

**NPRB Use Only**

**Reference No** 75      **Date Submitted** December 01, 2006      **Date Received**

**Project Title:** Herring Synthesis: Documenting and Modeling Herring Spawning Areas within Socio-Ecological Systems over Time in the Southeastern Gulf of Alaska

**Project Period:** from June, 2007 to May, 2009

**Name, Address, Telephone Number and Email Address of Applicant:**

Dr. Thomas F. Thornton  
Portland State University  
503-725-3316  
503-725-3905  
tthornto@pdx.edu

**Principal Investigator(s): (Include name, affiliation and email address):**

Dr. Thomas F. Thornton, Portland State University, tthornto@pdx.edu

**Research Priority:**

Local and Traditional Knowledge

**Summary of Proposed Work:** Pacific herring (*Clupea pallasii*) is a foundation and bellwether species for North Pacific marine ecosystems. Herring roe fisheries are among the most lucrative, competitive, and controversial in the region, often pitting commercial and subsistence users against one another. One reason for this is that productive spawning areas (and times) are limited and historical population dynamics and ecology of herring are not well understood. Yet many communities with local and traditional knowledge (LTK) of herring claim that historical stocks were larger and spawning areas more numerous, but that they have dwindled due to factors such as over-harvesting, predation, disease, development, and climate change. While shifts in stocks and spawning areas have been reasonably well documented since 1980, no synthesis of the deeper archaeological, historical, and ethno-ecological records on herring spawning areas and their relation to local ecosystems has been carried out. Our goal is to synthesize this information for Southeast Alaska, where herring and herring roe traditionally have been harvested in quantity. Using existing published and unpublished archaeological, ethnological, historical and biological records and LTK gathered from community focus groups and fieldwork in each historical herring stock region, we propose to compile a historical and spatial database using geographic information systems (GIS) 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.

**Total Funding Requested From NPRB:**

\$ 100,000.00 Portland State University

**\$ 100,000.00**

**Total Other Support:**

**Legally Binding Authorizing Signature and Affiliation:**

---

1 **RESEARCH PLAN** (max 12 pages, including references, tables and figures)

2 A. Project Title

3 ***Herring Synthesis: Documenting and Modeling Herring Spawning Areas within Socio-Ecological***  
4 ***Systems over Time in the Southeastern Gulf of Alaska (Herring Synthesis)***

5 B. Proposal Summary

6 Pacific herring (*Clupea pallasii*) is a foundation and bellwether species for North Pacific marine  
7 ecosystems. Herring roe fisheries are among the most lucrative, competitive, and controversial in the  
8 region, often pitting commercial and subsistence users against one another. One reason for this is that  
9 productive spawning areas (and times) are limited and historical population dynamics and ecology of  
10 herring are not well understood. Yet many communities with local and traditional knowledge (LTK) of  
11 herring fisheries claim that historical stocks were larger and spawning areas more numerous, but that they  
12 have dwindled due to factors such as over-harvesting, predation, disease, development, and climate  
13 change. While shifts in stocks and spawning areas have been reasonably well documented since 1980, no  
14 synthesis of the deeper archaeological, historical, and ethno-ecological records on herring spawning areas  
15 and their relation to local ecosystems has been carried out. Our goal is to synthesize this information for  
16 the region encompassing Southeast Alaska from Dixon Entrance to Yakutat Bay, where herring and  
17 herring roe traditionally have been harvested in quantity. Using existing published and unpublished  
18 archaeological, ethnological, historical and biological records as well as community focus groups in each  
19 historical herring stock region, we propose to compile a historical and spatial database using geographic  
20 information systems (GIS) to :1) identify the extent of historic and prehistoric herring spawning and  
21 massing areas; 2) link changes in herring spawn extent and intensity to environmental and human factors  
22 in the socio-ecological system; and 3) identify sensitive areas for protection and potential restoration of  
23 herring spawning.

