year because of the sets that we had at Silver Point. But there was good spawn in those areas. In, at that time, I and my family would harvest just for immediate family and so we needed quite a bit less than what it turned into here in the last 10 years or so. (Mike Miller)

I've only been trolling the last couple of years and this might, I think my third season coming up. See balls of herring? ... See herring there. Just a few small ones up by Silver Point. (Nels Lawson)

### **Sinitsin Cove**

Fred Hope identified herring spawn at Sinitsin Cove:

We've seen it in July when they were trying to spawn there. That was in Sinitsin Cove area. (Fred Hope)

### **Sinitsin Island**

Roby Littlefield described harvesting herring roe at Sinitsin Island:

There's been years when I didn't get any, anything because I couldn't catch them. They only spawned for a day and a half and I couldn't catch them. I have set hung branches in the Sinitsin Islands. A couple times I've ended up like two weeks after the herring harvest and I don't have enough eggs and I'll keep my eyes out and I'll see them spawning in the Sinitsin Island area. That's not really an easy place to get your eggs but if I have my branches ready I'll just go out and tie them off of a tree—it's

really steep cliffs there on most of the island. And I just hang them off of a point where they're spawning and a couple of years I got enough eggs to harvest just from branches tied to a tree hanging in the water. (Roby Littlefield)

### **Slocum Arm**

Al Wilson described herring spawning at Slocum Arm:

I've seen spawn occur later north of Sitka up north of Slocum Arm, north of Ford Arm and the Myriad Islands I've flown over and seen that. (Al Wilson)

### **Sitka Area**

The Native village of Sitka (*Shaaseiyi.aan*) belonged to the Kiks.ádi, is located at the mouth of Indian River (*Kaasdahéen*) and extends to Jamestown Bay (Goldschmidt and Haas 1998). Many Sitka Natives are alarmed at the observed decline in herring spawning populations in and around the area. Many attribute the decline to increasing pressures placed on herring as the result of an active commercial sac roe fishery (also see Regional Comments).

Yeah, and the biggest spawning area is right here. Sitka area. Because they spawn from Dorothy Narrows in here all the way. (Herman Kitka, Sr.)

My observations of Sitka and the surrounding areas go back nearly 70 years. Prior to the Sitka Sac Roe Fishery [sic], there was no concern or worry about herring. Local Southeastern villages were allowed to come and harvest in the Sitka Sound area traditionally. This meant that there was a large spawn in the Sitka area. I have been around here long enough to see what has happened. I have been here longer than most of the people fishing for herring today. I have been here longer than the Fish and Game biologist. For these reasons, I am very concerned about the Sitka herring stocks. ... In the local area, before the commercialization of herring fishing, the

herring spawned heavily right along Sitka's shore. Sealing Cove is now a small boat harbor and no longer attracts herring spawn. (Roy Bailey, 1996)

I am 72 years old and I am a life-long resident of Sitka. I remember when herring used to be so numerous the sea lions would come into the harbor in huge numbers. In those days, the herring would flip up onto the beaches to get away from their predators. For as far back as I can remember, herring and herring roe has been an important and a very special delicacy to myself and my people. I remember when we used to packing herring roe on branches up from the boats after we harvested them from the water. Trollers would heckle us, telling us that what little bit of eggs we were taking was killing the herring. What subsistence users take then and now is a minute fraction of what is taken for commercial export to Japan. (Mark Jacobs, Jr., 1996)

I started collecting herring with my mother and father in the late 1950's. In those days you could get herring eggs right off of the beach. The spawning area has gotten a lot smaller and shorter in the Sitka area. I remember, in the late-fifties, the spawn used to go on for one or two weeks and now it only lasts a few days. Now, the spawn lasts only a few days and you have to look for places where they have spawned heavily. The herring spawning area has gotten drastically smaller. Also, there are a lot of areas in the Sitka Sound area that the herring don't seem to be spawning in anymore. (Robert Sam, 1996)

The Sitka Sound Sac Roe Fishery has estimated this year's biomass as being really high, but I don't agree with their methodology to determine the biomass. I believe that we need to incorporate both Traditional Native Knowledge and the opinions of

Sitka residents Native and non-Native into the management plans for Sitka's herring stocks. (Ray Nielsen, Jr., 1996)

I had been gone from Sitka from 1965 to 1980. I returned to the Sitka area in 1980 and that is when I noticed the marked difference in the amount of herring returning to spawn in the Sitka area. (Nels Lawson)

***the Cove dock***

And right in there, right next to the Forest Service. Even to this day, that's one of the better spots. It's a very tiny place. But you can always count on them going there to spawn almost every year. Even if you don't catch them anywhere else. (Roby Littlefield)

***Sitka Sound general***

No. There's no halibut come in. No big herring stock coming early anymore. You know, all the sea lions used to come in with that herring and they used to hang around all in front of the Sitka village. They never cared. Even if you throw a stone at them, they won't duck! (Herman Kitka, Sr.)

The State Southeast Biologist is right about lots of herring at Kah Shakes Cove and Sitka Sound. Well there should be for that is where they spawn. (Ray Ford, 1996)

This is pretty much where, that's where we had to journey too. Didn't have to go too far. That's why we feel that we need to protect it. (Consultant #25)

I can remember when we were going up to Old Sitka Sound used to be all spawn, the whole bay. (John Nielsen)

Offshore and a lot of them used to just stay in Sitka Sound... The herring stock all of them stayed in the inside: all gone. (Herman Kitka, Sr.)

Today, like last year, the herring spawn was around Middle Island in Sitka Sound only. (Herman Kitka, Sr. 1996)

[After the herring seiners nearly fished it out in the 1930s] It took almost 30 years before the herring stock got pretty big in Sitka Sound again. (Herman Kitka, Sr.)

But usually it [the spawn] was somewhere in the last week in March. I was thinking there was one time, almost, well it continued to spawn through the middle of April. That was a very long spawn. That was the last big spawn I saw. That was back in the [19]80s I believe ... Everybody got tired of herring eggs that year. That's the only time in a long time since that happened. And that was, that was in the 80s, and that was on the south side. (Harvey Kitka)

And then all of the sudden this miracle happens and since then, you know the stock hasn't really dipped. The biomass has kept going up and up and up. (Consultant #23)

Used to be years ago before Sitka Cold Storage burnt, they'd have what they call the herring siren. The first load of herring everybody in town would hear that siren going. ... Well, you didn't use it for bait. You give it to the Sitka people. The siren

would go off, they knew the first load was the first day of spring as far as we were concerned. (Duck Didrickson)

[W]hen I was younger, there was lots of spawn in here. I remember killing sea lions in the harbor, you know before anybody thought that was bad, you know. And the herring would spawn all along in this area. (John Littlefield)

With that breakwater, it's quite possible that that changed things, because it just doesn't seem like there's as many herring in here. There was a lot of herring right under the—on the bridge that way last year, but the whole area here used to be filled inside here. (John Littlefield)

There was a few people who did fairly well in the Channel last year. Actually right by the bridge. ... Yeah, there was really good thickness there but I've always been a little bit apprehensive of setting in the Channel proper just because of all the boats and the sewage outfall which is right on the south of the airport island there so I usually try not to put our food there. (Mike Miller)

I remember in the 40s the whole Sound would turn white with milt. (Nels Lawson)

But the other part I want to say is that run didn't build by itself. There was about 15 of us guys that were fishing roe herring and we worked together with the Department and made sets, test sets whenever they asked us to. And we spent a lot of time there. It was all—the thinking behind this was someday we're going to get a fishery here. And while all this is going on, the Natives were there. They never said, when the run was small, we never had any trouble with them. Not one bit. They never said a "boo."

Nowadays we have lot of trouble with them because the run is tremendous. But the run didn't build by itself. There was a lot of work put into it and the fishermen were right there helping the Department. ... We didn't go much to Salisbury. Most of the test fishing that we did was right around Sitka like out in Sitka Sound and those different places. Deep Bay, that's another one. Anyway, it was right around Sitka proper where we did our test fishing. And it was building so much from year to year it was really interesting seeing what was happening, you know. (Nels Otness)

Yeah, they'd announce the [roe on kelp] opening when they'd get so much spawn on the kelp. They'd go out and test it and announce a one or two hour opening. At first it just started a few people like in 1964. I picked kelp. I sold it to Bob Wyman. He had, it was Sitka Sound fisheries, but it was called—Bob Wyman's operation. It was in the old Pyramid cannery where that ah, what's that ah—Fisherman's Quay is. He had—he bought a lot of herring from us on kelp. And if I think if I remember right, we got eleven cents a pound but I made a couple hundred bucks a day at it because there was no competition. I think there was only about four or five of us guys that did it. ...

[We used a grapple hook and pull them off the bottom and pick them off the leaves and throw them in boxes. And when our skiff couldn't hold them anymore we'd run to town with them. ...

We'd pull the whole line and tear the bigger leaves were the fastest. You wouldn't bother with the little ones. And then we'd bring them in and unload them and there was a tide was still low, we'd run back out and... Oh, it went—oh, probably until '68 or so. I think. Around '68. And then there got too many people doing it. Pretty soon there was half the town would be out there. Anything that would float was out there. (Bob Kirkman)

They seemed like they got to be full-sized. How I found that herring is kind of a strange fish cuz I've found that some places the king salmon don't like the ones outside and they'll be up closer to the beach. The bigger ones will be down deeper, go down deeper. I found an awful lot of the bays, they'll start coming more to the surface after May and June. Basically when the little salmon fry are coming up. They feed on the salmon fry. Especially the pinks. The pinks are basically about that big [an inch or two]. ... Oh yeah. It'll sound like rain when they're feeding. You'll look at the bay and it's just a mass of herring feeding. And I was amazed in the beginning that salmon would come back after something like that. (Charlie Skultka)

We've seen, I don't know, in my lifetime a real good comeback here. And the people that are older than me, they used to tell me, "Geez, the herring used to spawn from Lisianski Inlet all the way down to Whale Bay." And that's a significant area. But after refinery [reduction] fishery got through them, they pretty much really did a good job of thinning them out. And in my lifetime here, I'm watching herring, not only come back here, but they're coming back in other places. Maybe not as significantly, but it's happening. ... All the way from Lisianski Point on the opposite side of the ferry terminal clear up into Silver Bay. That's a significant amount of herring. And the virtual heart of the pack we left alone here in Sitka Sound because of all the public outcry. And we're hoping to see these things really hit these islands big time and everybody comes out a winner. (Charlie Skultka)

### ***Sitka Harbor***

If you go watch Sitka in the spring time, watch how they're killing the herring before they're born. (ADFG and STA, 1993)

I think herring have their origin or where they spawn and that is the reason that experimental pond fishery in Hoonah Sound is now the subsequent of herring thinks that is their home ground. That is where herring go to spawn now. They no longer migrate to Sitka Sound. That might have enhanced the population of herring. But there are many herring that die up on those flats. Where they don't move off the flats fast enough to preserve their own lives. (ADFG and STA, 1993)

Ninety-two years ago. And I saw it [herring spawn in Sitka harbor area]. It wasn't any larger. It wasn't any smaller. Who says it has been reduced around Sitka? It has possibly increased ... Even now it seems to be very intense: very intense. (Walter Soboleff)

We used to go over to Sitka and Auke Bay to get our herring eggs for our own subsistence use. (George Dalton, Jr.)

And they moved out. You won't believe it. The herrings moved out. Oh, there's all kind of humbo-jumbo stories about it, but they just found another place. And Sitka became the great place. They just moved out. They never came back and they don't know what happened. (Lily White)

There's been big changes there [Kah Shakes] and big changes in Sitka. Because Sitka you only leave your branches one night and that's all you can. You can't lift them up: too big, too thick. You don't see that, I mean now you'll—now you have to fight for your spots to set. (Franklin James, Sr.)

Yeah, because when we were kids we would spend a lot of time in the winter just going down the docks and snagging herring: herring and smelt. And all the docks and all the harbors had herring and that was kind of the pastime. Little kids go down and snag fish and take them up and everybody would fry them up for food. And you just don't see winter fish either smelt or herring here anymore. So I don't know. (Mike Miller)

I went out with went south and I look at the other charts I see that there was spawn in northern areas but I don't know why we went to the southern side. It was probably the last year that I remember getting good eggs there was 1989. (Mike Miller)

And when I moved to Sitka, we'd go and get our own branches and stuff like this, but we moved there in 1958 and the herring weren't very plentiful here but people got their eggs. (Charlie Skultka)

We started off, ok, when I first started fishing here, we had seven areas to fish. We had Helm Bay, Kasaan Bay, Kah Shakes, Sitka, Lisianski Inlet...I believe we had a little bit at Tenakee—no, no—Seymour Canal, and Juneau. And through my part of fishing these things, we've lost every area with the exception of Sitka. (Charlie Skultka)

And then, I started herring fishing. I think I went in 76 with Jeff Funt. We went gillnetting and seining and that year we fished Sitka, Juneau and Seymour Canal. And it was my opinion then, participating in the fishery and then seeing what was going on with the herring—we were fishing on a reduced stock. (Eric Jordan)

### ***Old Sitka***

See additional comments, Gavanski Islands, Phil Charles Nielsen; Katlian Bay, Harvey Kitka.

I can remember when we were going up to Old Sitka Sound used to be all spawn, the whole bay. (John Nielsen)

All of Aleutkina had many good places to set your branches. And during that time, if I didn't set my branches in soon enough (or if someone decided they needed them more than me) and I didn't get enough eggs on branches to gift out, then I would go ahead and try to find a spot out by Old Sitka, or Kerrs Island that was just starting to show spawn. (Gary Olsen, 1996)

### ***Sitka Sound Pulp Mill***

Many comments were made regarding the impact of the Sitka Sound pulp mill on herring populations in the area:

I think I can say for sure, I can say the mill was detrimental. Yeah, I've lived here through the mill's being built and I watched it go away. But during the time it was here, even though people didn't admit it, we had fish kills in the eastern sound that virtually had fish all over the beach like from Silver Bay, all the way to Baranof Point. And for what I've seen, they had a chemical outlet there. They called it a red liquor. They'd treat the red liquor and they'd dump it into the bay there right at the end of where Silver Bay Seafoods is now. Matter of fact the yellow boom is still there. And that treated stuff would lay there for years and then it would start bubbling and we'd have a fish kill. And I don't know that they've ever cleaned it up or anything, but we haven't had a fish kill in a lot of years. They shut the mill down and there was never a spawn up in Silver Bay, the whole time the mill was there, up until several years back

when—ten years ago, twelve years ago. And so, the mill not being there, allowed them back in there. Yeah, because the herring would get to the mouth of Silver Bay and they'd do a turn and go right across to the opposite shore. They wouldn't even go in there. And I say that was directly due to the pulp mill being in the mouth of the bay. Yeah. (Charlie Skultka)

Well, I can speak fairly knowledgably about Sitka Sound. As you know, there was a pulp mill there. And I wouldn't know this if I weren't still fishing there now, but when that pulp mill closed in. ... Whenever it was. It's been ten or fifteen years now. The population—we always had—well we had ups and downs in the biomass: natural ups and downs. But in the later years, right before the—a few years before the pulp mill closed, there was kind of an explosion in the biomass. But the fish would only get to 100 grams and it actually, one year, the kind of the consensus of all the people involved in that fishery was that those fish were starving because there were more fish there than could get something to eat. But as soon as that pulp mill closed and the water cleaned up, over the next ten years, the fish kept getting bigger and bigger and bigger. And now we have, this year we fished on 200 gram fish, which is twice as big as they ever were for the first 20 years. And it's just amazing. (Consultant #23)

But I think what killed them off more than anything, was that the mill took all their wood waste and dumped it up in the—one stream that fed into the harbor. And I think whatever was in all that wood waste, mixed with the water coming in and I think that killed them off. I mean, that's just my theory. (Dick Stokes)

It was a one year thing, but it killed off all the herring, basically. (Harvey Kitka)

The pulp mill polluted the whole Sitka Sound and was all red. The whole Sitka Sound was red. And then when you went and looked at the fur seals, they were infected. Their eyes were all infected and red and popping out and everything. And there were some laying on the beach. And it was, it was affecting them. And they finally moved out. I'm not sure what year it was, maybe you could find that out, but it was probably '68 or somewhere in there. But they couldn't take it anymore. Every year we counted on them showing up at Biorka and they quit coming. And nobody explained why they didn't come back. ... I worked at the pulp mill so I know the whole thing. But it infected the water. It infected their eyes. And it didn't seem to, well we couldn't see it anyway, it didn't seem to affect the herring. The herring were still coming in.

... Yeah, we had, the byproduct was called red liquor and the red liquor actually changed the ocean color and it went out as far as the islands in front of Redoubt. The whole area was red. (Fred Hope)

I believe that pollution from boat traffic, the pulp mill, spilled oil and commercial over-harvesting are causing the reduction in the herring spawning area in the Sitka Sound area. (Robert Sam, 1996)

### ***Sitka Sound breakwater***

Many consultants commented on the effect construction of a breakwater in Sitka Sound had on herring movement and spawning behaviors:

And perhaps that's—that might be a function of breakwater ... With that breakwater, it's quite possible that that changed things, because it just doesn't seem like there's as many herring in here. (John Littlefield)

[F]or whatever reason—and who knows you know, with the new breakwater here and all the increased activity, maybe the herring are shying a little away from town. (Eric Jordan)

The new Break water [sic] a part of the boat harbor is acting as a continuation of the cause way "fence," further impeding the flow of herring in Sitka Channel. Essentially the fence goes from Sitka shore out to Maknahti Island which is furthest out into Sitka Sound. (Roy Bailey, 1996)

The breakwater changed the tidal flow and the water temperature in the channel ... Now the herring go around the outside [of Japonski Island] and come to the beach in different places. (Dan Moreno, pers. comm. 2010).

### **St. John Baptist Bay**

St. John Baptist Bay belongs to the Kaagwaantaan and "From this bay the Sitka Natives get fish, deer and berries, and from the beaches, clams and crabs" (Thomas Sanders #56 in Goldschmidt and Haas 1998:63). Herring spawn has been observed in this location as well:

There's an awful lot of places that they'll spawn basically one day [like St. John Baptist Bay]. (Harvey Kitka)

Yeah, we'd get our fish eggs from Fish Egg Island and then oh, around St. John and there they'd spawn but we didn't mess with that that much. (Charlie Skultka)

But over the years I've seen evidence of herring spawning from Sukoi Inlet up there off of Salisbury and St. Johns [Bay] and all around in here. (Eric Jordan)

### **Sukoi Inlet**

See additional comment: St. John Baptist Bay, Eric Jordan.

### **Three Entrance Bay**

Three Entrance Bay is identified as a subsistence herring roe harvest location (see additional comments: Samsing Cove, Charlie Skutlka; Deep Inlet, Phil Nielsen):

Used to ... run a big boat in there: Three Entrance Bay. Where we fall the trees right into the Bay and we'd pull the trees up a couple days later and just chop the branches off, you know. You got all the herring you ever wanted and then we'd run it all over to Angoon, Hoonah and Juneau you know, because they never got any over there, you know. (Duck Didrickson)

We used to get herring eggs down towards Three Entrance Bay and other areas south of town. It's been so long since we've had much spawn, I don't remember. (Mike Baines)

Herring spawning would start here in Sitka in the spring of the year around Three-Entrance Bay and then move through the whole of Sitka Sound. (Nels Lawson)

### **Ushk Bay**

See Sitka Sound general comment, Harvey Kitka.

### **West Crawfish Inlet / Windy Passage**

Smokehouses were once utilized at West Crawfish Inlet but now "There are not enough fish in Crawfish Inlet to warrant purse seining" (Goldschmidt and Haas 1998:65) (see additional comments: Regional Comment, Charlie Skultka; Big Bay, John Littlefield).

## **Whale Bay**

Whale Bay (*Geey Tlein*) was historically an important subsistence fishing area (Goldschmidt and Haas 1998) and also a spawning and massing area for herring, which was exploited by the reduction plant seiners and other commercial herring fishers. Harvey Kitka remembers a February bait fishery occurring in this location (see additional comment: Cedar Cove, Harvey Kitka).

Interviewer: So, I want to be clear on the number of stocks then. Historically, you think there were more than one stock?

Herman: Mmhm.

Interviewer: There were at least two? Or how many do you think there were? You said one from Whale Bay up to Crawfish? And then another one in Sitka Sound?

Herman: Mmhm.

(Herman Kitka, Sr.)

Yeah, and probably all the way up to Whale Bay. And they [herring seiners] fished all along in here. (Clarence Jackson)

It sounded like a small scale spawning area [in Whale Bay]. And then there's some places where they'd just be spawning for one or two days and then they're gone. ...

(Fred Hope)

## **Whiting Harbor**

Nels Lawson identified Whiting Harbor as a good location to harvest herring eggs on kelp:

In here. West of Signal Island that little cove in there. That's good for eggs on kelp.

Whiting Harbor. (Nels Lawson)

## **Windy Pass**

Windy Pass was identified as a herring spawning location (see additional comment: Big Bay, John Littlefield; Cape Edgumbe, Bob Kirkman):

I think it was last year. I saw a bunch of herring spawning after the main spawn down there in the area by Windy Passage. (Eric Jordan)

## **Yamani Island**

See additional comment: Windy Pass, Eric Jordan.

### Predation

Many factors have been identified as the cause of herring population decline (commercial fishing, pollution, etc.). In addition to these place-specific observations, there were consultants who identified changes in herring predator behaviors and populations (halibut, salmon, sea lions, seals, seabirds, whales, etc.) that may be affecting herring populations in and around Sheet'ka Kwáan. Herring are described as an integral part of the marine food chain, a keystone species:

Herring is very important to other animals. It is the beginning of the food chain for everything. Salmon. You have a lot of trollers who will tell you, "If we don't have the herring coming in then we won't get the salmon. Herring is the only reason they are here." There are years when we don't have too much fish coming back. Everything in the water feed on herring. We, as subsistence users, depend on the herring. We have the eggs of course, but then when the herring come in and spawn, that brings in the King salmon. (Herbert Didrickson, 1996)

Seals, any sea mammal involved in the food chain, and other fish species are affected by the absence of herring. Herring are a part of the food chain. The Kings, I don't

think that there are as many as there used to be. I think that this is the normal chain-reaction that if you deplete a certain item of your food chain, the other animals will go somewhere else. Besides the seals and the sea lions, you have your Kings, your Silvers, your Dogs and your Humpies that are all part of the food chain and eat herring. The herring were so plentiful, when I first got here, you could walk across the channel and not get your feet wet. They used to have herds of sea lions in the channel. They didn't hurt the herring. The over-harvesting is. It's like any other species of fish, Salmon, Kings, Cohos, who has the highest priority to that fishery? I believe that economics are the driving force. (Ted Borbridge, 1996)

Many animals depend upon herring. Sea lions, whales, seals and eagles just to name a few. (Vickie R. Bartels, 1996)

And oh, geez there's umpteen different predators. They have—get eaten by the—I've watched this cycle ok. The herring come in, they spawn. Got these little babies swimming around there. And they're there. I see them every year, but the seagulls feed on them, the ducks feed on them, the Dolly Varden feed on them. After they get a little bigger, bigger fish feed on them. They run this whole gauntlet, and I've been out here picking my eggs in March and April. And that's when the humpy fry start. I've watched little schools of humpies like there might be two hundred in a bunch. They come across spawning herring and the spawning herring will eat the humpy fry. (Charlie Skultka)

The whales won't come around if they can't load up easily; seagulls, birds, salmon, halibut won't come around Sitka if there is just a small population of herring to feed

on. The prey and predator populations follow each other, this is a naturally occurring phenomenon. (James Parker, 1996)

Other animals eat herring. Sea lions, salmon, and halibut depend upon herring as part of the food chain. Herring is very important to the food chain. If we lose herring, we lose everything. When I was younger, I remember there would be so many birds in the springtime, and now you hardly see any. I remember the seals used to come right up to your boat, huge seals. You don't see that anymore. (Robert Sam, 1996)

Obviously all the birds: ravens and eagles and seagulls. Let me think what else preys on—bald eagles. Well, the sea lions and the whales. ... Well, there's snails that eat them. And when you pull up your eggs you sometimes find a few crabs. I don't know if they're hiding in there or eating them. You know, the little, tiny little crabs and occasionally a shrimp. Maybe they're just hiding in there. I don't know. (Roby Littlefield)

Everything eats herring. All the salmon, all the trouts, birds, marten, mink, seal, and sea lions. I think that herring is a very important resource for our area. (Ray Nielsen, Jr., 1996)

I remember when you would have whales and seagulls and sea lion in greater numbers. All species of salmon (except sockeye) eat herring, and without the herring you may as well put salmon on the endangered species list. You normally can get a halibut now, but there aren't very many halibut around this year. I've also tried salmon fishing and haven't gotten anything. Fifteen years ago, picking up one or two kings a day when you wanted them wasn't a problem. (Wade Martin, 1996)

And it's also my belief that this time of the year for a lot of the predators that utilize the herring stock is a critical time of year for the other predators. If they don't get it, then those predators themselves will be stressed. (Nels Lawson)

Yeah. I think around 60s. Around 60 there was a whole bunch of herrings here. And—if you get rid of --deplete the herring, and it'll affect everything. It'll affect the king salmon. It'll affect the whales. And it'll affect everything: the sea lions. We don't like sea lions you know, but the seal. It'll affect everything as far as—if you deplete the herring stock. It'll affect everything, but also it'll affect the Tlingits. (Al McKinley)

The herring spawn area is getting so small I am afraid the herring stock will be all gone and all animals, birds, and salmon will disappear with it for lack of food. Among other things, the herring species in the ocean is a very important food supply for whales, seals, sea lions, porpoises, all ducks, seagulls and all salmon. (Herman Kitka, Sr., 1996)

There are a lot fewer salmon to be harvested in the area. Because of a few good years of herring in previous years, we had a couple of big seasons. Now we have less herring. Therefore, we have less fish, less salmon. Our winter quota of King [sic] salmon was set at 45,000. So far there have only been 6,000 caught. We need the herring to have other fish to catch. (Moses Johnson, 1996)

The migration of salmon was often identified as following the same path as the herring (see the Life Cycle section for more on this):

King salmon eat a lot of herring so the king salmon only come in when the large schools of herring, like in the spring they'll come into the Sitka Sound now. What that

kinda tells me is that there are no more local herrings. And we don't see them flipping around anymore. ... Another indicator that the local salmon stocks are gone is the seal. Seal need a lot of herring. They need a lot of local herring. Probably the last 20 years the fat layer on the seal is only probably about an inch thick. Prior to that it was not be unusual to harvest a seal with the fat layer 2-3 inches thick: any time of the year. (Nels Lawson)

When they [salmon fry] get bigger yes. We also see them, actually more the little chums when they come out, they come out just about the time the herring are laying their eggs and we watch them; they'll be eating the eggs as well as the herring that are between the larval stage and their—they haven't got the ability to swim yet. They just move with the wind. And you can see them. They'll feed on those. (Harvey Kitka)

Some consultants were concerned that the hatchery salmon are preying heavily on juvenile herring:

Um. I hadn't really noticed, but they say because of all the hatcheries a lot of the hatcheries will they release a lot of the fry, whatever they're called, and they say there's more of those preying on the baby herring I guess. But it's not something I've really noticed myself. (Mike Baines)

