

PREPARED STATEMENT OF

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Before the

HOUSE FISHERIES COMMITTEE

ALASKA STATE LEGISLATURE

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Dear Members of the Fisheries Committee:

I am pleased to have the opportunity to report on an ongoing research project undertaken by me and several colleagues (beginning in 2007, to be completed in 2009), entitled “ *Herring Synthesis: Documenting and Modeling Herring Spawning Areas within Socio-Ecological Systems over Time in the Southeastern Gulf of Alaska.*” This project, funded by the North Pacific Research Board, was conceived in response to numerous comments and concerns I have documented about the status of herring in Southeast Alaska during the course of my anthropological research in the region over the past 20 years. The aim of the project is to better understand broad trends in the ecology of herring in Southeast Alaska by synthesizing historical and local sources of knowledge not widely consulted by fisheries managers at present in order to improve our collective understanding and management of these precious fish stocks.

PROJECT OVERVIEW

- 1) *Background:* Pacific herring (*Clupea pallasii*) is a foundation and bellwether species for North Pacific marine ecosystems but productive spawning areas (and times) in Southeast Alaska are limited and historical population dynamics and ecology of the species are not well understood.
 - 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 1980, no synthesis of the deeper archaeological, historical, and ethno-ecological records on herring spawning areas has been carried out.
 - The lack of deep historical knowledge in fisheries management is growing issue of 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 environmental baselines” in management 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.”
 - Our objective is to synthesize existing archaeological, ethnological, historical and biological records with data from interviews (60+) 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.
- 2) *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, 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.

3) *Preliminary results:*

- Our interviews have documented numerous herring spawning areas not previously identified in state and territorial management records (see Maps 1 & 2, compiled by Jamie Hebert). These spawning areas are represented by the green lines on the accompanying draft maps. Some of these sites still may be viable for herring spawning, and some local fishers report having experimented with transplanting herring spawn to historically productive areas in order to revitalize stocks.
- In addition we have been able to verify the spawning areas identified in state and territorial records (yellow lines) with local sources, and have record hundreds of observations about the qualities and changing status of these spawning areas (black dots and red triangles). Most of the green areas and many of the yellow ones are/were not major spawning areas. (Note: not all data has been entered/vetted in GIS)
- The interviews we have analyzed to date reveal a complex picture of herring stocks (in light of the first two hypotheses above), with many areas of historical spawning observed to be in decline or even barren, but some also displaying rebounding or cyclical trends. It is not clear to what extent decreasing numbers of herring in one spawning area may represent a shift to other areas.
- Sitka stocks are recognized as a uniquely large and relatively stable in producing quality spawn for subsistence, but other smaller stocks are also highly valued by local communities for subsistence and personal uses as well as their foundational role in supporting the marine ecosystem.
- Integration of LTK observations and select historical and environmental data layers in Geographic Information Systems (GIS) mapping is being carried to analyze potential causal factors contributing to changes in contemporary herring stocks, including anthropogenic impacts (e.g., fishing, habitat degradation), as hypothesized, but also non-anthropogenic ones, such as marine mammal and salmon predation and climate change. In most communities, multiple factors are cited as contributing to changes in local herring stocks.
- There are no estimates of herring biomass in the pre- and early commercial fishing eras. However, historical analysis of the fisheries conducted by Fritz Funk for our project shows a long period of more-or-less constant catch, ranging from 4,000 to 10,000 tons,

from 1880 through 1918, when only one herring reduction plant operated at Killisnoo, near Angoon. With intensive capitalization in the early 1920s, there followed 3 waves of "boom-and-bust", where peak catches exceeded 40,000 tons annually. By the 1940s, the paucity of herring during the bust cycles attracted federal regulators, and quotas were enacted to preserve herring for other uses (food, bait, prey for other species). Note that the quotas always lag the catch in the declining phase of each cycle. Fishermen are first unable to find enough fish to catch the quota, then the quota is lowered in the subsequent year. There was no stock assessment focused on abundance estimation, so quotas merely reflected fishing experience from the prior year. The number of operating plants peaks in 1928; as the efficiency of factory processes and vessels increased, fewer plants, fishermen, and vessels could attain the same production as in the earlier, more labor-intensive era. The last plant closed in the mid 1960s. Overall fishing impacts associated with these plants were concentrated in central Southeast Alaska, especially South Baranof Island, Frederick Sound and Chatham Strait. (http://www.backwater.org/herring/history/Historical_Catch.html).

- As of January 2009, records from 228 archaeological sites have been reviewed by colleagues Madonna Moss, Virginia Butler, and J. Tait Elder. Only 25 of these sites were excavated and studied using methods appropriate for documenting small-bodied herring. Of this sub-set, 21 (84%) contain herring bones, which highlights the consistent use of the fish in the past. The earliest herring remains are about 8000 radiocarbon years old and from the Chuck Lake Site (49-CRG-237) on Heceta Island. Most of the records date to the last 4000 years. Many long-standing Native community settlements appear to be associated with important historical herring stocks. We are assessing patterns in herring use over time and space, comparing them with known cultural changes in settlement patterns, social organization, and technology, as well as environmental forces (e.g., changing climate, sea-level changes).
- Our project website, (<http://herringsynthesis.research.pdx.edu/research/index.html>) contains additional details on the progress and results of our research.

4) *Preliminary conclusions:*

- Better historical and local understanding of herring populations and their role in marine ecosystems is critical for assessing the long-term trends and health of these stocks and other species that rely on them for food. A precautionary principle toward management may be called for until broad-based historical-ecological studies assess the overall health and trends of herring stocks in Southeast Alaska and adjacent waters.
- Our research in the communities of Angoon, Craig, Hoonah, Juneau, Kake, Ketchikan-Saxman, Klawock, and Sitka is not comprehensive for the region, but indicates the value of local and traditional knowledge, combined with broader historical ecological enquiry, for assessing key herring impacts, relationships, and trends over time. Our data show that many herring spawning areas have declined resulting in increasing fragmentation and vulnerability of remaining stocks.
- Herring have shown vulnerability and resilience since the advent of commercial exploitation more than a century ago; however many local residents in communities with historically significant stocks are concerned about their present status. They are acting in their own ways to conserve them, including "reseeding" historical spawning areas. However, a broader, ecosystem-level strategy is needed to balance herring stocks.