24

25 C. Project Responsiveness to NPRB Research Priorities or Identified Project Needs

26 This project responds to the priority that Local and Traditional Knowledge (LTK) be meaningfully  
27 incorporated into fisheries research and management and also serves to significantly advance NPRB goals  
28 to 1) improve understanding of North Pacific marine ecosystem dynamics through a multi-scale  
29 spatiotemporal study of herring, a critical and fluctuating forage fish within the food web; 2) improve  
30 ability to manage and protect healthy, sustainable herring fisheries and provide sustained benefits to  
31 communities and the nation through understanding of the prehistoric, historic and local traditional  
32 knowledge records; 3) improve the ability of agencies to forecast long-term trends in herring stocks; 4)  
33 foster cooperation between local and scientific communities by synthesizing data sources currently not  
34 well incorporated into modern herring fisheries modeling and management; and 5) support high quality  
35 projects that promise long-term results—in this case a deeper spatiotemporal understanding of regional  
36 herring stocks and their relationships to human populations and other species and to key environmental  
37 variables over centuries and millennia rather than just decades—that will be useful for both short-term  
38 and long-term resource management. Related research priorities are 2.b.ii, Recovery and resilience of fish  
39 habitat; 2.c.i. Local impacts of fishing on prey availability for top trophic level consumers (relations  
40 between herring stocks and salmon, marine mammals, etc.); d.v. Fur Seals (changes in fur seal migration  
41 patterns due to herring availability); and 6. Community Involvement.

42 Herring are important not only as a subsistence and commercial resource, but also as a forage fish, a  
43 prey base for a large variety of other marine organisms. For millennia, herring have been harvested for  
44 food by aboriginal peoples throughout the North Pacific coast (Stewart 1977). Through their massing,  
45 particularly in nearshore spawning areas, herring have contributed to “resource blooms” which humans  
46 and other top trophic consumers have exploited. Currently, however, we do not know the historical extent  
47 of herring-based food webs in the North Pacific or the key human and environmental variables that have

48 contributed to herring population and spawning dynamics over long periods of time. Evidence from a  
49 variety of sources in Southeast Alaska suggest the abundance of herring stocks and extent of herring  
50 spawning areas were significantly reduced prior to the advent of systematic biological surveying in the  
51 1980s. However, no major studies to date have been designed to assess the abundance, distribution, and  
52 importance of herring in local and regional food webs over multiple time scales. Our project responds to  
53 this gap in our understanding of the North Pacific marine ecosystem by combining Local and Traditional  
54 Knowledge studies and fine-grained archeological analyses of human-herring interactions in an original  
55 and targeted way.

56 Our project is driven by previous traditional knowledge and archaeological studies (e.g., Thornton  
57 2005; Butler and Campbell 2004; Thornton and Midgett 1996: STA n.d.) carried out by the investigators  
58 and tribes and locally-driven hypotheses which suggest herring spawning areas have shifted and shrunk  
59 over the past 100 years due to specific human and environmental factors. The historical ecology of  
60 herring spawning is referenced in oral traditions, geographic names and associations, and generations of  
61 direct experience with herring stocks and associated fisheries. Alaska Native communities have long  
62 recognized the critical role that herring play in the food web and have relied on the species for  
63 nourishment, including spawn harvested as “first fruits” of the spring. They also have prescriptions for  
64 interacting with herring, including the maintenance of spawning grounds (Emmons 1990, Thornton  
65 1997). In addition to subsistence use of spawn, herring have also have been taken for their oil and flesh,  
66 as well as for their commercial value as food and bait (cf. Schroeder and Kookesh 1990, Victor n.d., Moss  
67 1989). Sac roe fisheries for export to Japanese markets are currently a major commercial activity in  
68 several regions in Southeast Alaska and elsewhere in the Gulf of Alaska and Bering Sea.

69 The potential for using LTK to improve scientific understanding and management of fisheries is well  
70 documented (cf. Johannes 1981, 1993) and has yielded useful results in assessing the contemporary  
71 ecology of cod spawning areas in the Atlantic (Ames 2006) and herring ecology in parts of Prince  
72 William Sound (PWS) and outer Kenai Peninsula (Brown, et al. 2002). This study will build on these  
73 successful models and complement work in PWS by incorporating the southeastern Gulf of Alaska, and  
74 by synthesizing the rich ethnological, biological, and historical records of the North Pacific in relation to  
75 the LTK in an accessible and scaleable time-space database.