That—ADF&G allowed NSRAA to put a hatchery, there are pens here in Deep Inlet ... [and] Medveji Hatchery [is] over in Silver Bay....About three weeks after the herring spawned in this area they released the fingerlings from the rearing pen. Of course they went out and just wiped out the herring, the larvae that spawn that had hatched just a week ago previously. (Al Wilson)

Increasing whale and sea lion populations were often identified as having a detrimental impact on herring populations:

Whales and sea lions feed on herring. Sea lions have been on the Endangered Species List. Fur seal used to come in on their way North, but it is rare to see a fur seal here today. I don't imagine it is worth the fur seal's time to make a side trip into Sitka Sound anymore. (Roy Bailey, 1996)

The biggest one is sea lions and the whales. They all come in. They take quite a big chunk out of the herring, herring stock or biomass or whatever you call it. And sea lion is no food value for anything whatsoever. We don't take it for food, but they're protected by law. And they're finding out they're protecting a bum animal because they're pretty vicious. They have taken a lot of lives on the floats. Guys sitting on the floats will get a big chunk taken out of their rear-end but now it's written. (John Nielsen)

And you know it kind of takes me back to when government allowed the Pribilofs (Islands in Bering Sea) to kill so many seals. You know we never had the problem we're having now where seals are coming (laughing) in and laying on the docks and then you can't shoot them off because you're harassing the seals. Well, I think there's not enough for them to eat you know. They're getting to that point where there won't be enough herring even for the sea lions to munch on. We used to have somewhere close to a thousand. I never really did see them. I know they were over on the islands. The sea lions didn't lay on the beach. There'd be small pods you know maybe 12, 15 sea lions that would come into the harbors, but the majority of them I think would stay away from town. So that part that bothers me is that not only takes away from our subsistence but the feed for the mammals you know, that come in here to get their shares. (Consultant #25)

There were seals, sea lions and everything, all in the harbor which I don't notice much anymore. (John Littlefield)

As a boy I remember we used to only go up across eastern channel into Samsing Cove when it would be running across eastern channels we'd see more than a dozen pods of killer whales coming in after the herring. And we don't see that anymore. (Nels Lawson)

Oh, like in 98, I took my grandchildren and nieces out, nephews out in the Sound and was showing them my new equipment and stuff. And there was virtually whales all the way across from St.—not St. Lazaria, but Vitskari Rocks clear to Biorka. They were just puffing everywhere. And this year, this is the most whales we've had in Sitka Sound proper in the 50 years. (Charlie Skultka)

Oh yeah. Yeah. Right now the whales are pushing them. They're pushing them to the beach and moving them out of the deep. Kinda-they look like they push them all different directions right now. Some of the whales are over against Gavanski Island holding near the other trough. Sounds like there's about thirty whales out there. (Philip Charles Neilson)

Most--you know definitely the [humpbacks] whales have been the biggest increase. We used to see occasional whales but I think around the mid 80s again that there's this huge population of whales that moved in and actually it's gone down again since then but. ... And the sea lions have stayed pretty constant I think. There's been some increase in them: not nearly as notable as the whales. I think it's settled into, it's not like in the 50-60 range that stay offshore here in the winter. In the late 80s there

were probably 100 whales that were staying in the [Sitka] Sound. They'd over-winter up until spawning time. So, they definitely were responding to the herrings and putting you know I'd imagine a pretty big stress—I talked to--the whale researchers you know estimate up to a ton per day per whale. (Mike Miller)

In those days there was so much herring and it was such a large resource at the beginning of the food chain that it allowed for large amounts of wildlife to live or travel into the Sitka area to feed on the herring. The last time I remember seeing a great many killer whales coming in after the herring and feeding on the herring was in 1988. Maybe about eight to twelve different schools of killer whales would come in annually. The last time I remember seeing any killer whales coming into the Sitka area looking for herring before I left. (Nels Lawson)

Sea lions really like herring. Hair seals like those little ones when they're just that big. A lot of them used to lay in the channels on the inside and you know, trapping time, those harbor seals, the fat is two and half, three inches thick. Now that the herring is gone, they feed on that flounders from in the bays. And those flounders, I guess don't have enough fat. Nels says you gotta have a grapple hook made out of halibut hooks, make it like three prong hook with lead the lead pounded on the end. When they shoot it, it sinks. If you can see then they'll fish it back up. He says the fat is no longer thick any more. [so it doesn't float]. (Herman Kitka, Sr.)

What the sea lion take ain't no biggie, or what the whales take is no biggie, or what the birds take is no biggie. (Bob Kirkman)

A variety of birds also feed on herring:

And wherever the salmon is feeding, that's where the eagles sit in the trees. A wounded one, when it comes to the surface, they all make a dive for it. The one that's the speediest is the one that gets the herring. (Herman Kitka, Sr.)

[S]coters; And the black ducks move in there. The black ducks eat up a lot of them. That's what they feed on. They move into the spawned out area. (Herman Kitka, Sr.)

### **Áak'w and T'aaku Kwáan: Juneau/Douglas**

Áak'w Kwáan territory begins in the north at Berners Bay and continues south to Gastineau Channel and encompasses most of Douglas Island and the west coast of the Lynn Canal from St. James Bay to Point Howard. It also extends southward onto the northern portion Admiralty Island and includes Oliver Inlet, Hawk Inlet and the Mansfield Peninsula. We interviewed in Juneau during March of 2008 and 2009. Two focus groups were held and nine individuals attended the sessions. Fourteen people were interviewed altogether, including one man from Kake.

T'aaku Kwáan territory begins in the south at Holkham Bay and continues north to encompasses Endicott Arm, Taku Inlet and the southern portion of Gastineau Channel. It also includes the southern tip of Douglas Island. We interviewed in Juneau during March of 2008 and 2009. Two focus groups were scheduled and nine individuals attended between the two sessions. Thirteen people were interviewed altogether, including one man from Kake.

Áak'w Kwáan and T'aakú Kwáan comprise a good part of what is today the City and Borough of Juneau. While Juneau is built on Gold Creek, which Tlingits named *Dzantik'i*

*Héeni* (Flounder at the Base of the Creek), the original winter settlement of the Áak'w people was at Auke Recreation Area and, even earlier, at Indian Cove. The oldest dated archaeological material drawn from sites at Auke Fort (*Áak'w Noow*), Auke Cape (*X'unáxi*), and Montana Creek (*Kaxdegoowu Héen*, #81) suggests a human presence in the area dating back more than 700 years. Due to its cultural significance, Auke Cape was recently found to be eligible for inclusion in the National Register of Historic Places as a traditional cultural property, the first such designation in Southeast Alaska (Thornton 1997). The origins of the T'aaku Kwáan are more difficult to pinpoint based on archaeological evidence, mainly due to the fact that the T'aaku watershed's dynamic glacial and riverine landscape has destroyed many traces of early habitation. T'aakú Kwáan boundaries extended up the Taku River into present-day Canada, southeast to Port Snettisham, and west to Admiralty Island's Young Bay, Seymour Canal, and Gambier Bay. Certain areas, however, seem to have been used by both kwáans (Goldschmidt and Haas 1998). Seasonal settlements at Hobart Bay, Seymour Canal, Port Houghton, Gambier Bay, and Pybus Bay took advantage of the abundant herring at these locales.

The Alaska Department of Fish and Game (ADFG) currently manage a significant portion of the Áak'w Kwáan as a purse seine sac roe commercial herring fishery in the Lynn Canal (Sections 15-B, 15-C and a portion of 11-A) (see Figure 1). However, because Lynn Canal herring spawn has failed to meet ADFG's herring spawning threshold level of 5,000 tons, the fishery has not been open since 1982. Kevin Monagle, the ADFG, Juneau Area Management biologist responsible for the Lynn Canal Stock has stated: "Although 1982 was the last year of fishing, there was evidence for 7 to 8 years prior to that of a declining population." According to ADFG records:

From 1953 to 1981 Lynn Canal herring spawned from Auke Bay to Point Sherman including Berners Bay and Cascade Point. The documented spawn for Lynn Canal herring during this period ranged from 5.7 to 28.1 nautical miles (nmi), averaging approximately 12 nmi. Recently, spawning activity has been centered between Bridget Cove and the east shoreline of Berners Bay. ADF&G records since 1971 document herring spawn between Echo Cove and Berners Bay flats in most years, with few exceptions began in 1957 and continued through 1971 (2007c).

Additional spawn locations are identified as: Taku Harbor, Oliver's Inlet, Tee Harbor, Pearl Harbor and Auke Bay in June (Monagle in Hansen et al. 2007). In 2009, ADFG documented 10.1 nautical miles of spawn at Point Bridget, Bridget Cove, Mab Island, and Sunshine Cove with some minor activity at Berners Bay (ADFG 2009c).

On April 2, 2007, the National Oceanic and Atmospheric Administration (NOAA) received a petition from the Juneau Group of the Sierra Club to list the Lynn Canal stock of Pacific herring (including Lynn Canal, Auke Bay and Berners Bay) as a threatened or endangered species under the Endangered Species Act (ESA). On November 7, 2007, the Juneau Douglas Fish and Game Advisory Committee held a public meeting to hear public testimony regarding the status of the Lynn Canal herring. In December 2008, ADFG determined that the Lynn Canal herring should not be listed under the ESA because they: “are not a distinct population segment; are stable/increasing; are strong; and do not represent a significant portion of the larger Southeast Alaska metapopulation” (ADFG 2007c). Additional research regarding this issue is ongoing. Although the Lynn Canal herring stock was not determined to be a discrete population segment (DPS), NMFS determined that the Lynn Canal populations is part of a larger DPS of Pacific herring that may warrant listing under ESA and initiated further review (Federal Register 04/11/2008, Vol 73, No. 71).

The Alaska Department of Fish and Game (ADFG) currently manages three commercial fisheries within the T'aaku Kwáan territory (see Figure 6.7). Two of these occupy significant areas within the T'aaku Kwáan. The first of these is the Seymour Canal (Section 11-D) management area, a gillnet sac roe fishery since 1980. Before that time, the area was managed as a purse seine sac roe fishery. The first ADFG records of spawning activity in Seymour Canal began in 1972 and have continued nearly every year through 2009. According to this documentation, the first major spawning event occurs near the end of April and continues through mid-May. Nautical miles of spawn documented during this same time period (1972 – 2009) ranges from one nautical mile to nearly 19 nautical miles.

The second significant management area is Hobart Bay-Port Houghton (District 10), a winter bait and food fishery since 1993 as well as a gillnet sac roe fishery since 1997. A regulation passed in 1997 designates any portion of the guideline harvest levels (GHL) not used by the winter bait and food fishery to be transferred to the spring gillnet sac roe fishery. Sac roe harvests have occurred in 1997, 1998, 1999, 2005, 2008 and 2009. The first ADFG records of spawning activity in the Hobart-Houghton management area began in 1984 and have continued nearly every year through 2009. For the past ten years, the first major spawning events have occurred as early as April 19 and as late as May 4 with a peak spawning date of April 30 (ADFG9b). Nautical miles of spawn documented during this same time period (1984 – 2009) ranges from zero nautical miles to approximately 19 nautical miles.

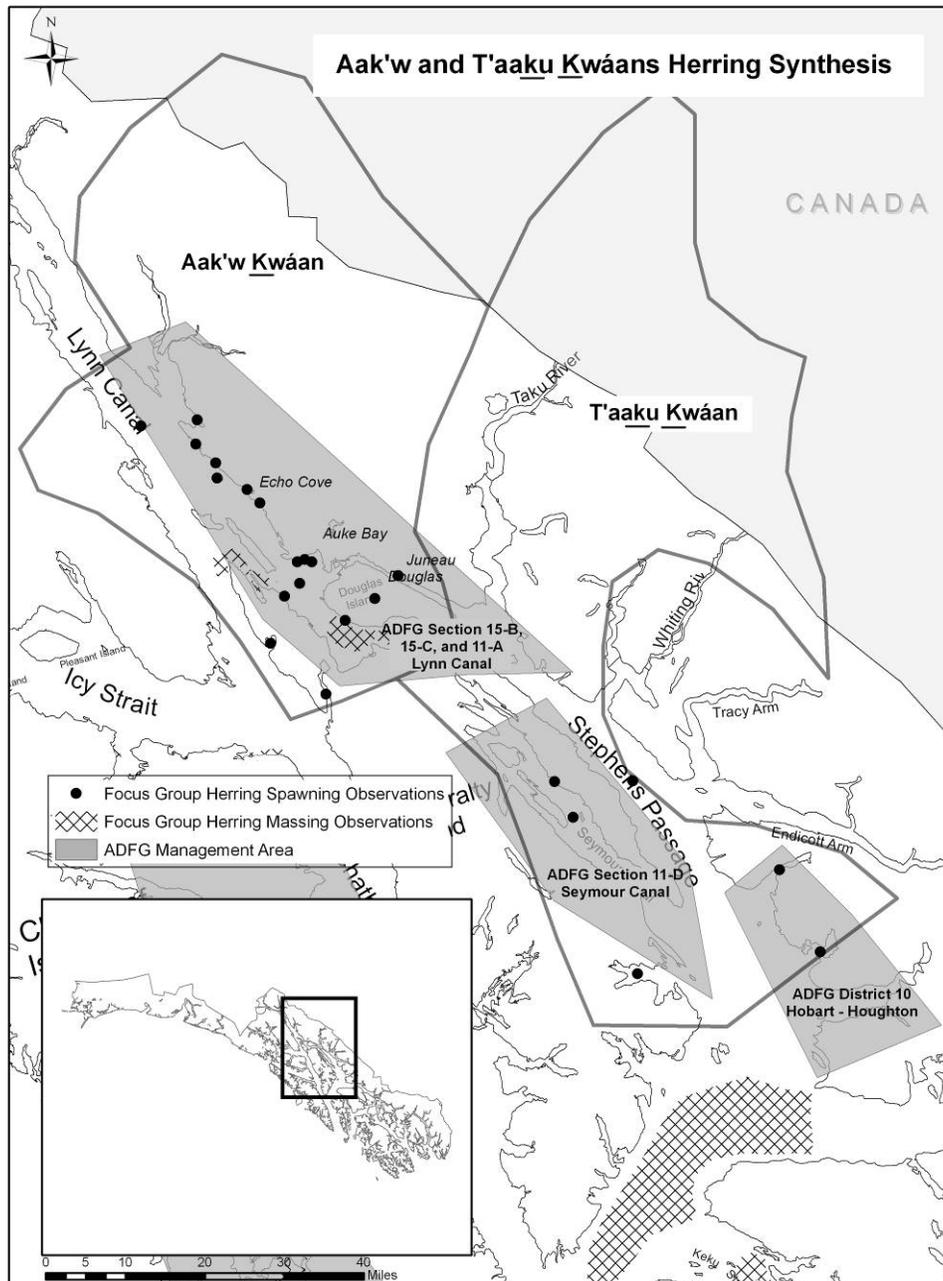


Figure 6.7: Overview of Herring Spawning Areas and LTK Observation in Áak'w and Taak'u Kwáans

The following is a list of locations within Áak'w Kwáan and T'aaku Kwáan that were identified as notable herring spawning and massing areas during individual interviews

and focus group interviews conducted during this synthesis project and in previously documented research efforts:

Auke Bay, Benjamin Island, Berners Bay, Bridget Cove, Douglas Island, Eagle River, Echo Cove, Funter Bay, Gambier Bay, Hawk Inlet, Hobart Bay, Indian Cove, Juneau Harbor, Lynn Canal, Middle Point, Piling Point, Point Louisa, Portland Island, Seymour Canal, Stephens Passage, Windham Bay, Winning Cove, Yankee Cove.

### **Auke Bay**

Auke Bay was a primary fishing and dwelling place for Áak'w K̄wáan people became an important herring and salmon fishery in the post-contact era (Goldschmidt and Haas 1998). Commercial fishermen, subsistence users and local residents noted a decline in herring:

There was a commercial "Herring Pot" [also known as a herring pound] in Indian Cove [in 1929], Auke Bay, about two miles from here ... Now we see nothing in Auke Bay [declining since 1961]. Along with the decline we have fewer fish to catch. This is shown by the increasing hours to take salmon and halibut along with more stringent catch limits. (Jack Gucker, 1993)

In the spring of 1940, when the herring started to move a fisherman could run into big pods no matter what direction he fished. (Marcus F. Jenson, 1993).

At that time [1949] you could go to Indian Point, Auke Bay or the harbor and jig all the herring you could use. (Jack M. Mason, 1993)

1992, 1996, 2000 were the last time I saw herring spawn in Auke Bay ... I've seen the Auke Bay herring decline from the 1980s. I haven't seen the big schools in 5 years. (Robert Stone, 1993)

In the years that I have lived in Alaska since 1950 I have noted a decline in the herring spawn in the Auke Bay area of Juneau. As a result of this decline it is more difficult to catch halibut and salmon... (Jeanne Gucker, 1993)

When I was 8 to 12 years old, I sat on a herring pond in Auke Bay. Lots of herring hten. We had a net out, captured the herring, and then the halibut boats would come for fresh bait. I would load the halibut (herring) on their boats. I saw the abundance from 1957 to 1960. There were a lot of herring. (Bob Loecsher, 2007)

You used to be able to go to Auke Bay and get buckets full of herring for eating. (Al McKinley, Sr.)

Berners Bay and Auk [sic] Bay with associated estuaries once served the purposes of prime spawning habitat but clearly both, have been, or will be, severely compromised into marginal, substandard habitat for herring reproduction purposes. (Davide Beebe, 2007)

And there was a huge spawn in Auke Bay [in the 1970s]. Now there's literally no herring. And of course they opened this area one time for commercial herring seining and that was the end of it. (Clarence Jackson).

The herring roe fisheries cleaned them up by Rocky Island and Auke Bay. (Herman Kitka, Sr.)

There used to be herring spawn out here too. It may still continue out there. Herring spawn. (Walter Soboleff)

But same thing in Juneau area. Used to be a heavy area. We used to go there as a child with my dad's seine boat. We'd load up the seine boat and bring herring roe in here for the whole town, you know. We'd let them have it. (Charles Jack)

[In the 1950s] we used to go over to Sitka and Auke Bay to get our herring eggs for our own subsistence use. (George Dalton, Jr.)

Yeah, when I was a kid going to high school in Juneau, you know, back in the early 60s, late 50s, go out to Auke Bay and catch herring off the beach with a dip net. (Floyd Peterson)

Well, see, we got kicked out of the Berners Bay/Auke Bay area 20-some years ago, I think now. I don't even remember. So we haven't, you know, we haven't go to look at that. It's just been plain closed and oddly enough, the Department can never find any significant spawning there, but I traveled through that area and in two different periods in all this time, I have seen a lot of herring, not at spawning time, but schools of herrings that are traveling through ... Well, it would have been from like '72 to whenever the last time we fished there [for sac roe] was. (Consultant #23)

I've seen very little, small herring coming into the Auke Bay area and I'm not sure if I've seen it lately. (Marcello Quinto)

I used to be in the herring business too [in 1963 and 1964]—my brother John, we used to own a herring pot [also known as a herring pound] at Auke Bay. I tried to establish a market, but there was not market for herring at that time. I tried to get the cat and dog food interest to buy it, our product. They wouldn't. (Al Martin)

Auke Bay, at that time [1970s], was so full of herring that as soon as they showed up, there was plenty of salmon. (Doug Chilton)

[Referring to his father's herring bait processing boat and where it operated in the vicinity of Juneau]. It didn't last a long time. ... But it was at Auke Bay, Hawk Inlet, over by Hoonah. I know we were in Tenakee a few times. (Doug Chilton)

Oh yeah, I've seen them in Port Frederick [1940-1944], fishing up here making sets, you know. And—another Auke Bay. ... Oh yeah, they'd go in. They'd swipe her out in one good—but Auke Bay had a lot of herring ... we used to go get our bait for halibut fishing, you know, from the herring pounds. (Karl Greenwald)

And you know, like there was a huge pot [also known as a herring pound] there in Auke Bay and after they couldn't get any around Petersburg, the fleet used to run to Juneau to get fresh herring. And that went for, you know, ever since I could remember in the 40s, it was what everyone was doing was running up to Auke Bay for bait ... And the whole bay, you know, when you went up there, and we went up there two different years. And that whole Auke Bay was filled with herring, you know.

And now there isn't any in there. It's kind of interesting ... Anyway, but, you know when I was a kid, the eggs that we got came from around Craig. And some of the eggs came from Sitka and some of the eggs came from Auke Bay. When you have a little spawns you know, it's not thick enough to get what you need. Even in Seymour Canal when the guys set there, you know, that school isn't big enough to get enough spawn in one spot, you know. (Ralph Guthrie)

And I did a lot of subsistence fishing here in Juneau at Auke Bay [in the 1940s and 1950s]. My family would go out there with our car and take our buckets and our sacks and we would get roe and herring to eat. We didn't get it for fishing. We got it for consumption. And I grew up eating herring that was caught right here at Auke Bay. And for some odd reason the State, the city allowed someone to build a house right over the spot where the herring spawned. And, you know it just didn't take long. I have to say that when I was a kid there was so much abundance of herring, salmon, crab. I mean, Dungeness crab. Clams, cockles, where we could just go on the beach and get them. I wouldn't take any anywhere near Juneau right now because of pollution. ... Actually, the ones here, what we did is they had kind of a trap. And I don't know what they were doing, but they had a trap and so that net, it would be like that thick. We'd put our finger in and just pull out a huge amount, you know. We'd fill up our bags. It would be thick with herring roe. (Walter John)

### **Benjamin Island**

Benjamin Island was noted for both herring spawning and herring massing:

I fished Juneau also ... For roe herring, yeah... Yeah, we were Bridget Cove, Eagle River, Benjamin Island [in the 1970s]. (Dick Eide)

My son run through a school last spring [2007], I believe it was. He was going into Auke Bay. He ran through a school a quarter of a mile long and thirty fathoms deep, but he didn't measure the width of it. But that's a big school. (Nels Otness)

### **Berners Bay**

Both subsistence users and commercial fishermen recognized Berners Bay as a significant herring spawning area that has been declining in productivity:

Working on researching Berners Bay the past few years. Dragging a small net to see where the hooligan end up after they leave the rivers. Berners is quite a bit different between the east and west side. The cold water shoots out the west side and the salt water runs in the east side. I did catch some juvenile and larval herring in my plankton net from early June through early July. I think Berners is a nursery area for the fish to nurse in. The salinity gradient may allow them to get away from few water intolerant species like jelly fish ... I believe it's an important rearing spot. In beach seining in Sept., I found 3 samples of high density of herring. Seems like a pretty good spot for them to grow up in. (Andrew Eller, 2007)

In 1977 and 1978 I was a crewmember on a seiner fishing sac roe herring in Berners Bay, Lynn Canl, there has not been a herring opening there since. What happened to those stocks? (Donald Hernandez, 1993)

Berners Bay and Auk [sic] Bay with associated estuaries once served the purposes of prime spawning habitat but clearly both, have been, or will be, severely compromised into marginal, substandard habitat for herring reproduction purposes. (Davide Beebe, 2007)

And I can't remember if they spawn in Berners Bay or not, but I know that one year [in the 1970s] we seined we were in Berners Bay. (Dick Eide)

Well, see, we [commercial sac roe fishermen] got kicked out of the Berners Bay/Auke Bay area 20-some years ago, I think now. I don't even remember. So we haven't, you know, we haven't go to look at that. It's just been plain closed and oddly enough, the Department can never find any significant spawning there, but I traveled through that area and in two different periods in all this time, I have seen a lot of herring, not at spawning time, but schools of herrings that are traveling through. (Consultant #23)

We used to have [commercial sac roe] fisheries in Juneau. ... Yeah, and Yankee Cove and Bridget Cove was up towards Berners Bay. (Bob Kirkman)

### **Bridget Cove**

See the following comments: Benjamin Island: Dick Eide; Berners Bay: Bob Kirkman

### **Douglas Island**

Douglas Island was identified as a highly productive herring spawning area in the past:

Yeah, [herring spawned along] the Bread Line all up and down you know, right around Point Retreat, through there, Piling Point, on the back side of Douglas. (Marcello Quinto when I was growing up [1960s])

Spawn. Heavy spawn. North Douglas area, all that area. What—the whole area was just so thick along the beach. Man, they just--they'd spawn and nobody to harvest it. (Al Martin)

### **Eagle River**

Eagle River is an important source of salmon for the Auk people and was used primarily as a location to dry salmon (Goldschmidt and Haas 1998) (see additional comments: Benjamin Island: Dick Eide):

I've heard of the spawn up in, we called it Eagle River area, where you can drive out to the tidal flat. (Al Wilson)

### **Echo Cove**

Herring spawn was noted in Echo Cove but appears not to have been harvested intensively due to its inaccessibility (compared to Auke Bay and Indian Cove) in the past:

Yeah. In that area. And they tell me it was up Echo Cove, that there was another one [herring spawning area] up there, but we never went up there because [we didn't have] transportation. (Walter John)

### **Funter Bay**

Local residents, commercial fishermen and sport fishermen recalled herring in Funter Bay:

My parents lived in Funter Bay. A herring fishery wiped it out and it didn't come back for 20 years. And then a bait fishery came in, seined the herring up, and the herring haven't come back again in 20 years. I think we can all be in agreement that we have to do something to precipitate the herring being looked at. I'm wary of the ESA, and as a troller I'm familiar with ESA listings, that's brought some real wild cards as to what is going to transpire. (Joe Emerson, 2007)

I've not seen them there. I know there used to be a lot around Funter Bay because when we'd troll, we could catch them, you know, for fresh herring. We'd always use our herring net...North of Funter Bay there. (Gordon Greenwald)

Yeah. Right there: right on that point. I seen it a couple times. [On the north point of Funter Bay]. It was only a couple times I saw it [spawn] there. (Raymond Howard)

Just when I'm out sport fishing, every now and then. It just—I don't see what I used to see, you know. You get out there for a couple days and don't catch a king salmon where you used to catch them. And then it dawns on you, you haven't seen any feed. Like we fish Funter Bay a lot. We used to love it there. We still love it there. I take the kids out there and spend a weekend when I feel well enough. But for the past two years, them killer whales been in there so thick. (Fred Hopkins)

### **Gambier Bay**

See additional comments: Seymour Canal, Jev Shelton.

It's very strange. And Fish and Game told us one time, in Gambier Bay there's a herring spawn in October and November. (Clarence Jackson)

Ah. I know [herring spawn at] Pybus Bay and Gambier. (George Davis)

In Gambier Bay on the right-hand side as you go up there, there's a creek right in the middle. They spawned on the flats there when I was hand trolling there. (Harold Martin)

Gambier. Same thing: a lot of herrings. (Marvin Kadake)

The spawning all over like Gambier Bay. One of my aunties husbands, Pete Martin, Sr., why they had control of the Gambier Bay. They came home with their share of herring eggs. Yeah. (Leonard Skeek)

### **Hawk Inlet**

Herring spawning and massing have been noted in Hawk Inlet. It was also the location of the Hawk Inlet Cannery when it was in operation from 1915 to 1960 (see additional comments: Auke Bay, Doug Chilton).