76 Beyond LTK and biological, ethnological, and historical data, animal bones and teeth from  
77 archaeological sites provide an unparalleled record of animal distribution and abundance over varying  
78 temporal and spatial scales. When coupled with paleoenvironmental indicators (e.g., tree-rings, pollen,  
79 isotope data, and so on), it is possible to examine species responses to past environmental change in  
80 detail. This field of study, zooarchaeology, also provides a record of long-term human-animal  
81 relationships and indicates both the extent to which human use of animals was sustainable (or not), as  
82 well as the degree to which animal distributions were determined by human behavior in the past. In short,  
83 zooarchaeological records can contribute to a range of issues within conservation biology, including  
84 understanding the long-term relationship between climate change and animal distributions and  
85 abundances; identifying animal ranges prior to industrialization or habitat fragmentation; and  
86 understanding the nature of human-environmental factors that contribute to long-term species survival or  
87 loss (Lyman and Cannon 2004).

88 Long-term zooarchaeological records for herring and other animals have not been synthesized from  
89 archaeological records in Southeast Alaska or other regions of the Gulf of Alaska. Records from other  
90 Pacific Northwest archaeological sites suggest that herring use came relatively late in some locations  
91 (after 2500 years ago in the Puget Sound/Gulf of Georgia: Butler and Campbell 2004) but was relatively  
92 important by 7000 years ago in others (central coast of British Columbia: Cannon 1991). Besides directly  
93 targeting herring as a resource, Monks (1987) suggested that Native peoples took advantage of and  
94 intentionally exploited the “resource bloom” that results from the massive spawning congregations of  
95 herring. Such blooms allowed foragers to actively pursue the numerous predators of herring such as  
96 dogfish, salmon, birds and marine mammals.

97 The project is uniquely interdisciplinary in combining LTK, archaeological, biological, ethnological,  
98 and historical data into a format that will be useful to resource managers, researchers, and community

99 members, and will be easily expandable and interpretable in light of future results.

#### 101 D. Soundness of Project Design and Conceptual Approach

102 Although a foundation species, the eco-dynamics of herring over time are poorly understood. Our  
103 project will synthesize socio-ecological systems data (Redman, et al. 2004) concerning herring for the  
104 first time by combining LTK, historical records, archaeological, biological, and environmental data. The  
105 key problem it addresses is the lack of historical depth and detailed local traditional knowledge of herring  
106 fisheries which can improve our understanding and management of this critical, dynamic and sensitive  
107 resource not only for subsistence and commercial fisheries, but for the health of the North Pacific marine  
108 ecosystem. Long term herring reproductive patterns and the factors that affect them have not been  
109 analyzed to date. Yet local fishers' knowledge and historical records suggests that major changes in the  
110 distribution and abundance of herring have taken place over the past 200 years. Our multidisciplinary,  
111 multicultural, and multi-scale synthesis will yield significant new information on herring ecology,  
112 historical spawning patterns and use, and factors affecting the health of herring stocks and their  
113 interactions with other species, including humans, over large time scales. The project is designed to both  
114 assess existing hypotheses (including LTK-driven hypotheses) and generate new ones. Among the key  
115 existing hypotheses to be addressed are: 1) *Present herring stocks, even in highly productive areas such*  
116 *as Sitka Sound, are essentially being managed in a "depleted status," representing a fraction of their*  
117 *historical abundance and distribution; 2) The most significant long-term impacts to Southeast herring*  
118 *stocks distribution and abundance have been anthropogenic, in particular over-exploitation of the species*  
119 *by commercial herring fisheries in the last century, but also disturbance, contamination, and degradation*  
120 *of critical spawning habitats; 3) Human dependence on herring as a food resource evolved through*  
121 *interactions with key spawning areas with abundant substrates for egg deposition (such as Macrocyctis*  
122 *[Giant] kelp, rockweed, and eelgrass), with which many aboriginal settlements are associated, and was*  
123 *later enhanced through the development of engineered marinescapes (e.g., placement of hemlock boughs*  
124 *in intertidal areas), techniques for conserving herring stocks by regulating human harvests and*  
125 *disturbances to critical spawning habitat, and by the development of new technologies (such as the*  
126 *herring rake) for capturing whole herring in quantity. The results of this project will allow us to test and*  
127 *refine these hypotheses in the context of more robust sets of socio-ecological data and a powerful*  
128 *analytical framework for evaluating the long-term dynamics of the coupled natural and human systems*  
129 *that are linked to herring. Thus, it will advance the state of knowledge of herring but also assist with*  
130 *analysis and modeling of long-term patterns, key impacts, and change events in herring ecology from*  
131 *prehistory to the present, and beyond. We expect that the project results will help to identify sensitive*  
132 *herring fisheries and habitat, mitigate deleterious impacts on herring spawning, and potentially aid in the*  
133 *restoration of depressed herring fisheries.*