[Before the 1980s] We used to do a lot of hand trolling in Hawk Inlet and there would be a lot more herring in there you know, in May, in June and it seems to be now is. And I don't know what the cause of that is. The salmon aren't in there like they used to be. For years I just quit going over there because it wasn't paying off like it did before the mine was in. (Floyd Peterson)

They usually spawn around the back and then the front [of Long Island]. But they move quite a bit. You know in—when we're fishing in the Auke Bay? The [herring spawned at] Hawk [Inlet] on this side. (Harold Dick)

When we were [salmon] fishing we'd see herring in Hawk Inlet. (Victor Bean)

But they were lucky Hawk Inlet Cannery took care of them pretty well, you know. Send them a big tugboat in for them every spring. Load up their stuff and take them out for spring and summer out there. And that—the only time I saw a lot of herring other than what they spawned is back when I was a kid the canneries had their fish traps, you know. And when the fish came in off these traps, they got barges coming in 24 hours a day with fish. And the barges come in they had every type of fish on there.

You know, they caught everything. ... Oh yeah. It was loaded with herring. You get all the herring you want, but the folks would take a certain amount when they felt like getting herring oil. Other than that it just went overboard. ... And then they'd just brail everything out and when they unload the barge, every fish in the world is in there. But it comes in on a conveyer belt, so the fish goes right back out. But the fish you want, the guys got little pitch forks up there on the conveyer belt, they got bins down there twenty four hours a day. (Fred Hopkins)

### **Hobart Bay**

See additional comments: Seymour Canal, Ralph Guthrie and Jev Shelton.

We've looked in Hobart Bay [for herring]. (Dick Eide)

100 miles from here, ADFG has managed a spring herring fishery in Hobart Bay and Port Houghton. We might examine those records. Herring will move. Normally, herring come back to where they spawn, but they'll move due to environmental conditions and weather. (Bob Loescher, 2007)

### **Indian Cove**

Indian Cove was once a significant location for both fresh herring and herring on branches:

We had a—our place was a little private [camp] above the beach and every spring they'd set out a herring pot [also known as a herring pound] in a place called Indian Cove [in the 1940s] ... And then we also, there was a large tide flat below as part of the beach as the tide went out when the herring were spawning, there'd be left a lot of live herring bouncing around and some of them caught in the pools. We'd go down there with buckets and collect them up. Mother would fry them. We'd smoke them and kipper them in hot smoke. Put them up in cans and had kippered herring. We

also took some of the, we'd hire rent a transfer truck haul branches into Juneau, Juneau village and sold herring eggs there. (Al Wilson)

In Indian Cove I think, on the outside. But Chris [McNeil] said, when he was a boy, he was the one that, he would by hand he would tow the seine open and when the herring went in he would tow it back and put it in a circle and the herring always just stayed in there and went in a circle. And they would go and brail, I don't know how many boxes you know, then they would take off for halibut fishing. (Clarence Jackson)

Yeah, but they were spawning [in the 50s and 60s] all along there [Indian Cove]. All the way from Auke Bay. ... (Floyd Peterson)

Yeah, they were but I guess after they built all those buildings over there, they [the herring] never came back anymore. That was early 80s. But that's happened all around Juneau like Indian Cove. We used to go down there when I fished with his brother and (?) used to run down there to get fresh bait. They'd have a herring pond in there. (Harold Martin)

Well, the—when I first drifted to the town of Juneau [in the 1960s], there used to be lots of herring that used to be here and our people, the Native people, actually pick the herring from the beach ... But there wasn't any spawn since my brother-in-law Tom Dalton, one time we chopped a tree down and we got too greedy. We got a real big tree and we—when we finally got down to the beach when we came out and checked it, there was some Filipinos pulling it up. ... They actually pulled it up and my brother-in-law Tom Dalton told them that was our tree. And after we packed

them up, I had my station wagon full. ... So we got all of it and we put ours in a storm locker. They had storm lockers. You remember the storm lockers? We got ours packaged up and we still had lots left over yet. Didn't even make a dent. My station wagon was still full of herring eggs all the way up from top to bottom. (Al McKinley)

And then during the herring spawning season, we made—I remember a couple, two, three times we lived out at Indian Island. That's out there off Indian Point. We spent some time out there during the herring season [during] which we put up our herring eggs. ... And we used to go out there and get out eggs every year, but they had the road system go in there ... (Al McKinley)

I was quite young, so you know, I remember doing it from when I was little kid [1940s]. And it was—what I remember of the place, you know, we just, like everybody else did, put our branches out, got our herring eggs. But I remember there used to be a herring pot [also known as a herring pound] out there. A boat had a big net out. How it worked exactly, was anchored in place. And it was there all through the herring run and the halibut boats would come by on their way out and pull alongside and they'd just bail herring and sell herring to the halibut fishermen. And when we lived out there, the old man liked to hang around there because there was king salmon around that herring pot [also known as a herring pound]. But, from when I was a kid, I remember going there for a lot of years. (Fred Hopkins)

And then as I got older [1970s], even after I was married, my wife and I went out there a little bit. Because I remember doing it—tried doing it more, but then it wasn't—it just started petering out. And we monkeyed around, tried different places

like Yankee Cove, you know. We got a little bit out there, and it gradually got to where there wasn't any. (Fred Hopkins)

### **Juneau Harbor**

The commercial sac roe fishery was often identified as the reason for the decline of herring in Juneau Harbor:

The Sac-Roe Fishery is diminishing the herring stock through its over-harvesting and by its methods of harvesting. When they make that set, and your talking about fifty sets, how many of those herring are actually ready to spawn and how many are immature? Yet, they are run through the system. I feel this will decrease the stock in a given area. The herring seiners used to start out in Craig, and go through Juneau. There is no herring in Juneau anymore. (Ted Borbridge, 1996)

Back in '69, you could get all the herring you wanted [from Juneau], and now we're paying \$5.00/dozen to buy the bait fish. (Phillip Gray, 2007)

This [commercial sac roe] fishery was 11 days in the 40s, 11 hours in the 60s, and permits are worth little now. (Eric Forrer, 2007)

I personally witnessed this phenomenon in Juneau, where I helped manage the fishery for a number of years. They had an extremely good population of herring, but it declined down to a level where it cannot bloom, and that was 25-30 years ago [1940s]. When they go down, they go down for a long time. Juneau hit their fishery so hard, they have had 25 years of practically no fishery. (James Parker, 1996)

Juneau area; That was a big herring spawn area, and the herring boats only fished there a few years and depleted the herring fast, and now that is closed. (Franklin James, Sr.)

Well, the one in Juneau kept getting downhill in, I'll say the 80s. Because them sport fishermen over there got on our case for killing off the herring before they—and so they stopped the fisheries. (Bob Kirkman)

We started off, ok, when I first started [commercial sac roe] fishing here [in 1971], we had seven areas to fish. We had Helm Bay, Kasaan Bay, Kah Shakes, Sitka, Lisianski Inlet...I believe we had a little bit at Tenakee—no, no—Seymour Canal, and Juneau. And through my part of fishing these things, we've lost every area with the exception of Sitka. ... So I don't know that they're coming back stronger because I haven't been there. And those spawns were minimal anyway: Juneau, Tenakee, Pelican and Lisianski. And Kasaan Bay was so small that that one only lasted a year or two in the fishery and they had to close it because, same thing there, the community got riled. (Charlie Skulta)

And then, I started herring fishing. I think I went in '76 with Jeff Funt. We went gillnetting and seining and that year we fished Sitka, Juneau and Seymour Canal. And it was my opinion then, participating in the fishery and then seeing what was going on with the herring—we were fishing on a reduced stock. (Eric Jordan)

At that time [1949] you could go to Indian Point, Auke Bay or the harbor and jig all the herring you could use. (Jack M. Mason, 1993)

I know, the [Juneau] boat harbor had spawn. Herring used to spawn in that area. I don't think it does now. (Walter Soboleff)

I got herring that used to come up at the ferry terminal in Juneau: they were small. Just bait size. ... Yeah, they were but I guess after they built all those buildings over there, they never came back anymore. That was early 80s. But that's happened all around Juneau like Indian Cove. We used to go down there when I fished with his brother and (?) used to run down there to get fresh bait. They'd have a herring pond in there. (Harold Martin)

And actually, even right around the Ferry Terminal area and there used to be just a load of herring in that area and then in I think in about 1970, right after I came home from college, they opened it up and they seined that area. And right after that there was you know, there was almost eliminating the total herring spawn or herring period in this whole area for, well since that period of time. (Marcello Quinto)

### **Lynn Canal**

Lynn Canal has been closed to commercial fishing since 1982 due to a decline in herring abundance:

Spawning occurs on the west side of Lynn Canal and around Pt. Retreat. (Jev Shelton, 2007)

In 1977 and 1978 I was a crewmember on a seiner fishing sac roe herring in Berners Bay, Lynn Canal, there has not been a herring opening there since. What happened to those stocks? (Donald Hernandez, 1993)

### **Middle Point**

Marcello Quinto commented on herring spawn at Middle Point:

In fact, I can remember days [in the 1970s] when I came all the way around the back side of Douglas and that thing was just loaded with herring from Middle Point all the way up to Portland Island. (Marcello Quinto)

### **Piling Point**

See additional comments for Douglas Island: Marcello Quinto

### **Point Louisa**

Jack Gucker, a local resident commented on the herring spawn at Point Louisa in Auke Bay:

In 1929 my parents built a summer home on the beach at Pt. Louisa, mile 16 Glacier Highway. For 25 years from 1929 the herring would yearly spawn on the beach in front of the house. (Jack Gucker, 1993)

### **Portland Island**

See additional comments for Douglas Island: Marcello Quinto

### **Seymour Canal**

The Seymour Canal population has spawned in Hobart Bay and around Gambier Bay. It's a feature that herring move around. It's not biologically correct to measure the spawning biomass and say that's a measure of stock status of the herring. There's not a shortage of herring in the summer period. There's not the research effort to determine the status of these herring populations. It's almost impossible to open a coho that's not full of herring, and there's lots of whales feeding on them. There's not an indication that there's a trend outside of the unreliable indicator of the spawning area that there's a decline in the herring population. Analysis is always suspect when

going back and using a baseline of a high population in a specific spawning area. (Jev Shelton, 2007)

In 1979 or 80 I was a crewmember gillnetting herring in Seymour Canal, Stephens Passage. There has been only one fishery there since that year. What happened to those stocks? (Donald Hernandez, 1993).

Comment on Seymour Cannel [sic]: They use to herring seine for sac roe in that area; it was so poorly mismanaged by the fish and game there is no more herring in that area; this place was a big herring spawn area; it is no closed for any kind of herring fishery in the Seymour area; in-fact they place to put the herring on the endangered specie [sic] list in that area; again poor management, they wait a little to[sic] long before they--the fish and game do anything; think about the mighty dollar. ... And then the other one is Seymour. Ok, Seymour Canal, that was a bait fishery and a sac roe fishery. And they killed that place dead. (Franklin James, Sr., 2007)

And this one has always been big [herring spawn area] too: Seymour Canal. (Clarence Jackson)

Oh, I think we pretty much fished it [for sac roe] through the 70s ... The Seymour—the fish we caught in Seymour, I'd say, tended to be a little smaller. (Dick Eide)

Yeah. We had Sitka, we had Auke Bay, we had Seymour Canal and then we also had Helm Bay down by Ketchikan [for herring sac roe fisheries] ... (Consultant #23)

They used to open Seymour Canal area also. ... Seymour Canal used to spawn pretty heavy there. ... Yeah, on the right-hand side. (George Davis)

And I took part in the fisheries one year up in Seymour. And I didn't go back to doing that again because to me it was too devastating. I knew what was going to happen. I knew what was happening, and I saw all those boats out there. I mean just wiping them out. And it was-I said, I'm not going to do this anymore. (Paul Aceveda)

Used to be herrings, the whole thing [canal]. (Marvin Kadake)

So, we fished herring up in Seymour Canal too. Better mention that in there before we forget now. It's [the herring spawn] almost maybe, well three, four weeks later than Sitka. (Leonard Skeek)

Deer Island and up on the north side here. We used to go to Seymour Canal [searching for herring]. Tebenkof Bay. Port Camden. (Nels Otness)

When I was young, you know, I watched a handful in these smaller bays, like Thomas Bay and Farragut Bay and up in Port Houghton and Hobart and Windham, you know, and power trolled a little bit up in Seymour Canal: all up and down the Admiralty shore. And there was just little batches of herring except Seymour Canal had a bigger, bigger school. ... Anyway, but, you know when I was a kid, the eggs that we got came from around Craig. And some of the eggs came from Sitka and some of the eggs came from Auke Bay. When you have a little spawns you know, it's not thick enough to get what you need. Even in Seymour Canal when the guys set there, you know, that school isn't big enough to get enough spawn in one spot, you know. ...

There's so much herring showed up in Seymour Canal it seemed like they should have been able to put branches out and get herring, but you know, they spawn on a lot bigger area, so they're not getting a heavy spawn on any one spot. And, you know, I don't think the herring up in Seymour Canal were ever threatened. (Ralph Guthrie)

Yeah, I went over there [to Seymour Canal] one year with Merle Enloe on the Icy Queen. (Bob Kirkman)

We started off, ok, when I first started fishing here, we had seven areas to fish. We had Helm Bay, Kasaan Bay, Kah Shakes, Sitka, Lisianski Inlet...I believe we had a little bit at Tenakee—no, no—Seymour Canal, and Juneau. And through my part of fishing these things, we've lost every area with the exception of Sitka. (Charlie Skultka)

And then, I started herring fishing. I think I went in '76 with Jeff Funt. We went gillnetting and seining and that year we fished Sitka, Juneau and Seymour Canal. And it was my opinion then, participating in the fishery and then seeing what was going on with the herring—we were fishing on a reduced stock. (Eric Jordan)

### **Stephens Passage**

And they're getting a good build-up of herring in Frederick Sound, Chatham, Stephens Pass area and from Seymour Canal down to Tyee. (Ralph Guthrie)

### **Windham Bay**

See additional comments: Seymour Canal, Ralph Guthrie.

But my other grandfather, T'akdeintaan, Henry Anderson, was talking about Seymour Canal as you mentioned. And he also talked about Windham Bay. Well, I don't know that they would that area but it was a good anchorage. And those guys liked to troll in this area because it's all good along here and also toward Windham Bay. So they kept a log on the migration of the herring. And so they knew about the herring running in Seymour Canal. But that was his favorite fishing spot was in that area. (John Martin)

### **Winning Cove**

Herring were once abundant at Winning Cove.

Winning Cove was one spot I remember from listening to the old-timers, down in Seymour. But the whole country was alive with herring in the old days. (Karl Schoeppe)

### **Yankee Cove**

Fred Hopkins commented on the decline of herring spawn at Yankee Cove (See additional comments for Berners Bay, Bob Kirkman).

And then as I got older [1970s], even after I was married, my wife and I went out there a little bit. Because I remember doing it [collecting herring spawn]—tried doing it more, but then it wasn't—it just started petering out. And we monkeyed around, tried different places like Yankee Cove, you know. We got a little bit out there, and it gradually got to where there wasn't any. (Fred Hopkins)

### **Predation**

Many factors were identified by consultants as the cause of herring population decline (commercial fishing, pollution, etc.). In addition to these place-specific observations, there were consultants who identified general changes in herring predator behaviors and populations (halibut, salmon, sea lions, seals, seabirds, whales, etc.) that may be

effecting herring populations in and around Áak'w Kwáan and T'aaku Kwáan. Herring are described as an integral part of the marine food chain, a keystone species:

To me it is an exciting time of the year as the thousands of gulls, sea birds, eagles and sea lions would converge in and around these vast spawning areas. (David Werner, 2007)

And even before that, we know that there, that herring spawn and even the herring itself is the food for all sea life including the sea lions, seals and also killer whales. (John Martin)

Auke Bay, at that time, was so full of herring that as soon as they showed up, there was plenty of salmon. There was plenty of—the seals, the sea lions were in there chasing the salmon, the herring and killer whales were right up in there brushing up against the floats and the sea lions would get scared and jump out on the dock and scare everybody on the dock, you know. (Doug Chilton)

Increasing whale and sea lion populations were identified as predators that may have detrimental effects on herring populations:

And there were a lot of whales. ... Yeah, there was a lot of whales when I was there. There were certainly a lot of herring. And a lot of salmon. (Gabe George)

A lot of seal. ... The only thing I remember is seals and sea lion come through. (Fred Hopkins)

It may be that we have an overabundance of sea lions in this area and not other areas. I feel for fishermen who have to deal with sea lions harassing their operations.

Perhaps some of our Tlingit friends could hunt some more to use the hide and meat.  
(Dennis Harris, 2007)

In the last few years I've seen a huge increase in whales and mammals feeding on herring. I've seen increased bubble feeding on herring in the summer time. (Kathy Hansen, 2007)

I'd like to have the predation looked at. Sea lions and humpback whales, while listed, are consuming a lot of feed. (Dick Hoffman, 2007)

The sea lions and humpback whales have increased. I don't fish at night anymore because of the sea lions. I saw 10 whales going home the other day, and then another group after that. I've watched the rookeries grow for sea lions. I saw 75-80 sea lions on Little Island, and lots on Rocky Island on my way to Hoonah. I've never seen sea lions in these areas. (Bill Thomas, 2007)

Keep in mind that between 1912 and 1923 on thousand six hundred whales were harvested in S.E. waters. (David Werner, 2007)

And the other thing too, I don't know anybody else said anything else about it, but from the Douglas Bridge all the way to Douglas they had these, we called them 'fish ducks.' I don't know what their true name was. They're a black fish that... [surf scoters]. ... But they're not there because they're starving. That's the way I look at it. They used to feed there, and they don't anymore. (Walter John)

### **Xunaa Káawu: Hoonah**

Xunaa territory begins in the south, encompassing the northern portion of Chichigof Island beginning at the northern shore of Tenakee Inlet, Lisianski Inlet, Lisianski Strait and all the islands in Icy Straits and Cross Sound. It continues northward to include Glacier Bay National Park and Glacier Bay and in the east, Excursion Inlet and Pleasant Island. We conducted a total of 14 interviews with residents of Hoonah. All other herring observations were made by individuals from other areas.

Hoonah (from the Tlingit, Xunaa, “In the Lee of the North Wind”) settlements have been recorded at the following locations in Port Frederick: Neka Bay, Game Creek, the mouth of Humpback Creek, the portage to Tenakee Inlet, Seagull Creek and at Salt Lake Bay. Bartlett Cove, now part of the Glacier Bay National Park and Preserve, is the original village site of the Hoonah people, before it was moved to its present site in Port Frederick (Goldschmidt and Haas 1998).

It was after their migration to Port Frederick, according to elder Lily White, that the Hoonah Tlingits learned how to harvest herring eggs on branches.

The Alaska Department of Fish and Game (ADFG) currently manage one commercial herring fishery that falls partially within the Xunaa territory: Tenakee Inlet. Tenakee Inlet (Section 12-A) has operated as a winter food and bait fishery, typically between 1 October and 28 February, since 1978 and as a spawn-on-kelp fishery since 2003. The first herring spawn activity recorded by ADFG was in the 1970s using aerial survey methods and supplemented with hydroacoustic surveys from 1979 through 1986. In 1987, hydroacoustic survey was replaced by spawn-deposition dive surveys. According to ADFG documentation, the first herring spawn occurs in Tenakee Inlet in the last week of

April and continues through the first week in May. A decline in spawn activity has been noted by ADFG since the 1998 season. The fishery did not open in 2008. The following locations have been identified by ADFG as herring spawning areas: south shoreline of Tenakee Inlet between Saltery Bay and Trap Bay, Kadashan Bay, East Point, Wachusett Cove, South Passage, Basket Bay, Tenakee Springs and Cannery Point (ADFG 2009a).

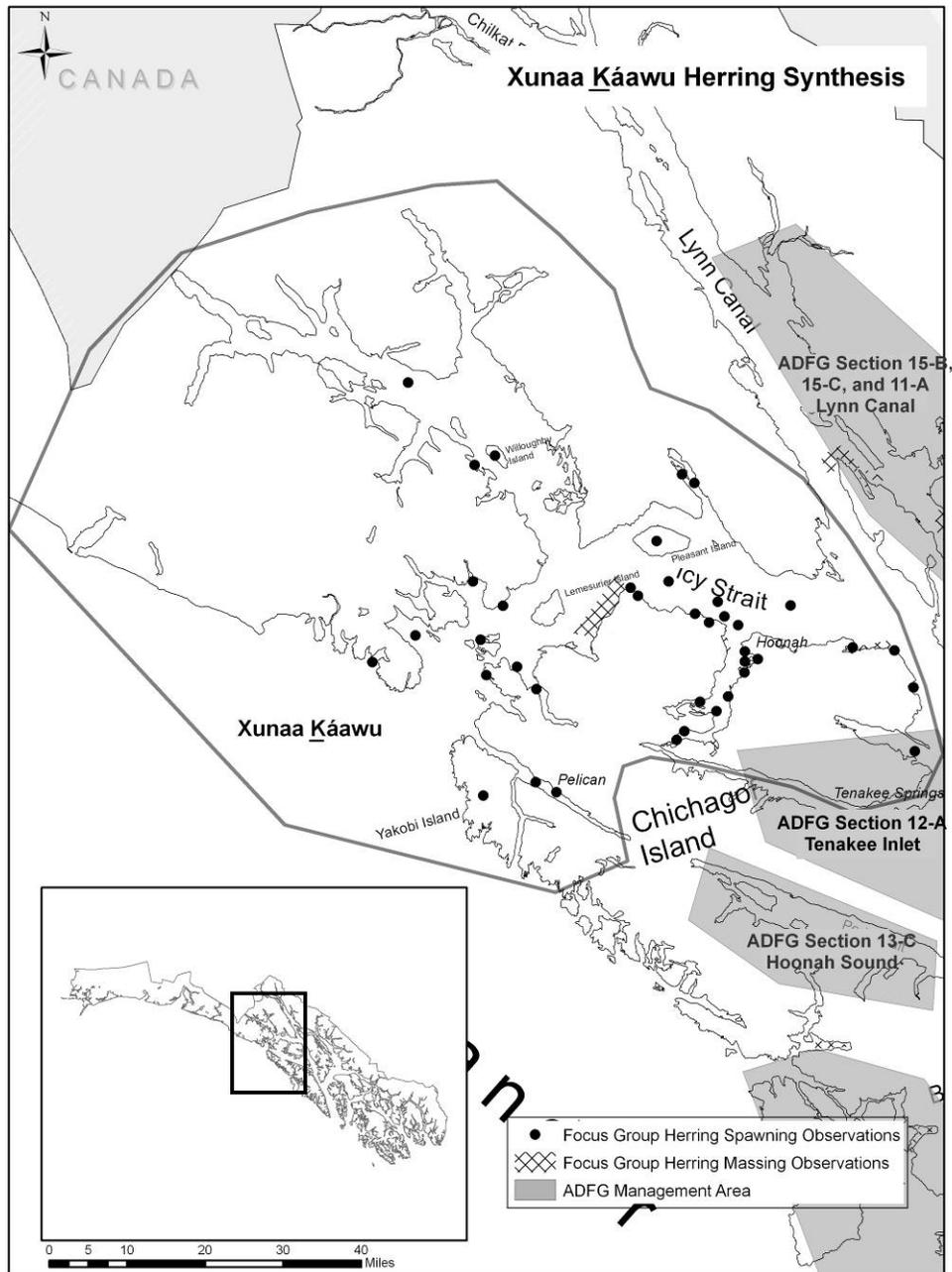


Figure 6.8: Overview of Herring Spawning Areas and LTK Observation in Xunaa Káawu

The following is a list of locations within the Xunaa Káawu that were identified as notable herring spawning and massing areas during individual interviews and focus

group interviews conducted during this synthesis project and in previously documented research efforts:

Bell Island, Burnt Point, Cedar Point, Chimney Rock, Dundas Bay, Dundas River, Eight Fathom Bight, Elfin Cove, Excursion Inlet, False Bay, Fingers Bay, Flynn Cove, Freshwater Bay, Gallagher Creek, Game Creek, Gartina Creek, Glacier Bay (Willoughby Island), Grassy Island, Graves Harbor, Graveyard Island, Hoonah Harbor, Hoonah Island, Icy Strait, Idaho Inlet, Inian Point, Lisianski Inlet, Long Island, Neka Bay, Pelican Harbor, Pinta Cove, Pint Rock, Pleasant Island, Point Adolphus, Point Augusta, Port Frederick, Sawmill Bay, Shaw Island, Taylor Bay, The Sisters, Whitestone Harbor, Willoughby Island, Yakobi Island

### **Bell Island**

Bell Island was identified as a herring spawn location:

Yeah, Bell Island is another place where it's always heavy conc[entrations]...oh you got it already. Yeah. Bell Island. Used to be heavy, yeah you got it heavy in this area used to be heavy and across here. (Charles Jack)

So, and then they spawn up in Helms Ranch ... Or, Bell Island actually. (Gordon Greenwald)

[Herring spawned at] Bell Island area and up here in Eight Fathom Bight. (Floyd Peterson)

### **Burnt Point**

George Dalton, Jr. recalled herring spawning at Burnt Point:

This is one [spawning area] that we always called Burnt Point and then they on the maps they call it—it's right here. (George Dalton, Jr.)

### **Cedar Point**

Mr. Mills identified Cedar Point as a herring spawning area:

Yes. And all the way up here in Cedar Point inside and up the head of the bay there, they spawned there. (Thomas Mills)

### **Chimney Rock**

Raymond Howard commented on herring spawn at Chimney Rock:

Seen them spawn up here. ... That's right inside, what's the name of that island, I can't even remember...Chimney Rock? (Raymond Howard)

### **Dundas Bay**

Dundas Bay was once the site of a T'akdeintaan village called L'istee (Goldschmidt and Haas 1998). Fish camps are located along the length of the creek that empties into Dundas Bay. Herring spawn has been observed in the bay itself:

I know that in the area of Dundas River, in that area, they have a large amount of spawn in that area as well as smelt and eulachon. (John Martin; areas also identified by Thomas Mills and Al Martin)

### **Eight Fathom Bight**

Herring spawning populations have been observed at Eight Fathom Bight:

And they've been spawning there [Eight Fathom Bight]—it's more so now than it had been in the last, previous years. (Fagan Skafalstead)

Bell Island area [had herring spawn] and up here in Eight Fathom Bight. (Floyd Peterson)

George Dalton, Jr. remembered harvesting herring roe at this location:

When we start getting our spawn here, I've seen the spawn here in the harbor, and what we call Graveyard Island and Long Island. Neka Bay, up quite a ways up the bay there at what we can call Eight Fathom Bight is where we got our spawn from when it did spawn here. (George Dalton, Jr.)

### **Elfin Cove**

Spawning herring populations were once abundant in Elfin Cove, but a decline in spawning activity was noted:

We used to see lots of herring in Elfin Cove. (Nora Dauenhauer)

And I've seen them spawn right there too: right on that island. ... I was surprised when I seen that. (Raymond Howard)

The herrings were in there, but they don't spawn there hardly anymore. Yeah, that whole place there. (George Dalton, Jr.)

### **Excursion Inlet**

*L'ux'uhéen*, a village once inhabited by the Wooshkeetaan clan, existed at the present cannery site in Excursion Inlet (Goldschmidt and Haas 1998). Excursion Inlet is currently utilized by Hoonah Natives as a hooligan camp and for trapping. Herring spawning populations have also been observed at this location:

All the herring from Lynn Canal used to come down to where the water temperature is right. And all the herring from Glacier Bay move out and spawn around the Excursion Inlet and Rocky Island. (Herman Kitka, Sr.)

And that's how we knew about herring except as a child growing up in Excursion Inlet the bay used to be just packed with herring ... The skiff would go to Homeshore, there's nothing there he'd go to Excursion, nothing there he'd go to Adolphus nothing there. You just keep looking until you find it. ... They would come in, always come in massively in Excursion Inlet in the spring just like they come into Sitka in the spring. And nobody figured out where they came from or what the abundance of it was. ... There's nothing in Excursion any more. I mean you see signs of herring, but they don't stay. (Thomas Mills)

They had it [spawn] toward Neka Bay, up in a—way up there [Excursion Inlet]. (Al McKinley)

Yeah. Also [herring spawned at] Excursion Inlet. (John Martin)

### **False Bay**

Charles Jack observed a minor herring spawn in False Bay:

Yeah, a little spawn in False Bay. Yeah. And all along the shoreline, but nothing major you know. (Charles Jack)

### **Fingers Bay**

Fingers Bay was identified as a herring spawning area used for subsistence harvesting:

And when I used to go collect the herring eggs for home use, I used to go into inside Fingers there to get, I used to get a lot of herring eggs out of there. ... Oh, but that one there. It stopped spawning now I say, after the log camp moved in, it just diminished to hardly nothing at all. (Owen James)

[Herring spawned in] Fingers Bay. Upper Fingers Bay in Glacier Bay. That would be right up in there. (Thomas Mills)

### **Flynn Cove**

Gordon Greenwald commented that he had seen herring massing in Flynn Cove:

Another one was Flynn Cove. Notorious for going, if you wanted to get herring, you'd go to Flynn Cove. Now, I never saw them spawn there... Yeah and there were times it sounded like it was raining on the surface. ... Um, I would say that it was in the late 70s I noticed not as much. (Gordon Greenwald)

### **Freshwater Bay**

Many consultants identified Freshwater Bay as a herring spawn location:

They [commercial fishermen] cleaned out Point Adolphus and Freshwater Bay and Tenakee. (Walter Moy, 1996)

Yeah, they did in Freshwater Bay too but not as heavy as Tenakee. They spawned in Freshwater Bay. You know, if I had choice of, pick a place to live from when I was young, and live to die, I would live in Freshwater Bay. (Charles Jack)

Growing up, I've never seen herring go in Freshwater Creek and now I see them up in Gartina Creek and Game Creek also. (George Dalton, Jr.)

Freshwater Bay has a lot herring. (Gordon Greenwald)

Yeah, they come into Freshwater Bay too. Kind of shallow, a lot of reefs in there. (Frank White)

Well, there was a lot of herring over there in Freshwater Bay... (Thomas Mills)

They [the Finlanders] had a—the brought a scow in, and that was the heaviest herring spawning area: Freshwater Bay. Right there, yeah. And they brought a scow in there to bring in king salmon and they used to cut it and put it in mild cure. And they would just have heaping king salmon on the scow but they were salted. And they didn't have any limit, you know. But Freshwater Bay was one of the notorious king salmon, herring spawn area. (John Martin)

### **Gallagher Creek**

Thomas Mills recalled a massive die-off in Gallagher Creek and attributes the cause to the rupturing of submerged propane tanks left there after a barge capsized in the area:

Well, a long time ago, back in the 60s I think a barge rolled over out in the ocean and a bunch of people towed it up into South Bight And there was bulldozers and stuff chained to it. And great big tanks of--rubber tanks with propane and stuff inside it yet that sunk to the bottom and...They cut the chains and stuff on it that dropped the equipment underwater down to the bottom and then hooked onto the equipment and pulled them back up to send them down to get them rebuilt. But they jus left all the propane containers and stuff up there. And I think some of it might have opened up because at one time there was some massive kill of fish of all sorts, not just spawn fish or anything like that: just bottom to top [in the 1990s]. (Thomas Mills)

### **Game Creek**

Game Creek is a notorious location to acquire many subsistence items including fish and herring (Houston et al. in Goldschmidt and Haas 1998).

Growing up, I've never seen herring go in Freshwater Creek and now I see them up in Gartina Creek and Game Creek also. (George Dalton, Jr.)

Karl: Kind of on the outside of Game Creek, that side down, on the outside.

Interviewer: Ok. Yeah, did that have an impact on the spawn when they...?

Karl: Oh, I think it did. When they very first put the logs in there, yeah ... It was coming back, but then—fifteen years ago now that they start putting the logs in there.

(Karl Greenwald)

### **Gartina Creek**

George Dalton, Jr. observed herring going into Gartina Creek:

Growing up, I've never seen herring go in Freshwater Creek and now I see them up in Gartina Creek and Game Creek also. (George Dalton, Jr.)

### **Glacier Bay**

Glacier Bay, commonly referred to by the Hoonah people as 'the Hoonah breadbasket,' once belonged to the Chookaneidí (Goldschmidt and Haas 1998). It is now part of the Glacier Bay National Monument, but was once utilized extensively by the Hoonah people for a variety of subsistence resources including herring spawn:

Water temperature has a lot to do with it. The reason I say that is because a lot of herring used to be in Glacier Bay. ... All the herring from Lynn Canal used to come down to where the water temperature is right. And all the herring from Glacier Bay move out and spawn around the Excursion Inlet and Rocky Island. (Herman Kitka, Sr.)

I know [herring spawned] for sure in Glacier Bay. (John Martin)

### ***Willoughby Island***

All over on Willoughby Island all over in this island area used to be spawning sites. The tide was moving but it wasn't really, really moving. And there's a lot of places for the herring to spawn there. (Thomas Mills)

### **Grassy Island**

Gordon Greenwald observed herring near Grassy Island:

Recently there were a couple different years that close to Grassy Island, right off of Burnt Point: Grassy Island. In fact, two years ago I believe was the last time I saw it spawn there. (Gordon Greenwald)

### **Graves Harbor**

Graves Harbor was noted as a herring spawn harvesting area and as a herring trolling location:

Yeah, there was people from Lisianski said there was ... they used to get some spawn eggs from Graves Harbor. ... (Jake White)

He cut out a flasher and polish it up and didn't use a whole lot of them, but I think he had one on each side and I know that at night we used to hang our trolling pole out and one of the areas that I remember distinctly was Graves Harbor. And we put our herring net out and we put a light out over the herring net and that attracted the herring. (John Martin)

### **Graveyard Island**

George Dalton, Jr. observed herring spawning at Graveyard Island:

When we start getting our spawn here, I've seen the spawn here in the harbor, and what we call Graveyard Island and Long Island. (George Dalton, Jr.)

## **Hoonah Harbor**

Many consultants remembered being able to gather spawn directly in Hoonah Harbor:

Five years ago we had a spawn right in the harbor here. The poles in the harbor were about two inches thick with herring eggs on them. ... They seem to shift out of here. The harbor was just loaded with them a little while ago. I thought they were fingerlings, but they weren't. I took a little scoop and I picked some up and it was baby herring about this long. (Fagan Skafalstead)

But we get herring eggs—we get herring here, herring eggs here, but very few. They spawn up the bay, some around the Long Island. We're talking just in Long Island. And there's a few there around the—on the upper side. ... My dad used to get it when we were young. I know people used to get it there. But like I said, at one time it was coming back. Right across, on the other side of the harbor. We used to go there and pick them off the beach and on the rocks and they were just starting to move back in when the fuel line busted. They covered that whole bay and that whole area. And they moved it again and stopped it. ... It's gradually coming back now. It's coming where—Keith's father-in-law's got a boat down there and he went down stuck a branch in the boat harbor and he got full of herring eggs. ... Yeah. Doris and I always go down there and try and snag some. But it's starting to come back pretty good. It used to be little here and there but now we get more and more all the time. (Harold Dick)

Not that I could say offhand really. It seems to be doing pretty well. I know up the bay this year it's quite a bit of spawn. Not compared to like Sitka, but for around here we'd say quite a bit. ... You just want enough for the fresh bait. ... Oh, right in front of

town we'd be. ... Like in, yeah. Down by the cannery, where the cannery is now ...  
Yeah, just around Hoonah there was quite a bit of spawn. (Karl Greenwald)

Was a year or two after they built the harbor the herring came in here and spawned  
on that creosote piling and of course all the roe turned black, you know, that fresh  
creosote. It all fell off. Hardly any of it probably hatched. But since then—just that  
one year. Since then, no herring spawning at—the herring are in there, but they don't  
spawn there. (Floyd Peterson)

And on late September/October the--towards the winter, they don't have any roe any  
more. But we used them for bait: trolling bait. I used to do that when I was living  
over there ... There's some there but they're not coming in real big any more. (Frank  
White)

Well, we had them one time, they spawned right in the harbor, you know. (Gordon  
Greenwald)

Herring were also observed massing near Hoonah and were often caught for bait:

People that set all that herring that used to be around, they don't see them around no  
more. Used to fish right there in town. I think it was the middle of May. King salmon  
used to chase the herrings. You don't see that no more. (Raymond Howard)

Mostly yes, they wanted the bait. And they fished them all for bait. Floating fish  
traps is what we always called them. And when everybody wanted them I guess they  
had a scow here that processed fish bait. ... Well, when before they put the floats in at  
the boat harbor. They just anchored down there behind the pilings by the cannery,

but they had a floating pond: a herring pond and they would electrocute the herring so you could keep all the scales on them. (Thomas Mills)

A few consultants observed herring feeding on the gurry produced by the cannery that once operated near Hoonah:

You know, when we were kids, they say herring don't feed on everything—or they feed on a particular type of food—but when we were kids that wasn't so because in our cannery, when the cannery was operating, there used to be herring around our cannery all the time and when the fish ladder, you know the fish elevator started up to haul fish up, the herring would concentrate under there and we'd take a bent wire from a box and we'd strap the box to it. We'd bend a hook on it and jig it in the water and we were catching herring left and right with it. (Charles Jack)

I know that when the crab cannery was operating, the herring stayed around under the crab cannery for as long as it was operating. (Victor Bean)

Quite a few participants commented on a chemical spill that occurred in Hoonah Harbor and the detrimental effects this pollution had on the marine life in the area:

'44. What happened is there was a shipwreck or a scow wreck of fuel and I don't know today if that was done purposely. They dumped barrels, 50-gallon drums all along the shore by Hoonah. And the Hoonah people gathered all these drums. And they contaminated this village. And they were trying to fish under one of the houses. (John Martin)

I remember something, but what you ought to say is it was those (?). All these tanks, 50-gallon tanks float down. The army said, 'Go. Help yourself.' And our people went down there with a seine and start picking them up and then they took them to Hoonah and put it underneath their houses. So actually Bobby Grant is one of my

cousins-- he was playing underneath the house. He set the house on fire out there. And then after it exploded, they just went, the houses just went 'Boom. Boom. Boom. Boom.' (Al McKinley)

That was in the late '60s. The oil tankers run up. It was weird. I come down town and I was going to check the mail and they had big signs all over the streets: 'No flame', 'No cigarettes,' no nothing because it was gas. I guess there was an old man wanted to take his boat in morning and busted it under the dock. Goes shooting out on the bay. And then that stopped it again. It killed all the herring from coming around again. (Harold Dick)

But you can't blame all that on the seiners over here in Hoonah because they had some kind of a major chemical spill here which the city won't own up to for one, you know. (Charles Jack)

So now the sea lion got to come now into the island waters and take the feed in here. And they're fully protected so, you know, we got places where sea lions—up in the bay, up in the head of the bay here where I was telling you—the number sea lions up there, I've never seen it like that up to two, three hundred sea lions. ... Well, we start getting into heavy sea lion here in the last 10 years. (Fagan Skafalstead)

According to some observations, herring spawning populations may be returning to the area:

Hoonah is coming back a little bit, but not enough to be fruitful [for spawn]. (Caroline Martin)

Jake: Gee, the whole bay's been full all winter. ...

Lily: They said some of them spawned by the boat harbor. They're trying to come back. (Jake and Lily White)

### **Hoonah Island**

Frank White described trolling around Hoonah Island in October:

It was kind of scarce because they were deep at that time, I think. On Hoonah Island, one time I was trolling there, and the herring came in: boy it was thick. Just—whales were right underneath me, you know, just about maybe from here to the corner: the whale's from me. And they come up--you can see the herring just pouring down into the mouth. That was in late October. (Frank White)

### **Icy Strait**

Icy Strait was an important subsistence area for the Hoonah people:

Icy Strait was called "Big Dish" in Tlingit because that's where we got our food. I can answer any questions you might have on Icy Strait. I fished there since 1940s (Al McKinley)

Herring massing has been observed in Icy Strait:

My friend that I call in Hoonah he said that he estimates that herring has been back in Icy Straits for 15 years. ... Icy Straits they killed the herring off. (Walter Moy)

Because like I say, there's an abundance of herring out here in Icy Straits. You go down to Point Augusta or Spaaski, Sisters Island, Point Adolphus, Pleasant Island: just tons of herring all summer long. Starting now after the herring spawn in the bays they move out into the strait and they're just there all summer. (Floyd Peterson)

But Raymond Howard noted a decline in herring populations in the Strait:

Mmhm. Used to see salmon breaking water right there at Icy Straits Point chasing herring all the time. You don't see that no more on account of all the herring disappearing. (Raymond Howard)

### **Idaho Inlet**

Idaho Inlet was identified as a herring spawn location:

The only place I know of where it spawned heavy is Idaho Inlet. (Charles Jack)

And some of them have, you know, Idaho Inlet and that, they got, but not that massive amount. (Frank White)

I remember [my family] raking herring in Idaho Inlet; they were thick in there. (Nora Dauenhauer)

### **Inian Point**

Bob Loescher remembered harvesting herring eggs at Inian Point:

Inian Point was a big herring spawn spot. Our people would gather herring and herring eggs from that spot. That was 40 years ago. (Bob Loescher, 2007)

### **Lisianski Inlet**

“Lisianski was an important source of food for Hoonah people” (Goldschmidt and Haas 1998:58). The Inlet was identified as a herring spawning location and as a commercial fishing area:

Oh, Lisianski, up at the head and Lisianski above Pelican [there was spawn]. (Karl Greenwald)

We started off, ok, when I first started fishing here, we had seven areas to fish. We had Helm Bay, Kasaan Bay, Kah Shakes, Sitka, Lisianski Inlet...I believe we had a little bit at Tenakee—no, no—Seymour Canal, and Juneau. And through my part of fishing these things, we've lost every area with the exception of Sitka. ... So I don't know that they're coming back stronger because I haven't been there. And those spawns were minimal anyway: Juneau, Tenakee, Pelican and Lisianski. And Kasaan Bay was so small that that one only lasted a year or two in the fishery and they had to close it because, same thing there, the community got riled. (Charlie Skultka)

### **Long Island**

Longling and trolling for herring has occurred around Long Island:

Along Long Island. Um. Yeah. I stopped longlining about 11 years ago. And at that time we were getting all our bait from out here. There was just, we'd use those casting nets and throw them out off the float and we'd get so much herring in them that we'd have to release some to be able to pull them up onto the float. ... But in the last two years, I haven't noticed herring in here like I used to see. ... It's not like it used to be. I used to notice the bottom turning white around Long Island. And there were a lot of herring there. And whales and sea lions and all of that followed them ... They—I think the place where they were dragging the logs off the Long Island into the water is one of the places that they used to spawn and I think they stopped spawn there because of all the activity that was there.... Could be because there's—that was a hot spot: Long Island. Where the bottom all the way around it used to turn white from the spawn and it hasn't been that way. (Victor Bean)

I've only been trolling the last couple of years and this might, I think my third season coming up. See balls of herring? Up along Long Island. Not very big ones. (Nels Lawson)

Long Island was also identified as a herring spawning area and location utilized for harvesting herring eggs:

Yeah, right there. They had a lot [of herring spawn]—and then Long Island. (Karl Greenwald)

But we get herring eggs—we get herring here, herring eggs here, but very few. They spawn up the bay, some around the Long Island. We're talking just in Long Island. And there's a few there around the—on the upper side. ... Yeah. One time my wife and her sister Merlina went up to Long Island and they set a branch in there. They were so full they couldn't even pull it, on the other side of Long Island. They usually spawn around the back and then the front. But they move quite a bit. (Harold Dick)

Then others it's [herring spawn] up here around Long Island. (Gordon Greenwald)

Herring population declines around Long Island were attributed to the introduction of logging in the area:

Raymond: They're coming back. They disappeared about I don't know ever since the logging started, they all disappeared for some reason. I don't know what it is.

Interviewer: And the logging started in the late 1980s or the 1990s?

Raymond: Mhm. And after that they disappeared. They used to spawn all around that island [Long Island]. Yeah. Until they started dumping logs over. They disappeared. (Raymond Howard)

Mostly it seems like they seemed to have disappeared shortly after they put in the sortyard over there on Long Island. They used to spawn all the time back up there in ...?... and Saltchuck Flats. That's right up in this area. ... That was back in the 80s when they started clear-cutting. They just moved out. I don't know if it's because of all the bark that's laying on the bottom. They had divers said that were diving down said there's no damage, but there's got to be damage down there. (Thomas Mills)

In Hoonah, we built a log dump at Long Island. We negotiated a period of time in the spring where we wouldn't dump logs for spawning herring, and it's my understanding there's a similar agreement with Goldbelt. It worked in Hoonah. (Bob Leoscher, 2007)

### **Neka Bay**

Neka Bay, on Port Frederick, was identified as a herring spawning location:

Yeah. That area [Neka Point] there was some spawn in there too. Not heavy, but they—it's noticeable what you can see. (Charles Jack)

When we start getting our spawn here, I've seen the spawn here in the harbor, and what we call Graveyard Island and Long Island. Neka Bay, up quite a ways up the bay there at what we can call Eight Fathom Bight is where we got our spawn from when it did spawn here. (George Dalton, Jr.)

And then they spawn here in Neka Bay. A little bit up in this area. (Floyd Peterson)

Neka Bay may have been one of the first herring spawning locations utilized by the Hoonah people when they left Glacier Bay:

When our people came down from Glacier Bay, after that ice age, they started settling over here on Chichagof Island. And after the ice age, they had two winters. And starvation came among the people. And that's when they saw this spawning of herrings up Neka Bay. They said they didn't know what it was. It just looked milky. And they put stuff in there like a branch when they take it out it just thick. They recognized herring eggs because when they opened herrings it'd be in there. That's when they first tried eating it because of starvation. (Lilly White)

### **Pelican Harbor**

Roy Bailey identified Pelican Harbor as a herring spawning location:

The areas that used to have herring spawn were from Dixon Entrance up beyond Pelican. Last year Cordova shut down because of no herring. Kodiak also shut down their fishery because they did not get enough herring returning. (Roy Bailey, 1996)

Karl Greenwald recalled gathering herring roe on hemlock branches:

Interviewer: The [hemlock] branches in Pelican was the primary way.

Karl: Yeah. Yeah.

(Karl Greenwald).

### **Pinta Cove**

Gordon Greenwald and Fagan Skafalstead remembered gathering herring eggs at Pinta Cove during their childhood:

But that was always on of those—Flynn Cove and Pinta Cove. You wanted to get herring, you always went out, you could set your herring net out and you could get all the herring you needed. (Gordon Greenwald)

Because when I was a kid, out here at a place called Point Adolphus, we would be out, right out here is Pinta Cove. You can anchor up in here at Pinta Cove. And we used to

sit there in the morning on the trolling boat and there would be acres of herring and the water was just alive: popping. All you could here was [makes ch-ch-ch-ch-ch noise mimicking the herring] going on the water. (Fagan Skafalstead)

### **Pinta Rock**

Owen James commented on gathering herring eggs at Pinta Rock:

Yes. There's a place out there by Pinta Rock that used to be really good for--what do you call it-- getting herring too. I don't see Pinta Rock out there [on the map], so I can't show you where it's at. (Owen James)

### **Pleasant Island**

See comment: Icy Strait, Floyd Peterson.

### **Point Adolphus**

Many consultants commented that herring massing had been observed in Point Adolphus, and these schools were often pursued by the commercial fishing fleets:

They [commercial fishermen] cleaned out Point Adolphus and Freshwater Bay and Tenakee. (Walter Moy, 1996)

The only places: Point Adolphus used to be a heavy area for seining. Herring seiners used to fish out there. My brother took pictures of them. (Fagan Skafalstead)

Because when I was a kid, out here at a place called Point Adolphus, we would be out, right out here is Pinta Cove. You can anchor up in here at Pinta Cove. And we used to sit there in the morning on the trolling boat and there would be acres of herring and the water was just alive: popping. All you could here was [makes ch-ch-ch-ch-ch noise mimicking the herring] going on the water. ... When I was a kid, after the big

herring fisheries around Point Adolphus there wasn't many herring and consequently not as many whales. ... Because like I say, there's an abundance of herring out here in Icy Straits. You go down to Point Augusta or Spasski, Sisters Island, Point Adolphus, Pleasant Island: just tons of herring all summer long. Starting now after the herring spawn in the bays they move out into the strait and they're just there all summer. (Floyd Peterson)

When I first started fishing, I was about maybe 14 with my uncles, and we used to come across herring fishermen. They have larger boats than a regular purse seiner and there used to be about four of them at Point Adolphus purse seining for herring. Even then there was a lot of herring. They used to come across some canneries. My uncle told me that used to be a herring plant. But after a while they disappeared: the fishermen disappeared, they closed down the processing plants. I guess the herring really thinned out. (Frank White)

Gee all the herring fishing sure knock---they used to have a big fleet of herring fishermen in Icy Straits here: Point Adolphus. ... Yeah. Gee, I was about nine, maybe nine years old. I forgot when they quit though. They didn't show up anymore. And the herring was hardly any much around. (Jake White)

The herring run—I don't know if the State of Alaska, or the biologists know that the herring migrate from outside waters. And maybe the outside water's warmer out in the ocean in the winter and they come in. They come in through the—they circle area through Indian Pass and they come around Adolphus through that route. They almost take the same route as the salmon. We used to get them in our nets, even the seine nets, the big herring, the twelve-year old herring. (Al Martin)

The skiff would go to Homeshore, there's nothing there; he'd go to Excursion, nothing there he'd go to Adolphus: nothing there. You just keep looking until you find it. (Thomas Mills)

Interviewer: But how about areas where they are en masse, where you would really see herring collecting?

Victor: Point Adolphus. (Victor Bean)

The other thing is every year we notice there's a lot of herring in the Pt. Adolphus area. (Eric Jordan)

Oh, another place too was Point Adolphus. There's lots of herring right at Point Adolphus. Right here. ... There was lots of herrings. I don't know if they ever spawned, but there was lots of herrings in there. (Al McKinley)

We used to have our camp right there. (Caroline Martin)

I know they were deck loading: the herring seiners and those guys were big boats. Humongous. Like Al was talking about granddad. Those were small boats compared to the big herring seiners. (John Martin)

### **Point Augusta**

Harold Dick remembered fishing at Point Augusta when herring were very abundant (see additional comment: Icy Straits, Floyd Peterson):

Yeah. And Point Augusta. An airplane came and they put a speaker on. ‘You guys are in the wrong spot!’ He said, ‘There’s millions of fish on the other side.’ So we pulled our seine in and we came across full-bore. And from that bay all the way to here, from here to across the street, maybe a little wider: herrings. It was all herrings . . . like that. Right here at Point Augusta on the inside here, all the way to this point. It was ah billions of them, just would seem as wide as this route all along the beach there. We got excited. We could see it coming you know, but after we got in there, there was—seen them flipping. They were all herring. (Harold Dick)

### **Port Frederick**

Port Frederick is the site of the present village of Hoonah. It is the territory of the Chookaneidí clan (Goldschmidt and Haas 1998):

Fish spawned in small areas all around Port Frederick. This year, the herring spawned right in front of town, and that hadn't happened in a long, long time—maybe 50 years. We don't have a lot of information on that stock, but it has recovered. (Bob Loescher, 2007)

We do see June spawning for Auke Bay and Port Frederick. I think it's rare, but that it's been going on over a long period. Every year is different. (Fagan Skafalstead)

Interviewer: So what time—you said there was a decline in the herring after the [reduction] fishery. What time was that?

John: Well, I was a teenager so I think it was in—around 1948, somewhere in that area: '47, '48.

Interviewer: And that affected the Point Adolphus, Port Frederick?

John: Yeah. It wasn't just one herring seiner. There was several herring seiners that came in there.

(John Martin)

Oh yeah, I've seen them in Port Frederick, fishing up here making sets, you know. And—another Auke Bay. (Karl Greenwald)

Then out here in Port Frederick, I remember AM, who's the captain of the Vagabond Queen, and he was just loading up. There was no limit on seining and he had access to the whole Port Frederick. And that depleted the mass of herring here. I still don't think they ever recovered yet. I mean you still see a lot of herring and stuff but not as much as they used to. They used to be just all over the place. (Thomas Mills)

Yeah. They got—I think they go deep because I've seen them run out there with the fathometer out there and you can see them on the fathometer just layers of herring. Now, you know 25-30 fathoms. ... Now, you can go up the, up the—we call it the bay—up the head of Port Frederick and you'll see a lot of herring around. And you look at the fathometer in different places where they're on different layers ... Well, them are the most—other than right here in Port Frederick got spawn but... Mostly inside, you know, up by the portage. ... Because I seen Port Frederick herring all over, different parts of Port Frederick. Sometimes you could hear just spouting. (Karl Greenwald)

### **Sawmill Bay**

Sawmill Bay was identified as a herring spawning area:

...but on this side of Sawmill Bay there's a lot of herring in there. I don't know if they spawn in there or not. I imagine they do though. (Floyd Peterson)

Yes there was spawning up there at Sawmill Bay. ... And I think the reason why they spawned mostly up in Sawmill Bay was the tides in Excursion are just like a river and that's where they, that was always the mainstay for where whenever we caught king salmon all year round. When we went over there we went up to Sawmill Bay and we trolled up there at the old wire-wheel (?) hangar from the old days. (Thomas Mills)

Sawmill Bay. ... Yes. All along here. All—on both sides. (Al McKinley)

### **Shaw Island**

Charles Jack recalled herring spawning at Shaw Island:

Especially, right where you got your pen by Shaw Island. That area. There always used to be heavy spawn in that area. ... Yeah. They still spawn there but I don't know how heavy it is. (Charles Jack)

### **Taylor Bay**

Taylor Bay was once the site of a T'akdeintaan winter village called Asgutu.aan (Mrs. Lonnie Houston, Mrs. Oscar Williams and Mrs. Eliza Lawrence #47 in Goldschmidt and Haas). There was also a camp on the east shore called Xéixitu.aan. Herring spawned at Taylor Bay, but may not have been harvested for subsistence purposes:

And also used to be some [herring spawn] in Taylor Bay up out here. (Charles Jack)

Well, there's a lot of spawning spots out there and-Port Althrop and then this bay, Taylor Bay. ... Yes. Very few people went up into Taylor Bay because a lot of people don't know where the rocks are. (Thomas Mills)

## **The Sisters**

See comment: Icy Strait, Floyd Peterson

## **Whitestone Harbor**

Gordon Greenwald observed herring spawn in Whitestone Harbor:

Whitestone. Whitestone Harbor, yeah. That was the other place [herring spawned].  
Freshwater Bay. (Gordon Greenwald)

## **Yakobi Island**

Harvey Kitka remembered his parents commenting on the herring spawn at Yakobi Island:

Yeah. I know my parents, they talked about the spawn all the way up into Yakobi  
(Island). (Harvey Kitka)

## **Predation**

Many factors have been identified as the cause of herring population decline (commercial fishing, pollution, etc.). In addition to these place-specific observations, there were consultants who identified changes in herring predator behaviors and populations (salmon, sea lions, seals, seabirds, whales, bears, etc.) that may be effecting herring populations in and around Xunaa Káawu. Karl Greenwald and Harold Martin commented on the importance of herring as a source of feed for many species:

Well, you know, nobody realizes how important a herring is. They're very important because everything feeds on them. Whales, I think, eat most of them, but there's sea lions quite a bit and seagulls, eagles. It feeds everything. It's part of the chain. ... Mammals? Well, I know the sea lion. They're not really depending on salmon. They try to go more for the salmon. But your coho salmon feeds on the herring more than any of the other salmon even when they're coming in to spawn. (Karl Greenwald)

. ... Well, it's usually king salmon and halibut and ducks and harbor seals [that feed on herring] ... In deep waters: whales. ... Seagulls. There's lots of seagulls. (Harold Martin)

Raymond Howard identified a decline in the seal population:

When I was a kid I think I saw more seals. ... But, even right now the seals are disappearing from around here for some reason. I don't know what it is. (Raymond Howard)

Both Fagan Skafalstead and Floyd Peterson voiced concern about the growing population of sea lions and their impact on the herring:

And like right now we have an overabundance of sea lions. (Fagan Skafalstead)

And, another thing I've noticed—a lot more sea lions. Gosh, they're on the increase. (Floyd Peterson)

George Dalton, Jr. commented on a rising sea otter population:

And I'm going to blame again, the sea otters because the sea otters are going to change everything that I see in my experience of growing up in the fishery. And the wild mammals around here. We need to do something with these sea otters because they've never been in this far. (George Dalton, Jr.)