134 *Documenting Past Herring Abundance, Distribution, and Local Ecology from LTK.* Data collected  
135 from multiple generations of local fishers "can be used to create a series of historical windows into a  
136 fishery's local ecology that can be used to identify long-term processes in the fisheries" (Ames 2006:352).  
137 This component of the project has three parts. The first is a thorough literature review of published and  
138 unpublished sources documenting historical and contemporary herring spawning areas and associated  
139 ecological observations. Information collected from different generations of LTK bearers already exist in  
140 various sources, especially the Technical Papers and reports published by the Alaska Department of Fish  
141 and Game (e.g., Schroeder and Kookesh 1990, Victor n.d.), EVOS Restoration studies (e.g., Brown, et al  
142 2002) and ethnographic reports (e.g., Thornton 1997), but have not been synthesized and organized in a  
143 historical and spatial database. For example, here is an observation from a Tlingit elder in Sitka,  
144 originally recorded by Thornton in 1992 and later compiled into an ADF&G and NOAA database (cf.  
145 Haynes and Wolfe 1993:369; Sepez, et al. 2003), which illustrates the richness of LTK and would be  
146 ideal to map into the GIS spatial-historical data framework we are proposing: "There are not as many seal  
147 lions now as there used to be [in greater Sitka Sound] because the herring stock is being depleted...There  
148 used to be a lot of herring across from Sitka and at Camp Coogan Bay—all the way down to Crawfish  
149 Inlet. But they've been fishing it pretty heavy (for sac roe) and the herring have disappeared. Also the

150 spawn Natives harvest for subsistence used to last as much as two weeks; now the herring spawn in  
151 patches in these bays and in one tide the spawn is gone...[Today] fishers have to move from place to  
152 place trying to get enough spawn. Years ago we didn't do that...And the sea lions are missing in those  
153 areas; they use to be so plentiful that they chased all the herring up into the shallow waters along with  
154 other birds, like ravens and crows. You don't see those big spawns anymore." The LTK contains  
155 information on historical extent of spawn and spawn harvest, relationships with top trophic consumers  
156 (sea lions), and analysis of ecological events (e.g., local declines of herring and sea lion or fur seal).  
157 Similarly, another unpublished set of observations collected in a Traditional Cultural Property evaluation  
158 of Auke Cape (Thornton 1997) documents centuries of herring roe harvest and observations of spawning  
159 extent, intensity, and ecology in a historically important but now virtually extinct herring spawning area  
160 at Auke Bay, Auke Cape, and Indian Cove in Juneau. These data includes direct observations of the  
161 fishery dating to nineteenth century and oral traditions extending back to at least the 1600s. Other existing  
162 sources include an LTK indigenous geographic names GIS database (SENSC 2001) which features  
163 numerous references to herring sites. Aggregating this LTK into a regional spatiotemporal framework will  
164 allow for broader understanding of the human and ecological patterns and processes that have developed  
165 in the southeastern Gulf of Alaska socio-ecological system over time.

166 *Documenting Herring through Historical Records.* LTK is even more powerful when combined with  
167 archaeological, historical and biological records of local herring stocks and ecology. In addition to  
168 synthesizing the archeological data (see methods described below), we will contract with retired fisheries  
169 biologist Fritz Funk to compile historical catch records, stock assessments, and biological census data on  
170 herring prior to 1980. He will compose a brief history and time line of the herring fishery in Southeast  
171 Alaska, to serve as backdrop for the maps of historical catch and spawning locations, and containing  
172 references to all known sources of herring catch and other historical information pertaining to herring  
173 stocks, such as the operations of industrial reduction plants which operated in Alaska in the late 19<sup>th</sup> and  
174 early 20<sup>th</sup> centuries, as well as the historical surveys of herring going back to the early 20<sup>th</sup> century (e.g.,  
175 Rounsefell 1930, Skud 1959, Skud, et al 1960). Using this and other data we will generate maps of  
176 historical herring catch and processing locations as GIS layers, and overlay them onto the LTK and  
177 contemporary data on herring stocks. Synthesizing and mapping these historical observations of herring  
178 will allow us to correlate them with other data gathered from the archaeological, paleoecological,  
179 climatic, and other environmental records relevant to forecasting and retrospective modeling (cf.  
180 Williams, et al 2000).