The whale population was described as both increasing and decreasing:

...The whole Icy/Chatham Straits and Icy Straits, there was whales all over. It was—you didn't have to look for them, they were there. Like we were waiting for an opening on time outside of Pinta Cove, and I was about 11 or 12 years old I think and I counted 80 whales just drifting around outside of Pinta Cove. (Charles Jack)

We used to have a lot of whales in here before. Even when they first started doing their log ships I remember when they first started clear-cutting here there was a lot

of whales. And then they started using dynamite or explosives when they were working on the sort yard and I remember that one time they set off a charge close to the water and it was a big charge because it fired rocks way out into the bay. But I saw them whales up in Neka Bay reacting to it. They were leaping out of the water just like salmon . ... And they wouldn't stop. There was something wrong. Something just messed up their echo-location system or did something to them anyway. After that the whales didn't seem to be plentiful anymore. It's almost like they told their buddies to stay away. Most of the whales you see now are on the far side of Port Frederick across the bay. So I think the herring are moving in on that side. (Thomas Mills)

And it just amazes me that the herring have come back strong enough to support all these whales. But there's no commercial whale fishery and I mean, herring fishing in the area. There hasn't been for many years.

. ... There is a lot of whales and what amazes me about the whales, they're on the increase. When I was a kid, after the big herring fisheries around Point Adolphus there wasn't many herring and consequently not as many whales. Of course they were hunted back in those days too. ... You'll go out here around Point Adolphus there's five, maybe four or five pods of whales and four or five, six, seven sea lions following every pod of whales. ...Of course the whales are on an increase. Only the cows, I guess the cows got to go to the warmer water to calve, but there's a few whales hang around here all winter. And they're always out in the middle and I presume, feeding on herring or whatever down deep. ...Well, if we're going to maintain our big increase in whales, I think we better take care of those herring because I think they must eat a tremendous amount of them. And if we want to protect whales, we better protect our herring stocks ...

All summer and to—the whales are feeding there well into October and then they'll start scattering out in November: the whales. Some of them heading south, but they start scattering. I presume it's because the feed is either going deeper or migrating or whatever it does. It's hard to keep track of those herring once they start moving out. I mean, they could be here one day and who knows where the next, you know. They just disappear or go deep or whatever. (Floyd Peterson)

Whales, they've increased since I've been a kid on Point Adolphus. It just-- tremendous increase in whales, yeah. (Fagan Skafalstead)

A variety of birds prey upon herring. Salmon fishermen have learned to recognize bird feeding behavior as an indicator of the presence of herring and therefore salmon. Thomas Mills described this behavior in ducks:

Well yeah, and then when we're trolling we also refer to the fish ducks as 'narcs' (laughing) They tell us where the bait's at and then the king salmon are there. (Thomas Mills)

Fagan Skafalstead has observed both bluebills and eagles preying upon herring:

...And we got birds that we never had—we've got, when I was a kid, we used to have a tremendous amount of bluebills ... They fed on herring. They're a bottom—they're a diver duck ... But see, like this year's the first year that I've seen eagles dying from starvation. (Fagan Skafalstead)

Consultants also commented on the herring predation by porpoises and bears:

And in Tenakee, there was a different kind of porpoise that came to Tenakee Inlet than here. .. They were a kind of brownish-purple color and they were a lot larger than the porpoise that are around here. See these around here are black and they got

kind of a white on the tip of their dorsal fins. Yeah. But the ones in Tenakee didn't have—the dorsal fin wasn't as high but they were a bigger porpoise ... Porpoise are devastating to them [herring]. (Charles Jack)

Fagen Skafalstead, a bear hunting guide, many times observed bear eating herring spawn:

Oh yeah. ... Yeah, because the spawn's thick. Yeah, they'll be along the beach eating it . ... Brown and black bear both will do it. But yeah, brown bear will eat there until their heart's content. (Fagan Skafalstead)

## VI. CONCLUSIONS AND RECOMMENDATIONS

This report has synthesized existing archaeological, ethnological, historical and biological records with data from interviews (86 individuals were consulted as part of this project as were 117 unpublished interviews) with herring fishers with significant long-term observations and local and traditional knowledge (LTK). These data show that human harvest of herring dates back almost ten thousand years in Alaska, while modern fisheries management is only decades old. The potential for LTK, in combination with archaeological, historical, and biological data, to contribute to a broader understanding of herring ecology is significant, especially given the shallow time depth and gaps in scientific studies of the species.

We built a historical and spatial database to: 1) identify the extent and qualities of historic and prehistoric herring spawning, massing, and processing sites; 2) link changes in herring spawn extent and intensity to environmental and human factors in the socio-ecological system; and 3) identify sensitive areas for protection and potential restoration of herring spawning. The database is largely descriptive at this point, rather than analytical or explanatory. However, by aggregating, linking, and analyzing the data through GIS mapping, relationships between various factors affecting the quality and quantity of herring populations become evident, highlighting issues for contemporary management and future research.

Although synthesis was the main objective of this project, several hypotheses were promulgated, which can now be evaluated in light of the research results. The first of these is that *Present herring stocks, even in highly productive areas such as Sitka Sound, are essentially being managed in a “depleted status,” representing a fraction of their historical abundance and distribution.* The yardstick for measuring the contemporary status of herring for the majority of our consultants was the period

between the 1920s and the late 1970s, before the herring sac roe fishing era began in earnest but after the herring reduction fisheries had reached their peak (in the late 1920s) and declined (ending in the mid 1960s). There was universal agreement among our consultants that the reduction fisheries overfished herring causing both local and regional impacts on herring stocks. This was also the perception of many local fishermen at the time they witnessed the fishery firsthand. In places like Kootznahoo Inlet, Seymour Canal, and Sitka Sound impacts were felt as early as the 1920s and 1930s, with the Angoon-Killisnoo area being disproportionately affected by the early plant at Killisnoo, which targeted herring locally for an extended period of time during its early operations. By the 1930s, Sitka Sound--by far the most productive herring fishery in the region--was also being impacted to the extent that local organizations, both Native and non-Native, were calling for a prohibition on herring seining there. Such restrictions helped the Sitka Sound population rebound over time. But the largest regional impacts of the reduction fishery took place between 1920 and 1960 when fishing increasingly targeted toward more remote areas of Southeast Alaska, such as Chatham Strait, Frederick Sound, Southern Baranof Island (especially Larch Bay), and other areas less visible to local communities. The cumulative impacts of these removals became increasingly apparent to fishermen plying these waters, who had been used to seeing herring "as far as the eye could see," and hearing their roiling surfacing activities which sounded "like rain " and "wind." The cautionary reports of biologists such as Rounsefell were largely ignored, even though herring conservation issues were raised in the U.S. Congress as early as 1939, when a fisheries manager proclaimed that herring fishing for commercial use in the Alaska district had been "in the past too extensive" (Alaskan Fisheries Hearings 1939:646). By the time statehood was achieved in 1959 and a modern fisheries management regime was put in place in the 1960s, herring appear to have already been depleted in many areas, though just how much is difficult to quantify.

Since 1980 ADFG models have suggested a herring biomass of between 44,776 (1994) and 167,683 (2008) metric tons, with a general increasing trend since 1995 (Hebert and Dressel 2009). But up to half of this biomass is concentrated in Sitka where there is an intensive sac roe fishery concentrated on the spawning grounds. It seems clear, based on the LTK observations and historical survey data, that spawning and biomass were in the past much more dispersed, and that the total biomass—based on the large masses of herring in central and southern Southeast Alaska (especially at Larch Bay and Whale Bay) seen up until the mid twentieth century--was as much as an order of magnitude larger than it has been since 1980. A more precise estimate of the historical biomass by decade may be possible through additional modeling.

These LTK observations, combined with fisheries records seem to support our second, related hypothesis that *significant long-term impacts to Southeast herring stocks distribution and abundance have been anthropogenic (a result of human activity), in particular over-exploitation of the species by commercial herring fisheries in the last century (e.g., for herring reduction plants), but also disturbance, contamination, and degradation of critical spawning habitats.* The localized impacts of the commercial reduction fisheries are clearly documented and widely acknowledged in both the written and LTK records. However the long-term impacts of commercial fishing versus other factors affecting Southeast herring populations are debated. Many but not all of our experienced consultants believe that the commercial herring reduction fisheries had the most profound impacts on herring stocks. However they also acknowledge the role of other fisheries, including the bait and sac-roe fisheries, in local declines. No one cited the subsistence roe on branches or roe on kelp fisheries as a factor in herring declines because these fisheries capture only the deposited eggs and do not kill the fish. Commercial roe on kelp fisheries had proven damaging, though, especially in places like Sitka Sound and Klawock. Bait fisheries were criticized for being poorly

managed, especially in the 1960s and 1970s, but their impacts were generally localized with short or medium-term effects, in contrast to the reduction fishery. The same can be said for the sac-roe fisheries, though the cumulative impacts and closures of these fisheries at places like Kah Shakes Cove and Auke Bay, have led some consultants to fear that a regional collapse of herring stocks is imminent if not already underway.

But a number of factors besides fishing are recognized as having caused disturbance, including contamination, degradation, and other changes in critical herring habitat. In Sitka and Ketchikan, the deleterious pollution effects of the industrial pulp mills, which operated for more than four decades at Silver Bay and Ward Cove, are widely believed to have caused major damage to spawning and rearing habitat in these waters. Shoreline development at places like Auke Bay and Ketchikan is also believed to have had an effect on reducing quality habitat for spawning in particular through both noise and water pollution. The installation of salmon hatcheries near rearing habitat for larval and juvenile herring, such as at Silver Bay and Deep Inlet, is cited by some consultants as having introduced a new source of predation on vulnerable herring. At the same time, the decline of fish processing facilities and a tightening of regulations on fish waste seem to have caused herring schools to migrate away from these sites or frequent them in small numbers, presumably because they no longer provide significant feed. Most significant to our LTK consultants, however, was the decline of spawning populations in many areas over the past 70 years. If the total miles of historical herring spawning habitat documented through our LTK interviews (Map 3) is subtracted from the miles of spawning habitat documented in recent years by Fish and Game, the loss of herring spawning populations appears to be highly significant, and would seem to be an important topic for further research.

Beyond overfishing and other anthropogenic impacts, the most important non-human impact on herring seems to be the recovery of marine mammal populations,

especially humpback whales. Commercial whaling records reveal that the historical population of humpbacks in Southeast Alaska was perhaps as much as 50 to 100 times higher in the era prior to commercial whaling (circa 1840-1923). Since the end of commercial whaling, the population has slowly recovered, especially since 1980.

Climate change is yet another factor affecting the health and abundance of fish stocks as well as such patterns, such as timing and perhaps even location of spawning. However, while its impacts on salmon have been documented, it is not clear what short or long-term effects climate changes and climate cycles, such as El Nino, have had on Southeast Alaska herring populations. This, too, is an area for further study.

A third hypothesis we put forth is that *Human dependence on herring as a food resource evolved through interactions with key spawning areas with abundant substrates for egg deposition (such as macrocystis kelp, rockweed, and eelgrass), with which many aboriginal settlements are associated, and was later enhanced through the development of engineered marinescapes (e.g., placement of hemlock boughs in intertidal areas), techniques for conserving herring stocks by regulating human harvests and disturbances to critical spawning habitat, and by the development of new technologies (such as the herring rake) for capturing whole herring in quantity.* The archaeological data synthesized for this project confirms the importance of herring in the prehistoric era, particularly in the last 4500 years where herring remains appear consistently in sites employing a fine enough screen mesh. Unfortunately, screen mesh too large to capture herring remains has often been used in excavations, and thus the archaeological record on herring presence is inconsistent. LTK observations of how humans came to depend on herring, in times of seasonal (late fall to early spring) and cataclysmic (e.g., the year of “two winters”) deprivation, as well as the myriad techniques used to cultivate herring by manipulating spawning habitat through the placement of substrate (mainly hemlock branches) to the transplanting of herring to more favorable

hatching areas speaks to the fact that major Tlingit populations have co-evolved with herring. Correlatively, because so many of the food animals (salmon, halibut, marine mammals, etc.) that Southeast Natives traditionally have consumed are reliant on herring, Natives necessarily have had to adapt themselves to the abundance and distribution of herring stocks.

A final thesis we put forth is that the *maintenance of diverse herring spawning locations in Southeast Alaska is critical to conserving intra-specific biodiversity*. The scientific literature and our LTK interviewees agree that herring stocks are dependent on quality spawning and rearing habitat and, when not stressed, herring will maintain a significant degree of fidelity to their spawning grounds. However, just how much fidelity is still largely a matter of speculation, despite some research on this topic in British Columbia (Flostrand, et al 2009). Local herring populations in Southeast Alaska do mix together over the course of their life cycles, and recruitment of non-local herring from a regional “meta population” seems to be a key characteristic of the species. Indeed, this feature may be adaptive in allowing depleted localized herring populations to rebuild more quickly than if they were isolated, making them more resilient and less vulnerable to environmental impacts, such as overfishing or habitat destruction.

While LTK recognizes the mixing of herring stocks, it tends to emphasize the distinctive life histories and diversity of particular herring populations in connection with the diverse spawning habitats with which knowledge bearers are intimately familiar. For subsistence harvesters especially, knowledge of local herring behavior at spawning time is critical, and differences in spawning characteristics are recognized and reflected in local cultural practices, such as the “quieting” of spawning areas around Fish Egg Island near Craig and Klawock, which is not commonly found in Sitka Sound.

The selective removal of mature fish and especially female herring by the sac roe fisheries may effect entrainment to younger herring to traditional spawning habitats.

This process thus may be playing a role in the poor returns and local depletions of herring spawners to numerous areas in Southeast Alaska which have been opened to commercial herring fishing. Similar local depletions have been recorded in British Columbia in hundreds of locations in the Georgia Strait and beyond. Treating spawning populations as discrete stocks can exacerbate conservation problems, as can overfishing. As Gillis and Ellis (1994:172-173) point out in their analysis of the “The Georgia Strait Herring ‘Stock’ Problem, Inclusive of the First Nations’ TEK (Traditional Ecological Knowledge) Perspective,”

The notion of a herring ‘stock’ is imprecise. It is more an assessment tool than an obvious categorization. To hold that Georgia Strait herring are a discrete stock does not account for the numerous sub-divisions such as by migratory behavior, local-spawning subsets, temporal and spatial differences in spawning and others ...

Significantly, Schweigert and Linekin (1990) noted that herring have ceased to spawn or spawn with much reduced frequency and intensity at about 170 locations in Georgia Strait since 1981 ... [perhaps] due to overfishing of non-migratory stocks by the sport bait fishery ... We submit that Georgia Strait may also be sub-grouped by the year-class compositions of migratory spawning populations, which may display heritable or learned traits relating to the precise area and timing of spawning. Although it is acknowledged that herring will opportunistically spawn in environmentally favourable locations, there may also be discrete spatial and temporal age-class separations that correlate with exploitation of diverse habitat and substrate, predator avoidance, the timing of hatching with the onset of plankton blooms, or other factors.

The authors go on to suggest that managing the roe herring fisheries on the basis of a twenty percent harvest model may be contributing to the loss of local spawning areas and intra-specific biodiversity, and disproportionately discriminating against Native

people who rely on the diversity of local stocks for their herring eggs and salmon livelihoods. Sitka Tribe similarly argues that the commercial harvests levels of herring should not be set without knowing what impact the fishery has on subsistence opportunities before subsistence harvests occur each year.

All of the above hypotheses concerning the spatial characteristics of herring stocks and the effects of the fisheries upon them would benefit from further refinement and study based on the results of this synthesis. We are encouraged to see proposed studies along these lines in the recently released “A Program for Improving Management and Research of Fisheries in the Southeast Region—Herring” (Hebert 2010), though they do not include a social scientific or Local and Traditional Knowledge component, which we think is critical to a broad, long-term program of study to understand the historical ecology and dynamics of the herring fisheries. We note with concern that, while the Canadian government is expanding partnerships with Haida Gwaii Haanas and other First Nations in order to improve marine spatial planning and ecosystem management (Jones, et al. 2010), the Alaska government recently (May, 2009) chose to unilaterally terminate its 2002 Memorandum of Agreement with the Sitka Tribe seemingly in order to reassert its exclusive managerial authority over the herring fisheries.

We make the following recommendations to further our understanding of long-term historical and cultural ecology of Southeast Alaska herring, and apply best practices for managing and evaluating herring sites and rebuilding threatened or depleted herring schools and spawning areas.

#### Archaeology

- Forest Service archaeologists and contractors as well as other archaeologists working in the region do a better job documenting all manner of excavations by explicitly describing areas excavated, volumes excavated, recovery, identification,

and analytical techniques used. This will ensure that important herring sites are not missed.

- all archaeologists working in Southeast Alaska employ 1/8 inch (or finer) mesh screens and/or recover bulk samples to facilitate sampling of herring and other small-bodied fish.
- special efforts be directed to sampling sites for herring in the vicinity of localities where herring were historically abundant, including Sitka, Craig, and Auke Bay (near Juneau).
- further work be conducted at Garnes Point to see if the dominance of herring found by Moss (1989a) is characteristic of other areas of the site. An initial step might be locating materials excavated by the State of Alaska in 1987 and examining these samples for the presence of herring.
- special efforts should also be directed to testing sites within the territories of the Huna, Klukwan, Yakutat, Auk, and Taku kwáans, where very few sites have been investigated.
- additional work is required for sites dating from all time periods, but sites older than 4500 cal BP and more recent than 500 cal BP are particularly poorly represented. Investigators studying sites dating to these time periods should be vigilant about using data recovery techniques that will insure adequate sampling of herring.

#### LTK, Research and Management Recommendations

- LTK should be documented for the remaining communities not included in this study, including Yakutat, Haines/Klukwan, Hydaburg, Wrangell, and Metlakatla. These communities have unique, if not exceptional features. For example, the Tsimshian community of Metlakatla has a herring fishery that is independently

managed by the tribe due to their sovereign status as a reservation; at times they compete with Alaska managed fishers for the same herring schools. Yakutat, significantly, has seen a noticeable resurgence in herring spawning in Yakutat Bay in recent years for the first time since the herring seiners from the reduction plant fleet fished it heavily nearly a half century ago. Wrangell was another major spawning area that has been depressed in recent years. There is also limited herring spawn in the Haines area. And Hydaburg is said to have been the recipient of a major herring transplantation, successfully carried out by local Haidas and Tlingits.

- Critical parts of the herring life cycle, including larval, juvenile, and adult recruitment stages should be the subject of further investigation. LTK is not as well developed in these areas, because herring are often out of human sight and pathways during these phases of development, in contrast to spawning, which is comparatively well-observed. Similarly, scientific studies of local conditions of herring development would reveal the unity and diversity of conditions under which herring thrive or do not thrive. Also in need of further study are the roles of key “development” variables, such as pollution (e.g., in Silver Bay and Auke Bay) and hatcheries (e.g., in Deep Inlet), on herring populations in key historical habitats, particularly in the larval and spawning stages of the life cycle.
- Efforts should be made to develop herring restoration plans based on historical herring spawning areas and transplantation and spawning enhancement techniques documented in this study. Although herring transplantation has been tested in limited scientific studies, apparently with little success (Hay and Marliave 1988; Ware and Tovey 2004), these tests have not been based on LTK and techniques, which the oral historical record suggests were successful. Perhaps restoration plans could be carried out in conjunction with local Alaska

Native tribes, whose members are the best repositories of local knowledge about herring habitat and enhancement techniques. This should not be a substitute for conservative management of remaining herring populations, but could enhance depressed or defunct runs of herring. However, such a program would have to be launched at an appropriate regional—perhaps even international—scale (other techniques for herring enhancements are being piloted in Japan) and with corresponding commitments to long-term monitoring, so effectiveness could be evaluated over time and under different ecological conditions. As a starting point, we recommend that a herring restoration plan be developed and piloted using key historical spawning sites identified and mapped for this study that are considered by consultants to have declined in productivity. Potentially, all the historical spawning sites we have mapped could be included in the plan as herring restoration sites. However, effort should be prioritized based on: 1) the current quality (water and substrate quality, etc.) and productivity trends (stable or increasing presence of spawning herring) of the site's habitat; 2) suitability of the site for monitoring by management agencies and communities; 3) competing uses of the site (such as commercial fishing, recreation, or aquaculture); and 4) hypothesized relationships between the proposed restoration sites and other active and historical herring spawning populations and spawning grounds. Given the dynamics of the region's herring population, a networked approach to restoring key historical spawning sites within one or two sub-regions, such as the greater Sitka Sound/Salisbury Sound area, would likely be more constructive than isolating efforts on a single site, or a few widely dispersed sites. Such restoration efforts would serve to enhance diverse spawning locations and improve herring biodiversity, resilience, and adaptive potential. By concentrating

efforts on restoring key historical spawning areas, greater conservation and enhancement of herring stocks can be achieved.

- Increased monitoring of particular herring spawning areas should be carried out to reveal how climate and other environmental changes are affecting local herring populations. Some monitoring is already being conducted formally and informally by tribes and other associations, such as STA, and individual fishers. But this could be augmented and coordinated with other long-term monitoring efforts beyond the aerial and deposition surveys carried out by Fish and Game. Sites of increasing herring productivity (such as around Yakutat and perhaps Hoonah) and decreasing productivity (such as Kah Shakes Cove, Auke Bay, and areas of Sitka Sound). Similarly otolith and DNA studies could be carried out to further explore genetic and biological relationships between different local populations of herring. In addition, impacts, such as noise pollution and contamination from development, could be monitored vis-à-vis key indicators of local herring population health and LTK observations over time as documented in this study. With respect to climate change, it has been hypothesized (Planque, et al. 2010) that the demographic effects of targeted fishing (e.g., removal of mature spawners) may have “substantial consequences on the capacity of populations to buffer climate variability through various pathways (direct demographic effects, effects on migration, parental effects).” Similarly, “selection of population sub-units within meta-populations may also lead to a reduction in the capacity of populations to withstand climate variability and change” How current herring fishing patterns might play out in relation to realized and anticipated climate change patterns would be greatly enhanced if the historical fishing and observational data presented in this report could be more closely

correlated with historical patterns of climate variability and herring abundance and spatio-temporal variability within Southeast Alaska.

- Further studies correlating the presence or absence of herring in connection with critical environmental variables such as ecozone, eelgrass and kelp habitat, and sea surface temperature should be carried out to augment the data synthesized here, using GIS as a tool. Although we consulted maps of eelgrass beds and kelp forests, most are not detailed or historical enough to correlate with spawning trends. Historical mapping of kelp and eelgrass beds, based on documentary records and LTK, would be beneficial in further assessing environmental changes in these habitats and their potential effects on the productivity local schools of spawning herring. Recent efforts by NOAA, the Nature Conservancy, Fish and Game and other partners to map Southeast Alaskan shorelines and estuaries could yield important new data to correlate with the presence or absence of herring schools in these areas (Laura Baker, pers. comm. 3 August, 2009, see [http://akr-mapping.fakr.noaa.gov/sz\\_demo3/](http://akr-mapping.fakr.noaa.gov/sz_demo3/)). It is important to monitor trends in the quality of herring habitats at meaningful scales, particularly those areas defined by the LTK presented in this study. Some areas, such as parts of Port Frederick near Hoonah and Silver Bay near Sitka, seem to be improving following the decline of contaminants and sediments introduced by industrial logging and pulp production, while other areas, such as Auke Bay, remain have not recovered despite the cessation of commercial herring fishing for decades. But there are other factors that may effect spawning habitats and substrates, such as rising sea temperatures due to global warming, pollution, invasive species, reduced light (due to sediment) and diseases. All these factors have the potential to cause significant deterioration of kelp and eelgrass patches, (AKNHP 2005)

- Subsistence fishers concerns should be more carefully considered in the research and management processes. Alaska’s management system is ostensibly participatory, but tends to be heavily weighted toward the concerns of contemporary commercial interests rather than the full spectrum of participants. This leads to an overemphasis on maximum yield for certain fisheries, like sac roe, at the potential expense of the subsistence fisheries, such as roe on branches, and “ecosystem services” for other constituents of the marine environment. Our interviews in Sitka demonstrated strong feelings of concern and even distrust of and disenfranchisement from herring fisheries management. Members of the Sitka Tlingit tribe in particular seem to feel that their management concerns were not being listened to and that the fishery was not being managed in the best interest of subsistence users or the marine ecosystem in general. But they were not alone. Other constituencies, such as the Herring Coalition, headquartered in Ketchikan, were made up primarily of non-Native trollers and recreational fishers. This broad, strong citizen interest in the status and science of herring is a great asset to the governance of critical resources to marine ecosystems. But only if managers listen.
- Participatory research methods should be employed to decide, in conjunction with fishers, what further research needs to be carried out. Issues such as the impact of test fisheries, appropriate spatial scales for applying biomass models and harvest quotas, and the timing of sac roe harvests to minimize impacts on spawning are topics all ripe for investigation based on LTK observations and concerns documented in this study.

The website and outreach program for this project includes an executive summary of this report as well as highlights of selected findings. We hope this will allow interested parties to: improve communication; make better use of existing information

to improve sustainability of the herring fisheries; develop appropriate co-management arrangements catalyzed by participatory research; and improve knowledge and understanding of issues of common concern.

Stocks of small pelagic fish species, such as herring, have supported industrial-scale fisheries for more than 100 years in the Pacific and more than 600 years in the Atlantic. In the process they have suffered from severe overfishing as well as habitat stress. Atlantic herring have shown signs of both depletion and recovery in the recent past. For example, North Sea Atlantic herring populations were successfully rebuilt by the 1990s after being completely closed in the late 1970s due to overfishing. As a critical prey species in a complex marine food web, herring are both resilient and adaptive, and thus have avoided extirpation. Herring populations have shown the ability to recover and repopulate areas where they have been overfished or temporarily abandoned due to habitat stress. But it is important to get the management right at the ecosystem level, not just the commercial exploitation level, because herring are a key foundation species for the North Pacific food web, and rebuilding depleted stocks is difficult with or without LTK. In addition to putting in place a set of short, medium, and long-term ecosystem goals to encompass herring management, it is important to communicate effectively and bring local leaders together who are willing to consider the full spectrum of views and uses of herring and manage the species appropriately to meet critical marine ecosystem conservation goals. Local and Traditional Knowledge bearers are critical contributors to this mission, as well as key sources of data, often possessing the earliest and widest range of knowledge available for particular herring schools and habitats. Their knowledge should not be dismissed simply because it is not compatible with current management models. Our hope is that this synthesis will facilitate exchange among fisheries scientists, managers, and local experts and provide a path forward for improving the

collective knowledge, management, and status of herring populations, such that herring will again be celebrated for their abundance throughout the region.

### Outreach

A laminated poster summarizing our results has been created, a PDF copy of which is available at our project website: <http://herringsynthesis.research.pdx.edu/>. The outreach website also contains copy of the final report, photos, and other relevant information about herring, as well as a blogspot to post comments.

### Publications

We have presented our results at: a special session of the Alaska Legislature's Fisheries Committee, February 2009, Juneau; a special panel on herring at Sharing our Knowledge: A Conference of Tlingit Tribes and Clans, March 2009, Juneau; the University of Kent, Department of Anthropology, March 2009; the University of Oxford, School of Geography and Environment, May 2009; the Sitka Tribe of Alaska, April 2010; and the Society for Ethnobiology Conference, May 2010, Victoria, B.C. We also have further analyzed our results in several academic journal articles currently under review for publication.

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## APPENDIX A

### List of Participants

Consultant	Age (years)/DOB (b.)	Interview Date	Community
Aceveda, Paul	b. 1952	June 2008	Kake
Baines, Mike	b. 1961	March 2008	Sitka
Bean, Victor		June 2008	Hoonah
Brown, Wesley	b. 8.21.1931	June 2008	Kake
Brown, Wilbur	b. 11.26.1936	June 2008	Kake
Carson, Lawrence 'Snapper'	66 years	March 2008	Ketchikan
Carteeti, Elmer	b. 6.20.1947	June 2008	Hoonah/Craig
Charles, Sr., Marvin		March 2008	Ketchikan
Chilton, Doug		March 2008	Juneau
Cosgrove, Burt		June 2008	Craig
Culp, Wanda		June 2008	Hoonah
Dalton, Jr., George		June 2008	Juneau/Hoonah
Dauenhauer, Nora		April 2009	Juneau
Davis, George		September 2008	Kake/Juneau
Diamond, Dennis	45 years	March 2008	Ketchikan
Dick, Harold		June 2008	Hoonah
Didrickson, Donald 'Duck'		March 2008	Sitka
Eide, Richard (Dick)		September 2008	Petersburg
Frietag, Gary		October 2008	Ketchikan
George, Gabe		June 2008	Angoon/Juneau
Gossman, Lloyd		March 2008	Ketchikan
Greenwald, Gordon		June 2008	Hoonah
Greenwald, Karl	80 years	June 2008	Hoonah
Guthrie, Ralph		September 2008	Petersburg/Sitka
Hawkins, Merle		October 2008	Ketchikan
Hope, Fred		March 2008	Sitka
Hopkins, Fred	b. 5.15.1942	March 2009	Juneau
Howard, Sr., Raymond	b. 12.25.1940	June 2008	Hoonah
Jack, Jr., Charles		June 2008	Hoonah
Jackson, Clarence		March 2008	Kake
Jackson, Mike		June 2008	Kake
James, Sr., Franklin		March 2008	Ketchikan
James, Owen		June 2008	Petersburg/Kake/Hoonah
Jordan, Eric	b. 9.3.1949	March 2009	Wrangell
John, Walter	b. 1939	September 2008	Juneau
Kadake, Marvin	b. 3.25.1933	June 2008	Kake
Kiffer, Ken	68 years	March 2008	Ketchikan
Kennedy, Arthur		June 2008	Craig
Kirkman, Robert (Bob)		September 2008	Sitka
Kitka, Harvey	66 years	March 2008	Sitka
Kitka, Herman	b. 1914	September 2008/April 2009	Sitka
Copeland, Tom	65 years	March 2008	Ketchikan
Kushnick, Matilda		March 2008	Craig/Klawock/Ketchikan
Lawson, Nels		March 2008	Sitka
Leon, Hap		April 2009	Metlakatla
Littlefield, John		March 2008/April 2008	Sitka

Consultant	Age (years)/DOB (b.)	Interview Date	Community
Littlefield, Roby		March 2008	Sitka
Martin, Al		March 2008	Juneau
Martin, Caroline		March 2008	Juneau
Martin, Harold		March/September 2008	Hoonah/Kake
Martin, John	72 years	March 2008	Juneau
McKinley, Al		March 2008	Hoonah/Juneau
McKinley, Myrna		March 2008	Hoonah/Juneau
Miller, Mike	b. 5.28.1966	March 2008	Sitka
Mills, Thomas	63 years	June 2008	Hoonah
Murphy, Sonner		March 2008	Ketchikan
Nielsen, James (John)	b. 6. 20.1929	March 2008	Sitka
Nielsen, Phil Charles	b. 9.7.1956	March 2008	Sitka
Otness, Nels		September 2008	Petersburg
Peratrovich, Clara G.		June 2008	Klawock
Peratrovich, Jr., Alva		June 2008	Klawock
Perez, Juanita		April 2009	Ketchikan
Perez, Sr., Martin	b. 1.10.1918	April 2009	Ketchikan
Peters, Franklin		March 2008	Sitka
Peters, Floyd	65 years	June 2008	Hoonah
Quinto, Marcello		March 2008	Juneau
Rauwolf, Andy		March 2008	Ketchikan
Schoeppe, Karl		March 2008	Juneau
Skafalstead, Fagan	68 years	June 2008	Hoonah
Skeek, Leonard		June 2008	Petersburg
Skinna, Byron		June 2008	Klawock
Skultka, Charlie	b. 1944	April 2009	Ketchikan/Hydaburg
Soboleff, Walter	b. 1908	March 2008	Angoon/Juneau
Stokes, Dick		September 2008	Wrangell
Trimmer, Jeff	b. 1974	June 2008	Craig
Walker, Scott		October 2008	Ketchikan
White, Frank		June 2008	Hoonah
White, Jacob		June 2008	Sitka
White, Lilly		June 2008	Hoonah
Wilson, Al		March 2008	Juneau/Sitka
Wilson, Jr., Calvin	b. 1963	June 2008	Kake
Winter, Dustin		June 2008	Metlakatla
Consultant #13		June 2008	Klawock
Consultant #23	b. 6.21.1946	September 2008	Petersburg
Consultant #25	b. 6.11.1926	March 2008	Sitka
Consultant #37		October 2008	Ketchikan

## APPENDIX B

### Consent Form

**HERRING SYNTHESIS  
CONSENT FORM - ADULTS**

July 2007

Dear Participant,

You are invited to participate in a study funded by the North Pacific Research Board, entitled "*Herring Synthesis: Documenting and Modeling Herring Spawning Areas within Socio-Ecological Systems over Time in the Southeastern Gulf of Alaska.*" The project involves researchers from Portland State University (Dr. Thomas F. Thornton, Department of Anthropology, Principal Investigator) in collaboration with selected Southeast Native tribes.

The aim of the 2-year study is to synthesize information on herring ecology in Southeast Alaska, where herring and herring roe traditionally have been harvested in quantity. Using historical and biological records, interviews, and community focus groups, we will: 1) identify and map the extent of historic and prehistoric herring spawning and massing areas; 2) link changes in herring spawn to environmental and human factors; and 3) identify sensitive areas for protection and potential restoration of herring stocks and spawning.

The results of this study will be used to improve our understanding of the historical ecology and management of the herring fisheries of the North Pacific. The results will be shared with participating local communities, fisheries management agencies, and in publications. If you participate in an interview, you may be compensated for your time at \$20 per session. Individual and/or group interviews will be conducted at a place where individuals feel comfortable.

Your signature indicates that you have read and understand this form and agree to take part in this study. Please understand that by signing, you are not waiving any legal claims, rights or remedies. In addition:

1. The researcher will not record any information you do not want recorded. You may also restrict access to your recordings. If you agree to be audio-or video-tape recorded or photographed, copies of the original photographs, recordings and transcripts will be held by researchers at Portland State University at least three years. We will keep your interview confidential if you wish. We protect your confidentiality by coding the interview materials with pseudonyms such that your identity is not directly linked to your words in transcripts or publications. You may also request to read and edit transcripts before they are finalized.
2. The researcher(s) may use the information collected from this interview to produce academic articles and/or books. In cases of doubt, the researchers will try to check interpretations and conclusions with you, but will acknowledge their responsibility for any errors.
3. You understand that participation is voluntary. You may either refuse to participate or withdraw from the study at any time without penalty or loss of benefits to which you are otherwise entitled.
4. You understand that your information may be used in future publications.
5. You understand that you will be given a copy of this Informed Consent Form.

If you have concerns or questions about your participation in this study or your rights as a research subject, please contact the Human Subjects Research Review Committee, Office of Research and Sponsored Projects, 111 Cramer Hall, Portland State University, (503) 725-4288 / 1-877-480-4400. If you have questions about the study itself, contact Thomas F. Thornton (Principal Investigator) at Portland State University (see below). Thomas F. Thornton, Associate Professor, Department of Anthropology, Portland State University, PO Box 751, Portland, OR 97207-0751 USA, (503) 725-3316, email: [tthornto@pdx.edu](mailto:tthornto@pdx.edu)

\_\_\_\_\_ Date \_\_\_\_\_  
Participant signature

Please indicate consent by initialing each statement below.

I agree to participate in this study by \_\_\_\_\_ being interviewed.  
\_\_\_\_\_ being audio- or video-tape recorded.  
\_\_\_\_\_ being photographed.

Please circle the appropriate answer.

I would / would not like to be identified by name in publications.

I would like the materials to be deposited at \_\_\_\_\_ (indicate where).

State conditions under which material related to your interview could or could not be released:

\*\*\*\*\*

As researcher, I agree to abide by your wishes as outlined on this form.

\_\_\_\_\_ Date \_\_\_\_\_

## APPENDIX C

### Interview Schedule

### Sample Questions for Subjects

Open-ended, semi-formal interviews will be conducted, but as is usual with anthropological research, the anthropologists involved know that these questions are only the starting point in the process of gathering information. Anthropologists are trained to be flexible to adapt their interviews to different interviewees, acknowledging that different life experiences and age will influence interviews to go into new and exciting directions. The interviews will be based upon the following questions:

- How have you been involved in the herring fishery during your lifetime?
- Show on the chart where you have observed herring spawning and massing around your community (or in the areas you've fished commercially)? Which of these areas are you most familiar with and how (through fisheries, etc.)? When (what months) do you usually observe them?
- How many herring stocks frequent these areas? On what basis do you differentiate these stocks?
- For what purposes were they fished (eggs, oil, bait, sac roe, etc.)?
- What trends or changes have you seen in the herring stocks that mass or spawn in this area (by decade)? Tell me about changes in mass/spawn, timing (how long, etc.), extent (length of spawned beaches), and intensity (thickness or width of spawn)? What factors do you believe have contributed to these changes/trends?
- [For Natives] Are their customary and traditional beliefs or practices associated with maintaining herring stocks and spawning areas? Explain.
- Are there places you think are important for juvenile herring? Which places and why?
- Where do juvenile herring (age 0-2 years, about 4 inches long) usually winter? How do they travel from season to season?
- What predators have you observed in concentrations feeding on massing and spawning herring?
- What other species of fish have you commonly observed in conjunction with herring?
- Where and when have you seen schools of adult herring? At each locale were they nearshore, offshore, surface or deep? How do you identify them?
- Have you ever noticed signs of disease in herring populations? When and where?

## APPENDIX D

### Can Tribal Co-Management of Sitka's Commercial Herring Fishery Protect a Community's Traditional Herring Fishery?

Robi Craig, Sitka Tribe of Alaska

## Can Tribal Co-Management of Sitka's Commercial Herring Fishery Protect a Community's Traditional Herring Fishery?

### ABSTRACT

*In Sitka, Alaska a large annual commercial herring sac roe fishery is immediately followed by the region's large traditional herring egg harvest fishery. The commercial fishery employs purse seine nets and power skiffs to harvest thousands of tons of herring each year. As for the traditional fishery, small open skiffs have replaced wooden tribal canoes but other than that the annual harvest of herring eggs remains largely unchanged for the indigenous people of Southeast Alaska.*

*Responsible for the resources within a large traditional territory, the Sitka Tribe of Alaska and its citizens has documented a ten-year struggle to attain a co-management role in the annual Sitka Sound sac roe herring fishery. What is the outcome when, practicing collaborative management, the Tribe documents its third subsistence harvest failure in nine years? Official correspondence, meeting minutes, newspaper and radio stories, testimony to and discussion by the Board of Fish, personal affidavits and even the development of an annual post-season subsistence harvest survey are employed as one coastal Alaskan tribal community gambles on the ability of collaborative fishery management to sustain its annual subsistence herring egg harvest.*

*Tribal elders and harvesters have spent more than a decade purposefully working to protect their traditional herring egg harvest from, and document impact by, the large Sitka Sound annual sac roe fishery. Possessing an oral history which documents an intergenerational memory of herring abundance not only in Sitka but throughout the region of Southeast Alaska, Sitka Tribal citizens and their federally recognized tribal government has spent more than a decade researching past and current impact on the traditional herring egg harvest by commercial harvest activities. Tribal harvesters, elected tribal council members and tribal staff have worked with the Alaska Department of Fish and Game and the Alaska Board of Fish to develop methods to provide for a reasonable opportunity for tribal harvesters whose herring fishery takes place after the execution of the commercial sac roe fishery.*

### SITKA, ALASKA

The community of Sitka is located on Baranof Island in the Alexander Archipelago, in a region of the large State of Alaska commonly referred to simply as "Southeast." Sitka lies at the heart of the largest temperate rain forest in the world, the Tongass National Forest. Access to Sitka is by air or water only and there are no roads connecting Sitka to other villages or communities. Sitka is 95 air miles southwest of Juneau (Alaska's capitol) and 185 miles northwest of Ketchikan. The City and Borough of Sitka operates five small boat harbors and a seaplane base and our State owned airport provides daily jet service and several scheduled air taxis, air charters and helicopter services are available. The borough encompasses 2,874 square miles of land and 1,937.5 square miles of water. Summer



temperatures range from 48 to 61 and winter temperatures range from about 23 to 35 degrees. Average annual precipitation is 96 inches (including 39 inches of snow).

With a population of approximately 8,600 residents, Sitka is the fifth largest City in the state of Alaska. As a federally recognized tribal government, the Sitka Tribe is charged with the responsibility for the health, safety, welfare and cultural preservation of its citizens. The Sitka Tribe has a tribal enrollment of approximately 4,020 citizens, though not all of the individuals enrolled with the Tribe currently live in Sitka. Tlingit ancestors named the 3200 foot dormant volcano that rises up from Kruzof Island L'úx. In the Tlingit language that geographic place name means "to blink" - like sparks from a fire, though scientists suggest that the volcano last erupted approximately 10,000 years before present. Similarly, ancient geographic place names and traditional stories document the importance of herring and herring eggs to the Tlingit people; the annual harvest of herring eggs is a tradition that dates back to time immemorial for the indigenous Tlingit and Haida people of Southeast Alaska.

The Sitka herring egg exchange is a long standing cultural tradition with herring eggs being traded with residents of the Yukon Territory (Schroeder and Kookesh 1990). Tribal harvesters gather herring eggs on kelp, seaweed and hemlock branches with the majority of the harvest coming from hemlock branches. Using the hemlock boughs as strata for the herring eggs to adhere to, harvesters depend on protected waters in areas where the bottom is not sandy. Once the spawning herring have deposited sufficient eggs on the hemlock trees, harvesters retrieve these trees and their precious bounty of herring eggs which are taken back to Sitka to be shared, traded and bartered widely throughout the community, Southeast, the State of Alaska and even outside of Alaska. Because of the difficulty of traveling long distances in small open boats filled with first trees and then heavy loads of herring deposited on the trees, tribal harvesters rely on the continued productivity in the protected waters of Sitka Sound.

### **HERRING REDUCTION: 1882-1966**

In addition to being a cultural staple to the tribal people of Southeast Alaska, herring and herring eggs have long been a target of commercial fishing in Alaska. Through time, the region of Southeast Alaska has supported large and small commercial fisheries resulting in documented local depletion and discontinuation of spawning activity in numerous locations throughout the region. Herring "reduction," the earliest commercial herring fishery in the region, was inarguably the least regulated and most destructive. The reduction plants processed hundreds of thousands of pounds of herring into oil and meal during this era. The earliest herring reduction factory in Southeast Alaska was opened in 1882 using an old whaling station located at Killisno on Admiralty Island (Huizer 1952). The last reduction plant closed in 1966. Subsequent and existing commercial herring harvests occur in Southeast Alaska for bait, spawn on kelp, and sac roe.

In time, reduction factories operated in three regions of the State of Alaska, Prince William Sound, Kodiak and Southeast Alaska. However, it was not until 1925 that these factories began recording the quantity of fish being processed into meal or oil at these factories (Reid 1971). Reconstruction of the reduction factories catch and production records illustrate that between 1929-1956 approximately 812,290 tons of herring were harvested from Southeast Alaska (Skud, Sakuda and Reid 1960). While at least thirty-seven fishing districts were established in the Southeast region, the majority of the fishing occurred in only a few of these districts. Reid (1971) noted: "As an example - between 1939 and 1966, more than 40% of the landings in Southeast Alaska came from the vicinity of southwest Baranof Island (2)." Specifically, Huizer suggests "[t]he Cape Ommaney population long had been the mainstay of the Southeastern District, contributing 80% of the total catch for the [Southeast] district for the 12 year period from 1927 to 1938 (71)."

Tagging surveys designed to document the migration activities of Southeast herring occurred in the 1930's. For the study, internal metal tags were implanted into herring during the spring at locations that included both Sitka and Craig, Alaska; electromagnets at reduction factories were used to recover the tags. Analysis of the 4,883 recovered tags show limited co-mingling between the Sitka or "Cape" and Craig or "Non-Cape" area herring while illustrating that the majority of the herring processed at the herring reduction factories were taken from the summer feeding grounds located at the southern tip of Baranof Island which were Sitka spring spawners (Skud 1963).

Subsequent studies support this "Cape" and "non-Cape" area distinction. In the 1960's radioactive body cavity tags were implanted into 7,000 herring. Tags recovered at the summer fisheries at Larch Bay at the southern tip of Baranof Island and off the southern tip of Admiralty Island in Chatham Strait had been implanted on the spawning grounds at Craig and Sitka (Carlson 1977). The reason for the 1960's tagging research was "the contention of salmon trollers that local herring populations have been seriously depleted by the commercial reduction [herring] fishery" with the other two research directives being changes in the fishing areas and developments in the North Pacific Treaty regarding herring (Skud 1963:19).

The concern voiced by salmon trollers is captured in this "official protest" lodged by the Sitka Chamber of Commerce in 1954:

The Sitka Chamber of Commerce is hereby lodging an official protest against the commercial herring fishing in this area for reduction purposes.

We join our voice with the Northern Fishing Vessel Owners Association and all other commercial salmon fishermen in Southeast Alaska in this protest.

Perhaps you are not aware of the damage to the salmon industry that is being done with the depletion and destruction [sic] of the herring the salmon's natural food.

To our knowledge there are only two small areas in Southeast Alaska where there are still a few herring. One is near Ketchikan and the other is on the west coast of Kruzof Island, just outside of Sitka Sound. This Kruzof area only covers approximately 12 square miles.

To date, of this season, the herring seiners have only taken 15,000 barrels and have moved into the Shelikof Bar area on the west side of Kruzof Island with the intention of taking the remaining 35,000 barrels of their allotment.

Last year the same thing happened, with the result that the salmon industry in this area was a complete failure. There had been a good showing of salmon up to the day the herring seiners moved in and took the feed from them, but from that date, there were very few salmon in the entire area. Consequently, the Sitka Chamber of Commerce and the City Government had to appeal to the Federal Government for food relief for our fishermen. (July 3, 1954).

Less than a week later, the Sitka Chamber of Commerce drafted another letter, dated July 9, 1954, requesting "the prohibition of herring seining for reduction purposes within the three mile limit in Southeast Alaska." This letter also notes the herring seine fleet had removed 35,000 barrels of herring from Shelikof Bay located at Kruzof Island in Sitka Sound, contending that this harvest "[c]ompletely wiping out the herring in the entire Sitka area." The letter goes on to assert that the Chamber understood that "the Herring seiners and reduction operators are sending a delegate to Washington to try, in person, to obtain the extension to their allotment of 50,000 barrels" intending to use the

argument that they had caught so much herring at Shelikof Bay in such a short period of time thus attesting to the abundance of herring in the area which the Chamber stated, “is absolutely unfounded on fact.”

A subsequent letter indicates further concern regarding the commercial harvest of herring from Sitka Sound. On July 20, 1954 the Area Director of Alaska Native Services (Bureau of Indian Affairs) wrote to the Director of the United States Fish and Wildlife Service citing similar concerns while also noting that the area’s indigenous people relied upon herring for food: “Herring, as you know, serve as feed for a variety of fish that are taken for commercial purposes. Furthermore, our native people use it for food. Over-fishing of herring can have a detrimental effect on the economy of the fishermen, and may become quite serious.” This letter went on to request a “careful study” of the “herring situation at Sitka.” The final herring Alaskan reduction factory closed in 1966 (Reid 1971).

### **COMMERICAL SPAWN ON KELP FISHERY: 1964-1968**

A commercial spawn on kelp fishery began in Sitka in 1964 and was closed by the State of Alaska’s Board of Fish in 1974. During this period, there were five years that this fishery was executed (Ad Hoc Committee on Herring Spawn on Kelp Statements of Findings, N.D.) At its inception, 15 persons applied for permits to harvest herring on kelp. The number of active Sitka Sound roe on kelp harvesters expanding to 850 permits (of the 1,517 attained) being fished by 1967 when approximately 163,500 pounds of product was harvested.

In 1967 the spawn on kelp fishery in Sitka lasted only forty-five minutes during which 850 harvesters collected 81 tons of product from 425 skiffs (Garza 1996). In 1968 there were 1,736 permits roe on kelp harvest permits issued; two hundred of these were fished and 71,669 pounds of product was harvested (Management Plan – Southeast Alaska Herring Roe Fishery 1988, Alaska Department of Fish and Game Southeastern Region). Sitka’s commercial spawn on kelp fishery was not opened in Sitka Sound by the State of Alaska in 1968 and remained inactive until it was officially closed by the Board of Fish. However, a small sac roe fishery was initiated during this time period. Dolly Garza noting in her 1996 doctoral dissertation that the sac roe fishery in Sitka Sound began through the shipping of a “considerable” amount of frozen herring caught through the bait fishery that was shipped to Japan (39-40) in 1969.

### **SITKA SOUND SAC ROE FISHERY:**

A sac roe fishery was officially instituted by the Board of Fish for Sitka Sound in 1976 through its incorporation of a management plan. A limited entry system was employed to issue 52 commercial permits, most to individuals outside of the community and in fact outside of the region and the state of Alaska (CITE). The Fish and Game instituted a threshold for the sac roe fishery of 7,500 in the 1970’s. Simply, the threshold was a mechanism to protect the herring biomass being managed by the state as a stock. Until the threshold was reached a commercial fishery could not be opened and in the case of Sitka Sound, the fishery opened at 10% and a sliding scale elevated the percentage allowed for harvest above the threshold until it reached 20% at 45,000 tons of herring biomass. James Parker, the Sitka area fisheries biologist for twenty years provided the following information in an affidavit filed with the Sitka Tribe of Alaska:

The minimum spawning biomass threshold used in managing the herring sac-roe fishery and to which the harvest quota is directly linked is not based on biological considerations. I was personally involved in setting the minimum threshold level, and we were just trying to set a base level where no fishing would occur if the population dropped below that level. However, there were no biological or scientific reasons for this determination ...

When a herring population gets below a certain level, the natural inhibiting factors tend to hold the population down, or even deplete further. In areas around Juneau, Petersburg, Wrangell and Ketchikan there was really good populations of herring that have gone below this healthy level, and they have been held down, and do not have the opportunity to bloom when conditions are good. I personally witnessed this phenomenon in Juneau, where I helped manage the fishery for a number of years. They had an extremely good population of herring, but it declined down to a level where it cannot bloom, and that was 25-30 years ago. When they go down, they down for a long time. Juneau hit their fishery so hard, they have had 25 years of practically no fishery (1996).

By 1996, the State of Alaska believed its management of the Sitka Sound sac roe fishery had paid off and the Sitka Sound herring stock had rebounded. Reviewing ADF&G's records over time, 1995 showed the lowest recorded miles of spawn since 1978.<sup>1</sup> In 1995 commercial herring quota was set at 2,609 tons. In 1996 the commercial herring quota was set at 8,144 tons. However, in the winter of 1995 and spring of 1996, the Sitka Tribe and its tribal elders were intent on entering into a discussion with the Alaska Department of Fish and Game regarding protecting the subsistence harvest that would follow the season's annual commercial sac roe fishery.

The Fish and Game has been denying that they are depleting the herring. My feeling is that if they keep on pretending and keep on increasing and keep taking as much as they can possibly take, with the idea that they are not endangering the species, they'll probably eliminate herring. I think that if they continue to keep on increasing their take, the same thing that happened to the Southern California sardine fishery might take place with herring (Affidavit, Mark Jacobs, Jr. 1996.)

These concerns were largely redirected by the Alaska Department of Fish and Game who was eager instead to enter into discussions regarding its new Age Structured Analysis biomass and annual quota modeling program.

### **SITKA TRIBE REQUESTS SAC ROE FISHING MORETORIUM (1996)**

The Sitka tribal citizens and staff held several planning meetings prior to the commercial or subsistence fisheries taking place in 1996. The previous year (1995), a "branch watch" program had been put into place to try to protect subsistence harvesters' branches while they soaked in the intertidal waters. During the course of the discussions and subsequently through direction from the Council, Sitka Tribal staff were directed to prepare a motion naming the State of Alaska's Department of Fish and Game as Defendants for a preliminary injunction asking the State's Superior Court to prevent the Sitka Sound Sac Roe Fishery from opening prior to the threshold being raised from 7,500 to 15,000 tons of herring. The commercial fishery opened on March 23, prior to the injunction being filed. Following the initial 4,300 tons on March 23, 1996 the local newspaper reported nearly nightly on the fishery's slow progress.<sup>2</sup>

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<sup>1</sup> (ADF&G unpublished miles of spawn maps 1975-2001 – not cited in bibliography, looking for a published citation to source).

<sup>2</sup> Daily Sitka Sentinel articles for the 1996 commercial herring season are found at STA herring archives STA/HRN/57-STA/HRN65.

The April 5<sup>th</sup> newspaper carried reports of a letter dated April 3, being sent by the chairman of the Sitka Tribe of Alaska to the Area Manager of Commercial Fisheries citing: “Tribal Elders and subsistence harvesters have repeatedly testified that the geographical areas of herring spawn are shrinking with every year, the duration of the spawn is getting shorter, and the volume of spawn is diminishing. Tribal oral history states with certainty that the present level of herring biomass and spawn is much less than the historical level that once bloomed in the Sitka area.” The letter went on to state: “as the Tribe tracks this year’s commercial harvest efforts, it has become apparent that the models and assumptions made by your Department were grossly mistaken. It is reported daily that the herring population is not yielding enough commercial quality herring for sac roe processing. Yet, the Department is continuing the commercial fishery and expanding its reach . . .”

The letter’s formal request: “The Sitka Tribe officially asks you to exercise your authority in compliance with the Sustained Yield Clause of the Alaska Constitution and AS 16.05.258, and shut down the commercial herring sac roe harvest in Sitka” was announced in the local Sitka Sentinel newspaper. The local area management biologist responded in this way: “The thickness of the spawn indicates a large volume of herring so we’re not over-harvesting as STA claims” and “I don’t think keeping the fishery open for a couple more days will cause damage to the resource.” The paper went on to note: “For the past week the seine fleet has been allowed to catch any commercial-quality sac roe herring that can be located in the Sound, but the only catch since Sunday occurred Thursday when 9 tons were landed. That still leaves 3,401 tons remaining to be harvested . . .”

On Monday April 8, 1996 the Sitka Sentinel reported: “Fishing at night dramatically improved the fortunes of the Sitka Sound sac roe herring seine fleet over the weekend. With the blessing of the Alaska Department of Fish and Game, the permit holders fished all night, netting schools that were too deep to catch during the day.” In the end, the quota was reached using a technique previously employed by the reduction era fishery – night fishing with lights to draw fish to the surface. Subsequently, the Area Manager responded to the Sitka Tribe’s letter with a letter dated April 30 that suggested that the “department is willing to meet with the Tribe to hear directly of your concerns, to further explain our management programs, to review the current laws and regulations we operate under and to review the stock status of the Sitka herring population.”

The letter went on to suggest that such a meeting would encourage better communication and requesting: “If you are amenable to such a meeting, please suggest a meeting time and place. In addition, please let me know in advance if you intend to have legal counsel present. If so we will likely request that a representative of the State Attorney General’s office be present at the meeting.” This meeting was held in June of 1996 with approximately 36 individuals in attendance and no resolution reached.

Later, in a letter from the Alaska Department of Fish and Game’s Area Biologist for Sitka (Bill Davidson) dated October 17, 1996, addressed to the US Fish and Wildlife Service and written in response to report by a Sitka Tribal citizen “reported to have brought up concerns of Sitka area subsistence users concerning decline in abundance and distribution of herring spawn” brought up at a Southeast Subsistence Regional Advisory Council meeting on September 25, 1996 in Kake, Alaska, it is noted:

With all due respect to . . . and the Sitka Tribe of Alaska, the department would not agree with the conclusion that the herring stock is in a state of decline. Also, department records from subsistence herring spawn-on-kelp permits indicate that 1996 harvest levels are the third

highest since 1979. Additionally a successful spawn-on-branch harvest program was conducted with STA . . . <sup>3</sup>

While gathering numerous affidavits, including one from the previous area biologist (James Parker) the Sitka Tribe elected not to pursue court action but to exhaust its administrative remedies by focusing on the upcoming Board of Fish meeting which would be held in Sitka in the spring of 1996.

### **BOARD OF FISH – INCREASED THRESHOLD (1997)**

It is important to note that the jump in 1996 from 2,748 pounds of roe on kelp reported by subsistence harvesters in 1995 to 6,057 pounds reported in 1996 does not necessarily indicate that 1996 was a particularly good year for subsistence harvesters seeking to harvest roe on hemlock. That is, often herring egg harvesters will supplement their needs by harvesting roe on kelp more heavily due to the fact that it grows in areas outside of the traditional roe on branch subsistence fishing areas. However, there is at this time no way to know for certain, as there was at that time no real way to know for certain what the permit returns for spawn on kelp that lingered on from the 1960's days were actually reporting to the State of Alaska.

In the state of Alaska, a 9-member governor appointed board reviews fishery proposals regarding the fish in waters that are managed by the State. Proposals are submitted and reviewed in 3-year cycles. And allocative or regulatory changes to State managed fisheries required that the matter be formally brought before the Board either through the regular cycle or through a strict emergency agenda change request process. In 1996, the Sitka Tribe elected to submit a proposal requesting the Board to raise the threshold for the commercial fishery proposing better “low end” protections would protect both the sustainability of the commercial and the subsistence fisheries.

The herring reduction fishery and related tagging study data proved significant to the Sitka Tribe in 1996 and 1997 during the effort to increase its ability to back up its elders' testimony to the Board of Fish that the herring stocks remained depressed from these historic fishing activities as well as the Tribe and its citizens' efforts to increase the commercial harvest threshold for the Sitka Sound sac roe fishery. Accessing, utilizing and in a way returning these historic data to a discussion about Sitka Sound's commercial herring fishery provided support for Sitka's tribal Elders who routinely provided reports to the Tribe and the State regarding the effects of past and continued commercial fishing pressure at Sitka Sound.

However, during the subsequent Board of Fish meetings held in Sitka in January 1997 where the Tribe's proposal for a fishery moratorium and to raise the commercial fishery's harvest threshold commercial dismissed as anecdotal, the tagging study's number provided pause. The use of these numbers by the Tribe in a discussions with resource managers and with the Board of Fish, both cultures that rely upon a common language of numbers rather than emotional appeals, provided the Tribe with an opportunity to effect the management of the Sitka Sound sac roe fishery. The Tribe requested a doubling of the existing quota from 7,500 to 15,000 tons. The Board directed Fish and Game to implement a sliding scale that allows only a 10% harvest rate at a 20,000 returning biomass that gradually increases to a 20% harvest rate at the 40,000 biomass level.

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<sup>3</sup> Interestingly, due in large part to the annual post-subsistence harvest survey conducted in Sitka by the Sitka Tribe (2002-2009) a correlation is being drawn over time that years of high spawn on kelp harvest correspond with years of poor spawn on branch harvest. It would appear that a strategy employed by harvesters is to more aggressively harvest spawn on kelp which can be accessed in areas which are poor for branches but where spawn on kelp can be harvested.

Also at this meeting an experimental herring roe on kelp fishery was established with a sunset clause set for 2000. The experimental fishery was conducted with the participation of a tribal liaison/harvester.

### **BOARD OF FISH - ECOSYSTEM BASED MANAGEMENT AND OPEN POUNDS (2000)**

For the next cycle of proposals the Tribe submitted a proposal asking for an “ecosystem” management approach to the fishery. Quite simply Sitka Tribal citizens repeatedly brought for the their concerns regarding a fishery that harvested large quantities of fish seeking only the egg sacs from the females. Elder Mark Jacobs Jr. would often comment that this practice would be like hunting deer and then only taking from the deer its liver [find quote]. Reviewing definitions for ecosystem management, several common themes are important to the often quoted and rarely implemented practice of ecosystem based resource management:

Ecosystem management must include the following: 1. Long-term sustainability as fundamental value, 2. clear, operational goals, 3. sound ecological models and understanding, 4. understanding complexity and interconnectedness, 5. recognition of the dynamic character of ecosystems, 6. attention to context and scale, 7 acknowledgement of humans as ecosystem components, and 8. commitment to adaptability and accountability. (Carpenter, Brock and Hanson 1999: 5)

It was the Sitka Tribe of Alaska’s assertion that the State of Alaska’s age structured analysis herring biomass forecasting tool could not adequately model for either the impact to the environment or the herring biomass using a computerized single species forecasting model. Without this approach being built into the fishery’s management, the Tribe suggested, the only other way to address the situation was a commercial fishing moratorium. No action was taken on the Sitka Tribe of Alaska’s proposals before the Board in Juneau in 2000.

At the Board’s meeting that same year held a month later in Sitka there was significant discussion regarding a commercial spawn on kelp fishery. An experimental commercial herring roe on kelp program had been established by the Board in 1997 and was set to be taken up again in 2000 and if it was not moved forward at that time the experiment would sunset. The Tribe worked to support the option however could not arrive at consensus with the commercial permit holders about the potential for conflicts between the large floating pounds from which the kelp would hang and the anchoring of hemlock branches in the same areas.<sup>4</sup>

### **SUBSISTENCE HARVEST FAILURE (2001)**

In 2001 the quota for the Sitka Sound sac roe fishery was set at 10,600 tons. The Alaska Department of Fish and Game (ADF&G) directed the commercial fleet to harvest the entire quota from a 4-mile area located approximately 6 miles from the Sitka Indian Village and downtown Sitka, Alaska. The final commercial harvest was 12,005 tons. Due to the fact that the failure occurred “out of cycle” the Tribe submitted an “agenda change request” to the Board of Fish. In 2001, on a vote of 4 to 5 Board members, the Board elected to take up the proposal at its January 2002 meeting.

The Tribe worked from the noted in-season subsistence harvest failure through to the Board’s early 2002 meeting to document the hardship in the form of affidavits, surveys, personal statements, letters, meeting minutes and maps and these data were presented to the Board by eight active tribal harvesters, Sitka Tribal Council members and tribal staff at a Board of Fish meeting held in Anchorage

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<sup>4</sup> Materials related to this experimental fishery are found in the STA herring archives at STA/KLP/23.

in January 2002.<sup>5</sup> Board member Dan Coffey, summarizing the Board’s deliberation on the Sitka Tribe of Alaska’s proposal before the Board asking for a “reasonable opportunity” to harvest subsistence herring eggs, provided the following during Board testimony:

This is a hard one for me, part of what we are trying to do here is recognize the subsistence priority. Part of what we’re trying to do here is provide a seat at the table for people. There is, in my judgment, has been a divergence between what is predominately our Native population and the people who predominantly regulate and manage our fisheries and somewhere, somehow, we need to sort of bridge those divides that are there, that exist among us and results in, you know, lack of trust and suspicion of motives and so on. We didn’t see any of that in committee, commercial folks and the subsistence folks were considerate, cordial, attentive – all the good things you like when you work with a group of people and my thought was that, to the degree that we provide assurances to the subsistence users that they are in the game, at the table, have tier voices heard, listened to appropriately at the same level in the same way in which we have done with commercial fishers and processors and, please, don’t get me wrong, I do not think the department at all in any time in Sitka has excluded people. They have worked with folks that are there and attentive and it’s been good for that purpose and that reason. I mean obviously you’re going to talk to your processors about the quality of your product before you turn the fleet loose you, you don’t want to create a product that can’t be marketed ... I think that this State missed a big opportunity thirty years ago, forty years ago when we started to involve our local people in the co-management of fisheries we, we missed a lot of traditional knowledge and experience and that’s too late to do anything about that and know we’re sort of reaping what we sow. We didn’t bring our rural people, our Native people into this process to any degree except to, as they were commercial fishers. And now, and now we have the feds in our backyard treading everywhere. I wouldn’t even give it the level of treading there, stomping around ... one of the reasons I am going to support proposal 500 [the Sitka Tribe’s proposal] is because I want it known far and wide that the Board of Fisheries deals with the people who live in Alaska fairly and equitably and with consideration for all users within the bounds of subsistence priority (January 13, 2002).<sup>6</sup>

The outcome of the Board’s 2002 work with the Sitka Tribe, tribal harvesters, commercial permit holders and the Department the Board saw fit to provide ADF&G with regulations to further interpret the “reasonable opportunity” for subsistence harvesters protected by Alaska Statute: “distribute the commercial harvest by fishing time and are if the department determines that it is necessary to ensure that subsistence users have a reasonable opportunity to harvest the amount of herring spawn necessary for subsistence uses.” 5AAC27.195(a)(2). This regulation does not define the term “distribute” but clearly directs ADF&G to: “consider the quality and quantity of herring spawn on branches, kelp and seaweed, and herring sac roe when making management decisions.” 5AAC27.195(a)(2).

These regulations adopted by the State of Alaska do require ADF&G to weigh the success of the commercial harvest against the potential impact from their decisions on the subsequent subsistence fishery in “real time” instead of every three years according to the Board of Fish proposal cycle. Furthermore, as required by law, the State set the amount of herring eggs reasonably necessary to meet subsistence needs of Sitka Sound’s subsistence herring egg harvesters. AS16.05.258(b). Thus, the Board set the amount reasonably necessary based on previous survey data collected using random survey methods, arriving at a range of 105,000 to 158,000 pounds of herring spawn harvested annually

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<sup>5</sup> Predominantly found at STA herring archives STA/HRN51-STA/HRN85.

<sup>6</sup> Found at STA herring archive STA/BOF106.

for subsistence uses. 5AAC01.716(b). In this way, the Board saw fit to provide ADF&G and subsistence harvesters with a method to determine the success of ADF&G's distribution activities.

The Board also requested that a Memorandum of Agreement between the State and the Tribe be created to which the Board's chair, the Sitka Tribe and the Commissioner of ADF&G would be signatories.

#### **MEMORANDUM OF AGREEMENT BETWEEN THE TRIBE AND STATE (2002)**

The Sitka Tribe of Alaska and ADF&G entered into a Memorandum of Agreement (MOA) on November 4, 2002. The MOA was signed by the Chairman of the Board, Commissioner of ADF&G and the Chairman of the Sitka Tribe as per the Board's direction. Specifically, the State and the Tribe agreed to coordinate collaborative responsibilities that include: (1) participation in the pre-season stakeholder meeting and post-season meetings, (2) communication regarding each commercial opening, and, (3) conducting a collaborative post-season subsistence harvest survey.

Essentially, the MOA is an agreement to collaborate, communicate, collect and share data. This document differs from the Sitka Tribe of Alaska's Memorandum of Understandings (commonly referred to as MOU's) between itself and the City and Borough of Sitka, National Park Service and the United States Forest Service by way of being more specific in the level of collaboration and communication. Additionally, while agreements between boroughs and tribes and between the federal government and tribes are rare and hard fought, specific signed agreements between tribes and the State of Alaska are rarely mentioned and very few exist. The Millennium Agreement signed by Tony Knowles was designed in part to be a blanket agreement between the State and tribal governments but to date very little envisioned in the document has come to pass. And, since changes in the State's administration, the Millennium Agreement is rarely, if ever, mentioned.

#### **POST SEASON SUBSISTENCE HARVEST SURVEY (2003-2005)**

In 2002 the amount reasonably necessary for subsistence herring eggs from Sitka Sound was set using ADF&G expanded random survey data (1996) and during its deliberations, the Board determined the most reliable method to attain annual harvest data was an annual post-season survey. However, the Tribe argued that subsistence permit return data is intrinsically flawed because individuals consistently underreport. Additionally, for a subsistence harvest such as herring eggs, random surveys further water-down the reliability of resulting harvest data because they do not capture all "high harvesters" thus producing significantly low harvest estimates for activities such as herring egg harvest. It can be assumed, therefore, that the amount reasonably necessary for subsistence set into regulation is much lower than the amount of herring eggs actually needed for subsistence.

Thus, the Division of Subsistence and the Tribe elected to implement an annual "census" survey of the community's harvesters, especially the acknowledged high harvesters who, as a small population, harvest the vast majority of the annual harvest. Therefore, the MOA states:

- (1) The Tribe will collaborate with ADF&G in 2002 to create and conduct an annual customary and traditional [subsistence] harvest-monitoring program based on post-season surveys and interviews with local harvesters;
- (2) The annual harvest-monitoring program will follow standard survey sampling methodology;
- (3) The Tribe and ADF&G will collaboratively conduct the harvest interviews. The Tribe and ADF&G will collaboratively maintain the survey data, including a confidential list of participants and their contact information; and,
- (4) The Tribe will provide ADF&G with harvest data each year and this raw data will be analyzed by ADF&G using standard statistical techniques. [Section III (A) 1-4]

The survey has developed very well. Harvesters appear to welcome the ability to report to their own tribe regarding the quantity and the quality of their annual harvest of herring eggs. The survey providing the harvester with a tribal representative who listens and documents both the poundage and the harvest experience allows each participating tribal citizen to have their voice heard and their harvest expectation plotted against their annual harvest result. In 2002, the first year of the survey, the Tribe interviewed 86 individuals and it was estimated that the total subsistence harvest was 111,962 pounds.

By 2003, as the Tribe worked to expand the survey list to include more harvesters, the total pounds estimated to have been harvested was 209,995 pounds. By 2004, the Tribe was working largely on its own to conduct and to review the survey due to budget cuts experienced by the Division of Subsistence and that year the total pounds of herring eggs harvested was documented at 293,579 pounds. Then 2005 occurred. In 2005 the Sitka Tribe surveyed 161 individuals, the largest number of individuals surveyed up until that time, and the total number of pounds of herring eggs harvested was 73,432 pounds.<sup>7</sup> This is well below the 105,000-158,000 pounds set as “amount reasonably necessary” for subsistence set into regulation by the Board previously. In 2005, the commercial fishery harvested 11,366 tons of herring in six openings in an area of Sitka Sound that is most important to the subsistence fishery. The situation was nearly identical to the situation that occurred in 2001.

#### **BOARD OF FISH – LIMITING COMMERCIAL FISHING IN SUBSISTENCE ZONE (2006)**

Following the 2005 commercial fishery and the subsequent poor subsistence fishery, a Sitka Tribal Citizen filed a proposal to the State of Alaska’s Board of Fish. The Tribe was determined to both support its citizens while not losing its level of increased interaction with the process. After significant analysis and discussion, the Sitka Tribe of Alaska elected to support this proposal and sent representation to this meeting in Ketchikan. However, a priority was placed on working with the Board, Department and permit holders to remain engaged in the annual collaborative process. At this meeting, the Board determined that it was not the responsibility of the Department to ensure that the amount reasonably necessary was met.

While regulation requires the Alaska Department of Fish & Game to “distribute the commercial harvest by fishing time and area if the department [ADF&G] determines that is necessary to ensure that subsistence users have a reasonable opportunity to harvest the amount of herring spawn necessary for subsistence uses” ADF&G did not distribute the commercial fishery in 2005. A difficulty with the in-season consultation process was that the single point of contact for the Sitka Tribe of Alaska did, in consultation with some tribal harvesters, respond to communication initiated by ADF&G prior to commercial openings, agreeing to the openings. However, the single point of contact was assured by ADF&G that: (1) the commercial harvest will not impact subsistence; and, (2) there is no other opportunity for the commercial harvest elsewhere.

Thus, in 2005 the Sitka Tribe of Alaska and its tribal citizens began yet another phase of their effort when the community documented a subsistence harvest failure that mirrored the 2001 harvest failure. At this juncture the Sitka Tribe of Alaska and its tribal harvesters were faced with the need to impress upon the State of Alaska’s Board of Fish and Department of Fish and Game that (1) recognizing and actually (2) protecting the “reasonable” opportunity to harvest herring eggs for traditional purposes were in fact two different, though legally linked, activities. Recognizing the importance of a way of life is highly significant. But ensuring that a style of life or a cultural practice is allowed to continue is in fact applying significance to the recognition of that lifestyle’s intrinsic value.

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<sup>7</sup> Check against ADF&G figures, STA’s and ADF&G’s estimates often vary.

(1) The success of the annual post-season subsistence herring egg survey illustrates the community's growing desire to generate and control the best data available.

(2) While understandably concerned about being locked into a "numbers game" the evolution of a common method of establishing, substantiating and reviewing whether needs have been met has provided a common language to engage in collaborative post-season review.

(3) The 2005 documented subsistence harvest failure did lead to some collaborative management developments.

- (A) The Division of Subsistence's annual survey operating budget has been funded to allow for their 2006 involvement in the annual post-season subsistence harvest survey.
- Resumed funding was a result of the Sitka Tribe bringing forward not only their reports of concern but by having the data to substantiate these concerns.

- (B) Upon detailed review of the situation, it may have resulted from the fact that ADF&G estimated that perhaps 40-50% of the total biomass returning to an area that is virtually impossible for subsistence harvesters due to the tidal surge and an area that presents commercial harvest limitations due to the area's rocky bottom conditions.
- Having this detailed level of post-season review was difficult for everyone involved.
  - Failing to enter into this discussion would have been an example of failing to learn from the 2005 season and as such a step backwards in the collaborative management process.

The Board of Fish elected to deny action on the proposal put forth by a Sitka Tribal citizen which was supported by the Tribe. However, prior to the 2006 commercial tribal harvesters held the first of what will be an annual tribal/permit holders dinner meeting. A story covering the dinner with excerpts of the discussion at the meeting was playing over a public radio story as I drove to the airport to fly to this meeting. And both the commercial permit holders and the tribal harvesters were suggesting ways that they could work together to ensure the success of both fisheries in 2006 and into the future. This interaction with the permit holders themselves truly presents an evolution in the ongoing effort to engage in collaborative management of the Sitka Sound Commercial and Subsistence Fisheries.

### **SUBSISTENCE FAILURE 2008 AND BOARD INACTION IN 2009**

Again in 2008 the Sitka Tribe of Alaska documented a subsistence failure. Additionally, communication between the Tribe and ADF&G and the Tribe and the commercial permit holders appears to have suffered, perhaps coinciding with the transfer of management responsibility within ADF&G. While the Tribe continues to hold its annual pre-season herring dinner it is not so much to engage in conversation with the permit holders as it is a time for the tribal community to assemble. In 2009 the Tribe did hold the dinner in conjunction with the upcoming Board of Fish meeting and in attendance were regional tribal representation from Sealaska Corporation and the Alaska Federation of Natives.

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## APPENDIX E

### Timeline of Commercial Herring Fisheries in Alaska

## **TIMELINE OF COMMERCIAL HERRING FISHERIES IN SOUTHEAST ALASKA**

- 1867 The United States purchases Alaska from Russia\*.
- 1878 Commercial herring production in Alaska begins in 1878. A combination of beach seines, gill nets and a form of Norwegian seining produces an initial total catch of 30,000 lbs. Jigs and rakes produce a small fraction of that, usually by individuals for use as bait or for curing (Huizer 1952, Rauwolf 2006).
- “As early as 1878 persons in Wrangell engaged in the business of catching herring, from which they extracted the oil, in addition to salting and drying the fish” (Cobb 1906).
- The Northwest Trading Company establishes a trading station at Killisnoo\*.
- 1880 The trading station at Killisnoo begins rendering whale oil.
- 1882 The trading station, turned oil-reduction plant at Killisnoo experiences an explosion caused by a whaling harpoon. Whaling operations cease but herring oil reduction begins at the site: 1,520 tons of herring are processed for oil this year\*.
- 1883 The Killisnoo herring reduction plant processes 4,200 tons of herring.
- 1884 The Killisnoo plant begins processing herring into fertilizer as well as oil\*.
- 1887 The U.S. Bureau of Commercial Fisheries sends a research vessel “Albatross” to the inside waters of Alaska\*.
- 1889 Thirty seven canneries are operating in Southeast Alaska (Cobb 1905).
- 1889 Fifteen canneries are operating in Southeast Alaska (Cobb 1905).
- 1897 The first ‘official’ catch statistics are collected by the research vessel ‘Albatross’ and reported to the United States Fish Commission\*.
- 1900 Fishing operations begin purse seining from power boats allowing fishermen to increase catch rates in less time with less human labor (Huizer 1952).
- Herring bait production begins; 4–6 million lb (1,800–2,700 mt) per year. (ADF&G 2007a).
- “Soon after 1900 the small operators of Petersburg and Ketchikan commenced using purse seines from power boats” (Rounesfell 230:1930).
- Petersburg-based fishermen begin curing herring. Many of these early operations were off-shore operations where salt packing was done on scows\*.

\* See Chapter V. History of Commercial Herring Fisheries in Southeast Alaska

- 1902 Sixty four canneries are operating in Southeast Alaska (Cobb 1905).
- 1904 The Bureau of Fisheries first requires every individual and company fishing in Alaska to record annual statistics such as total fish products, fishing gear, and vessels.
- 1905 Forty seven canneries are operating in Southeast Alaska (Cobb 1905)
- 1906 An annual report "Fisheries of Alaska" (also known as the 'fish and fur seal' report) begins to be published by the US Bureau of Commercial Fisheries\*.
- 1907 The Tye Whaling Company is established at Murder Cove on Admiralty Island. It operates until 1913\*.
- 1910 The first herring are frozen for bait for the halibut fisheries at the New England Fish Co. plant in Ketchikan (Marsh and Cobb 1911).
- 1911 The method of salt-curing herring expands rapidly.
- 1912 The United States Whaling Company opens a station at Port Armstrong. The company operates until 1923, and processes nearly 1,600 whales\*.
- 1912-13 Halibut fishing is introduced as an important Alaskan industry. The need for herring bait fuels both fisheries (Rounsefell 1930).
- 1916 The Bureau of Commercial Fisheries hires experts to train fishery workers in the method of "Scotch Curing" \*.
- 1918 Power seine boats almost totally replace the old Norwegian method of operation in all of Southeast Alaska. All are powered by gas internal-combustion engines. Each boat employs a five to seven man crew. The average net tonnage is 17 tons (range of 11-31 tons) (Rounsefell 1930).
- Herring caught for the food market (salt-cured, dried) peaks at 12,304 tons. Large herring become hard to find in the following years and many salt-cure operations move to Prince William Sound and Kodiak \*.
- 1919 Three additional reduction plants are built in Chatham Strait \*.
- 1925 Herring plants begin to record the quantity of fish being processed into meal or oil (Reid 1927)
- 1926-1966 Ninety percent of herring catches go to the reduction process (Reid 1971).
- 1927 The purse-seine boat average net tonnage is 31 (range of 20-42 tons). Half of the fleet is powered by diesel engines. Each boat employs a six to eight man crew (Rounsefell 1930).
- The halibut industry uses over 8,000,000 pounds of herring bait from Alaska: 4,600,000 from the southeastern region (Rounsefell 1930).

\* See Chapter V. History of Commercial Herring Fisheries in Southeast Alaska

- 1929-1956 Approximately 812,290 tons of herring is harvested from southeast Alaska (Skud, Sakuda and Reid 1960).
- 1930-31 Rounsefell is assigned the task of studying the cause of fluctuating herring populations. Using catch per unit (CPUE) data from the 1920s, he concludes that there is no evidence to support the hypothesis that the reduction plants were the source of depletion (1930) but does attribute declines to fishing and recommends restricting the fishing fleet (1931)\*.
- 1932-1934 Herring populations undergo three successive recruitment “failures” and cause the collapse of the herring fishery in the late 1930s (Dahlgren and Kolloen 1944).
- 1935 Tagging surveys of herring are attempted (Rounsefell and Dahlgren 1935). Rounsefell and Dahlgren find that Kootznahoo Inlet was once an abundant herring spawning ground, but the population had declined\*.
- 1937 Peak herring reduction year: 125,000 tons are processed. Production levels begin to decline rapidly after 1937 (Reid 1971).
- 1939 Because of evidence of severe depletion of herring, commercial fishing for herring other than for bait purposes is prohibited after August 2, 1939 in all of southeast Alaska\*.
- The Bureau of Commercial Fisheries opens an ‘exploratory’ fishery in an attempt to locate herring and possibly reopen the commercial fishery. No herring is found\*.
- 1941 A 6,250 ton quota is set for the herring fishery. Half of the quota is filled\*.
- 1942 All of southeast Alaska is closed to allow herring populations to rebuild\*.
- 1943 Annual catch quotas are implemented, beginning with 12,500 tons.
- 1947 Kolloen (1947) develops ‘cohort analysis,’ a means to track herring using age composition. Using this technique, Kolloen describes the herring population as recovering: 41,828 tons of herring are harvested. Shortly thereafter, in the late 1940s, herring populations crash once again\*.
- 1948 The annual catch quota is set at 50,000 tons; 16,114 tons of herring are actually harvested.
- 1950s Japanese and Russian ships begin trawling for herring in the Bering Sea. (ADF&G 2007a).
- Herring reduction plants begin to decline due to competing Peruvian anchovy production (ADF&G 2007a).

\* See Chapter V. History of Commercial Herring Fisheries in Southeast Alaska

- The Sitka Chamber of Commerce lodges an official protest against commercial herring fishing for reduction purposes (STA Chamber of Commerce 1954).
- 1951 The annual quota is decreased to 100,000 barrels.
- 1959 The state of Alaska begins managing herring fisheries.
- 1966 The last herring reduction plant shuts down due to market conditions and depleted herring stocks (Reid 1971)
- 1964 The first commercial spawn-on-kelp fishery opens in Sitka (Ad Hoc Committee on Herring Spawn on Kelp Statements of Findings, n.d.)
- 1967-1972 “Unregulated bait fisheries deplete stocks in George Inlet (9000) tons and Carroll Inlet (1200) tons while being surveyed by ADF&G’s biologists aboard the vessel Sundance” (Rauwolf 2006).
- 1968 ADF&G opens the spawn on kelp fishery (Rauwolf 2006).
- 1969 The first unofficial sac roe fishery in Sitka begins operation (Garza 1996).
- 1970s Herring stocks experience the first collapse (ADF&G 2007a)
- Herring sac roe production begins in the 1970s to provide for declining herring numbers in Japanese waters. Much of the current herring sac roe harvest in Alaska is destined for these Japanese markets although younger generations are not so keen on this traditional dish.
- Japanese and Russian ships trawling for herring in the Bering Sea harvest 320 million lb (146,000 mt) in 1970 (ADF&G 2007a).
- “The development of extensive crab fisheries in the 1970s greatly increased the demand for herring bait” (ADF&G 2007a). Bait harvests increase to 4,000-6,000 tons annually\*.
- 1972-1975 ADF&G conducts stock surveys on spawning grounds in preparation for the sac roe fisheries. The results of these surveys on diminished stocks are called “pristine biomass” by ADF&G biologists (Rauwolf 2006).
- 1974 The commercial spawn-on-kelp fishery closes in Sitka (Ad Hoc Committee on Herring Spawn on Kelp Statements of Findings, n.d.)
- 1976 The Magnuson Fishery Conservation and Management Act creates the following for all commercial fisheries:  
 “A fishery conservation zone between the territorial seas of the US and 200 nautical miles offshore. An exclusive US fishery management authority over fish within the fishery conservation zone (excluding highly migratory species). Regulations for foreign fishing within the fishery conservation zone through international fishery agreements, permits and import prohibitions. National standards for fishery conservation and management

\* See Chapter V. History of Commercial Herring Fisheries in Southeast Alaska

and eight regional fishery management councils to apply those national standards in fishery management plans” (MMS 2007).

ADF&G opens commercial sac roe fisheries in southeast Alaska (gillnet and seine) (Rauwolf 2006)

- 1980s “[C]onsensus emerged among west coast herring biologists that a 20% maximum exploitation rate was appropriate for herring, and management agencies began shifting to this target. By the late 1980s, a consensus to set thresholds at 25% of the average unfished biomass also emerged. This policy was initially developed for British Columbia (Hall et al. 1988), and the rationale was extended for Alaskan herring fisheries by Zheng et al. (1993) and Funk and Rowell (1995)”\*.
- 1980 West Behm Canal closes to commercial herring fishing after only one year of sac roe and three years of bait fishing. (Rauwolf 2006)
- Auke Bay/Lynn Canal fishery collapses (third largest biomass in Southeast Alaska) (Rauwolf 2006)
- 1980-1988 Many small spawning areas are depleted by gillnet and seine fisheries (Rauwolf 2006)
- 1990 Kah Shakes gillnet sac roe fishery, second largest biomass in southeast Alaska closes (Rauwolf 2006).
- 1991 ADF&G moves the Kah Shakes gillnet fishery outside the legal boundary, 12 miles west to Cat Island, adjacent to the Annette Island Reserves herring fishery on Crab Bay flats. (Rauwolf 2006).
- 1993 Board of Fisheries tosses out proposals from local concerned citizens, and does not allow testimony on these proposals. At the same time the BOF expands the legal boundary of Kah Shakes to include Cat and Mary Island, and classifies all area stocks as one stock (Revilla Channel Stock) (Rauwolf 2006).
- 1994 Local citizens file a lawsuit in an attempt to protect the remaining herring populations in Kah Shakes and Cat Island (Rauwolf 2006)
- 1995 People begin to notice a reduced size in herring in Revilla channel. Spawning biomass at Kah Shakes has shrunk to 143 tons from a high of over 20,000 tons at the onset of the fishery (Rauwolf 2006)
- 1995 The Sitka Tribe of Alaska implements a “branch watch” program to try to protect branches set out by subsistence harvesters from theft and other destructive activities (see Appendix D).
- 1996 The chairman of the Sitka Tribe of Alaska sends a letter to the Area Manager of the Commercial Fisheries asking the agency to close the commercial herring sac roe harvest in Sitka (Cockerman 1996a).

\* See Chapter V. History of Commercial Herring Fisheries in Southeast Alaska

The Sitka Tribe of Alaska files a proposal to the Board of Fisheries to increase the threshold for the commercial fishery (see Appendix D).

- 1996 The combined spawning biomass of herring at Kah Shakes and Cat Island total 4338 tons, 1662 tons below the required 6,000 ton biomass threshold set by ADF&G before they are supposed to allow a commercial harvest for the coming season (Rauwolf 2006)
- An experimental commercial herring roe on kelp program is established by the Board of Fisheries in Sitka (see Appendix D).
- 1998 Gillnetters exceed the quota at Cat Island by 11%. No fishery has been conducted at Cat Island since (Rauwolf 2006)
- 2000 The Sitka Tribe of Alaska submits a proposal to the Board of Fisheries to implement an 'ecosystem' management approach to the fishery. The proposal was denied (see Appendix D).
- 2001 The Sitka Tribe of Alaska submits an 'agenda change request' to the Board of Fisheries in order to address the detrimental effects of the 2001 commercial sac roe fishery in Sitka Sound. Affidavits, surveys, personal statements, and additional data is collected to support this proposal (see Appendix D).
- 2002 The Board of Fisheries reviews the 2001 proposal and data submitted by the Sitka Tribe of Alaska. The Board sets subsistence harvest levels at 105,000 to 158,000 pounds of herring spawn annually and requests that the Sitka Tribe of Alaska and ADF&G enter into a Memorandum of Agreement, a document that was signed on November 4, 2002. This document created a collaborative responsibility for both the Tribe and ADF&G to 1) participate in the pre-season and post-season stakeholder meetings, 2) communicate, collect and share data, and 2) conduct a collaborative post-season subsistence survey. The first post-season subsistence survey documented 111,962 pounds of herring roe (see Appendix D).
- 2003 The Board of Fisheries opens West Behm Canal to commercial herring harvests in spite of intense local opposition and ADF&G briefing documents requesting more time to study the fishery (Rauwolf 2006).
- The Sitka Tribe of Alaska expands the post-season subsistence survey and documents 209,995 pounds of harvested herring roe (see Appendix D).
- 2005 The Sitka Tribe of Alaska expands the post-season subsistence survey once again and documents only 73,432 pounds of harvested herring roe, well below the threshold designated by the Board of Fisheries in 2002 (Craig 2009).
- 2006 The Sitka Tribe of Alaska files a proposal with the Board of Fisheries to review the inability of subsistence users to meet the 105-000 – 158,000 harvest quota set by the Board in 2002. The Board determines that it is not

\* See Chapter V. History of Commercial Herring Fisheries in Southeast Alaska

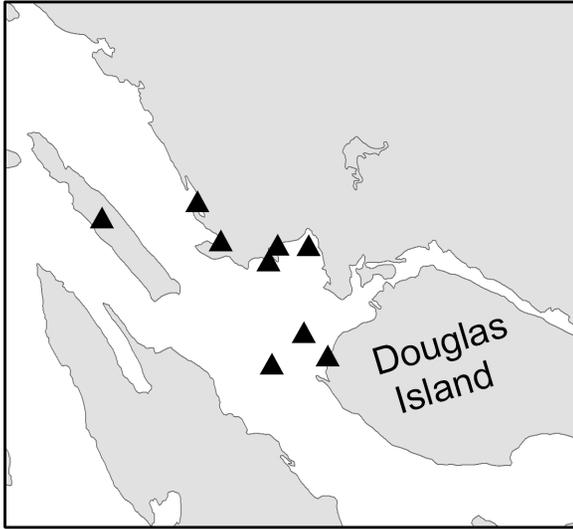
the responsibility of ADF&G to guarantee that this subsistence harvest quota is met (see Appendix D).

2008 The Sitka Tribe of Alaska documents another failure to meet the subsistence harvest threshold set by the Board of Fisheries in 2002 (see Appendix D).

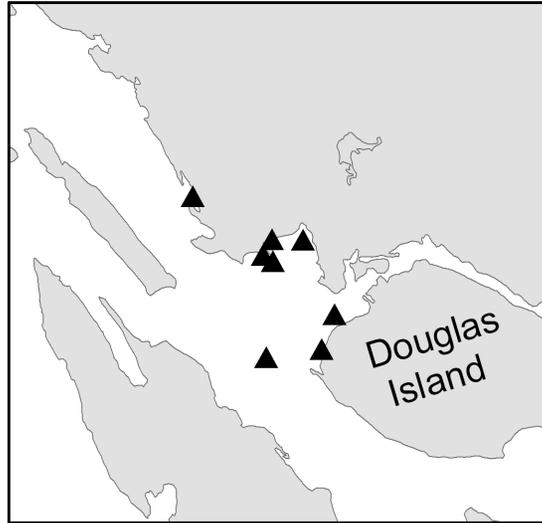
## APPENDIX F

### Historic Herring Spawn Location Maps

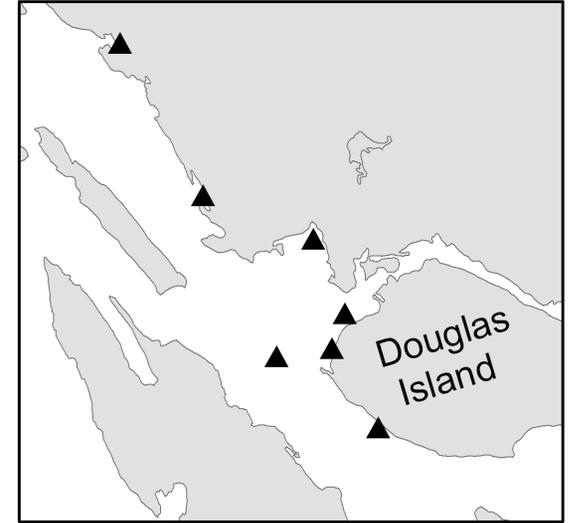
# Historic Spawning Locations 1973 - 1977, Auke Bay Area (Carlson 1980)



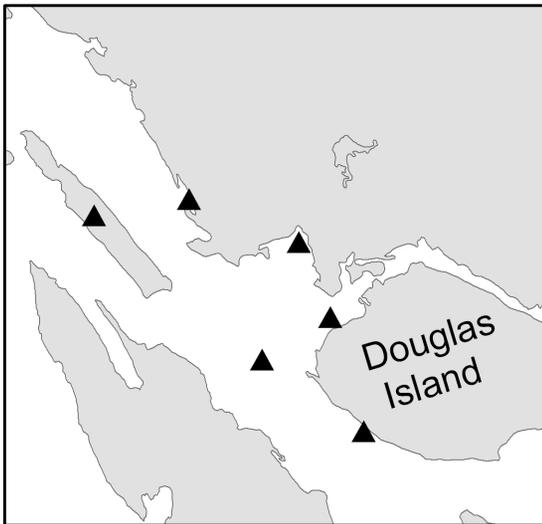
Herring Spawning Locations 1973



Herring Spawning Locations 1974



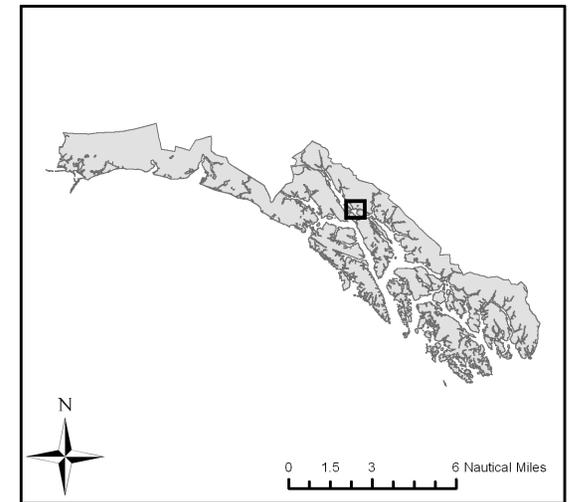
Herring Spawning Locations 1975



Herring Spawning Locations 1976

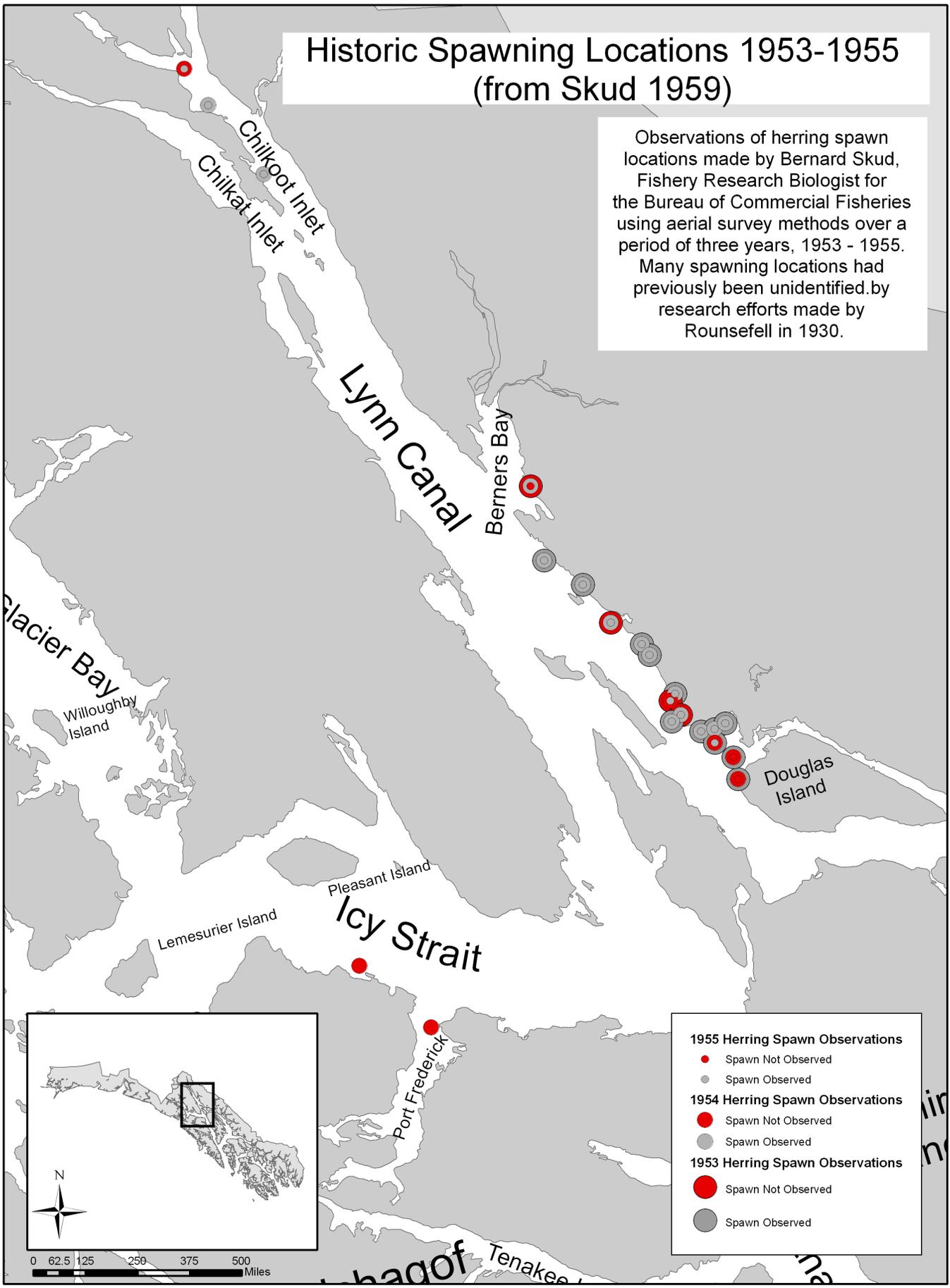


Herring Spawning Locations 1977



# Historic Spawning Locations 1953-1955 (from Skud 1959)

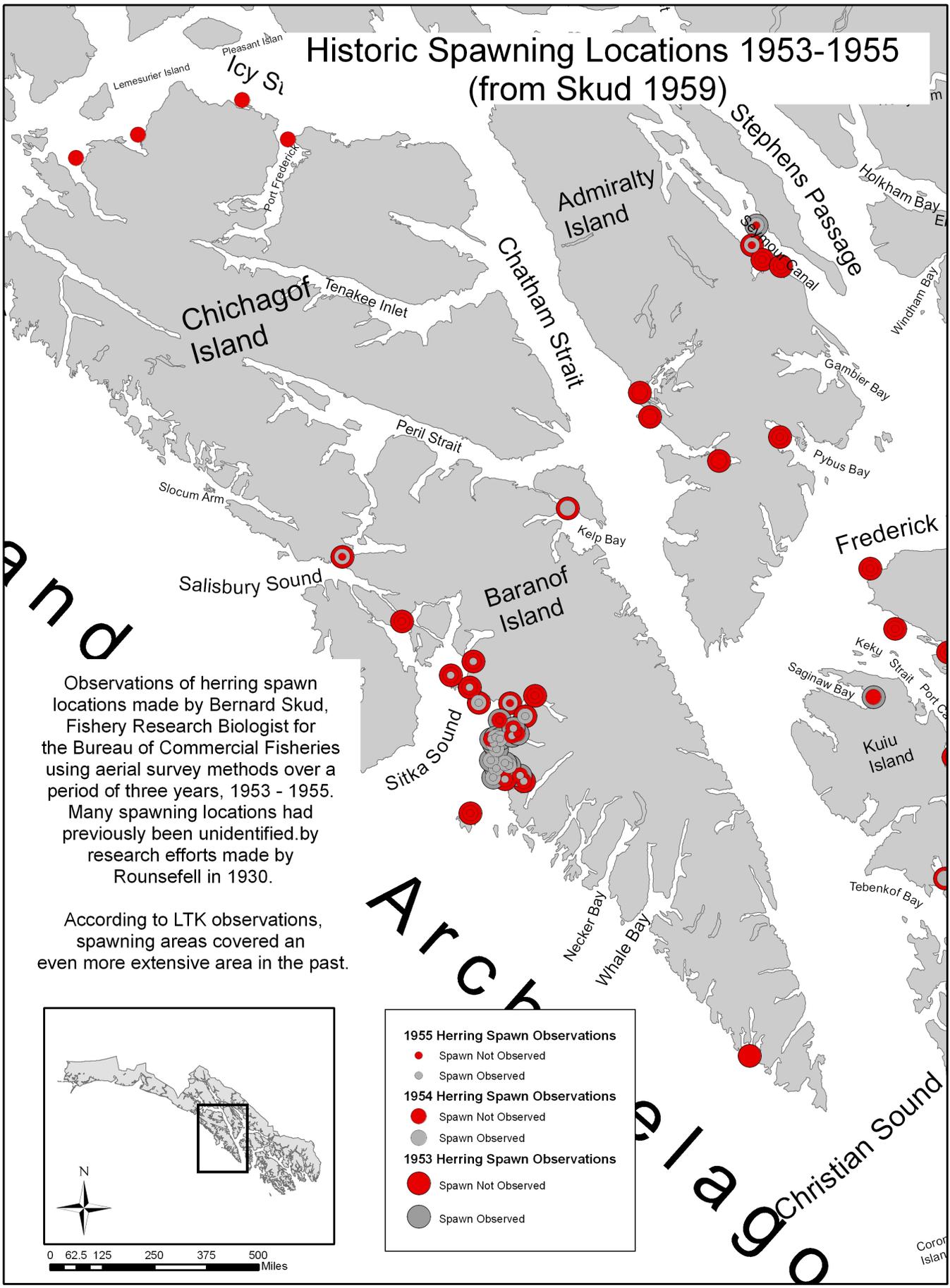
Observations of herring spawn locations made by Bernard Skud, Fishery Research Biologist for the Bureau of Commercial Fisheries using aerial survey methods over a period of three years, 1953 - 1955. Many spawning locations had previously been unidentified by research efforts made by Rounsefell in 1930.



- 1955 Herring Spawn Observations**
- Spawn Not Observed
  - Spawn Observed
- 1954 Herring Spawn Observations**
- Spawn Not Observed
  - Spawn Observed
- 1953 Herring Spawn Observations**
- Spawn Not Observed
  - Spawn Observed

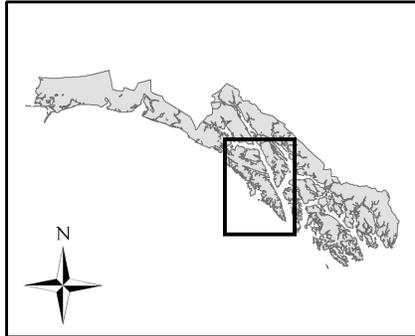
0 62.5 125 250 375 500 Miles

# Historic Spawning Locations 1953-1955 (from Skud 1959)



Observations of herring spawn locations made by Bernard Skud, Fishery Research Biologist for the Bureau of Commercial Fisheries using aerial survey methods over a period of three years, 1953 - 1955. Many spawning locations had previously been unidentified by research efforts made by Rounsefell in 1930.

According to LTK observations, spawning areas covered an even more extensive area in the past.

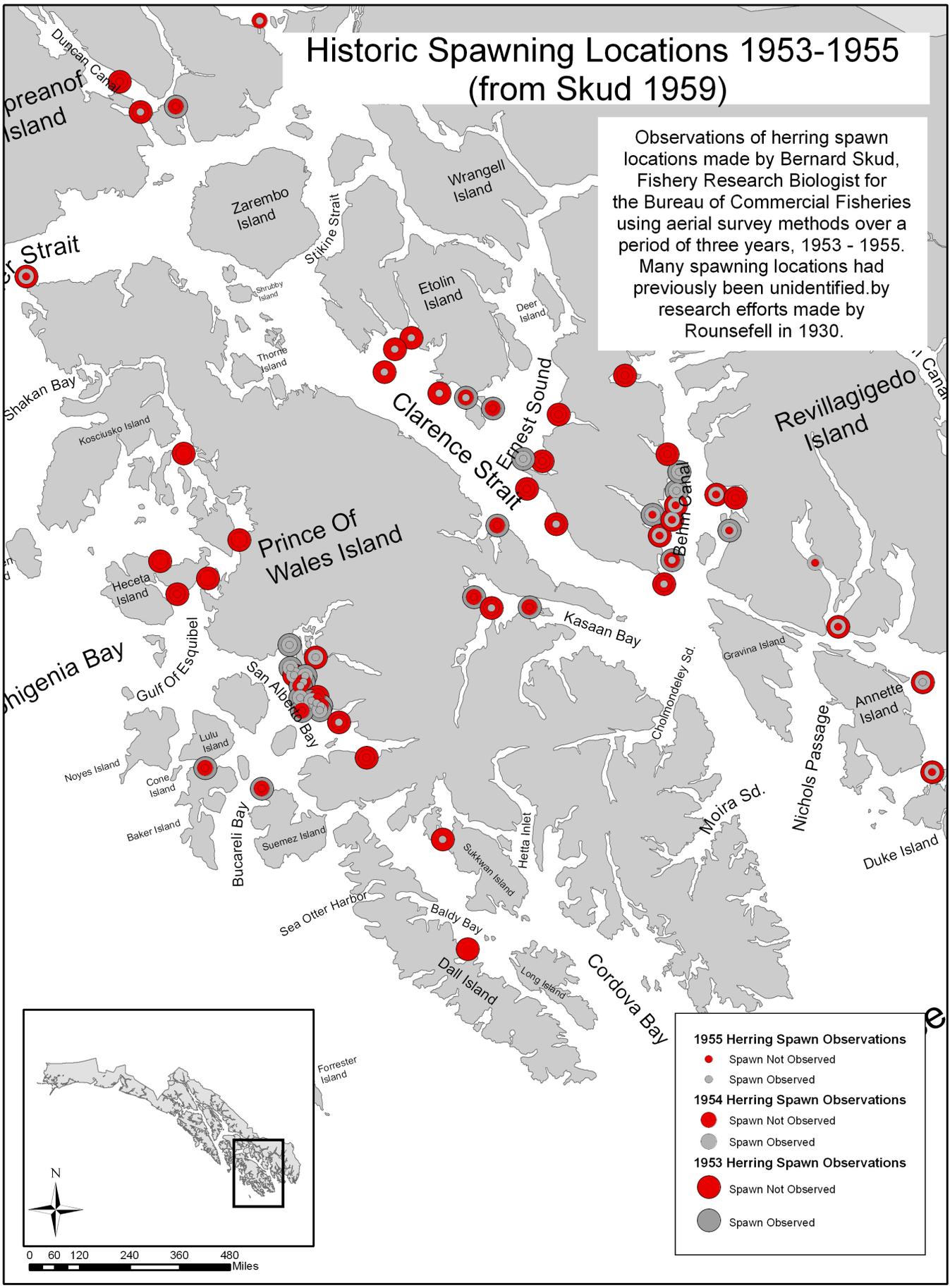


0 62.5 125 250 375 500 Miles

- 1955 Herring Spawn Observations**
- Spawn Not Observed
  - Spawn Observed
- 1954 Herring Spawn Observations**
- Spawn Not Observed
  - Spawn Observed
- 1953 Herring Spawn Observations**
- Spawn Not Observed
  - Spawn Observed

# Historic Spawning Locations 1953-1955 (from Skud 1959)

Observations of herring spawn locations made by Bernard Skud, Fishery Research Biologist for the Bureau of Commercial Fisheries using aerial survey methods over a period of three years, 1953 - 1955. Many spawning locations had previously been unidentified by research efforts made by Rounsefell in 1930.



0 60 120 240 360 480 Miles

## APPENDIX F

### Cruise Ship Routes in Southeast Alaska: Gray/Black Water Discharge Events