181 Existing environmental and cultural data already geo-referenced and housed in federal and state GIS  
182 libraries will be integrated and overlaid onto data gathered for this project. The compilation and  
183 standardization of these data will be a major task, employing one anthropology graduate student with GIS  
184 knowledge in consultation with the principal and co-principal investigators for Year One. When  
185 combined, these layers will serve as a powerful tool for analyzing key factors associated with changes in  
186 herring ecology and spawning patterns and for generating additional hypotheses and queries for the  
187 focus groups and key respondents.

188 The second phase of this component of the project will be to carry the preliminary maps to  
189 communities for verification, supplementation, and analysis through focus group-style interviews or  
190 round tables, in which researchers present preliminary mapped results and timelines of event data, assess  
191 working hypotheses, and solicit feedback and supplemental LTK to address gaps information gaps. This  
192 method has been used with success in past work in Alaskan communities and avoids duplicating existing  
193 information through costly individual interviewing, while at the same time providing space for analysis of  
194 key "event ecologies" (Vayda and Walters 1999) revealed in the data (e.g., specific declines in herring  
195 abundance and distribution). In addition this process will identify potential data gaps and clarify  
196 important research needs. If circumstances warrant and budget permits, follow-up interviews would be  
197 conducted with key respondents identified in the focus groups. Key research questions will include: 1)  
198 What historical spawning and massing areas are missing from the preliminary maps? 2) What  
199 observations do you have concerning herring population trends in these areas (productivity, impacts)? 3)  
200 What factors have influenced herring populations and fishing patterns in particular locations and times

201 (natural variability, impacts, adaptation)? 4) Other than during spawning, when and where do herring  
202 aggregate and when and where were/are herring fished for bait versus oil and other uses (ecology,  
203 adaptation)? 4) How have changes in herring abundance (particularly declines) affected the distribution,  
204 migration patterns, and behavior of other local species (trophic structure, “resource bloom,” etc.)? More  
205 specific questions and hypotheses will be developed in order to analyze significant events in herring  
206 ecology as manifest in the preliminary data, such as historical declines or extinctions of specific stocks,  
207 changes in fishing and fish processing patterns, shifts in spawning extent and intensity, and impacts to  
208 critical spawning habitat.

209 In conducting LTK interviews we will follow established “Ethical Principles for the Conduct of  
210 Research in the North,” which include informed consent and respect for privacy and confidentiality.  
211 Focus groups will consist of members of the Natural Resource Community (Dyer, Gill, and Piccou 1992),  
212 or those individuals who have significant historical relationships to both the resource and the community  
213 and thus are intimately familiar with the ecology of local herring stocks and seasonal and annual changes  
214 in fishing strategies. Through cooperative agreements we will arrange to carry out focus group meetings  
215 in collaboration with local tribal or community governments (see attached letters of support). These  
216 entities will help coordinate meetings, develop interview protocols, and, to the extent capacity exists,  
217 assist in carrying out focus group and key respondent interviewing, recording, and related tasks. In  
218 addition, they will have the opportunity to review and comment on the results before publication. Where  
219 possible, the focus groups would be timed to occur in coordination with spring herring spawning so as to  
220 allow participant observation of the fishery. This engagement will provide an important context for  
221 probing and documenting traditional and local knowledge *in situ* and *in vivo*.

222 *Inferring Past Herring Distribution and Abundance from Zooarchaeology.* This component of the  
223 project will create a data base summarizing our current knowledge of zooarchaeological and historical  
224 settlement records from Southeast Alaska. Taxonomic information for herring and other vertebrate and  
225 invertebrate fauna will be compiled from existing reports. All of the faunal data will be included given  
226 use of relative estimates of abundance. Direct measurement of absolute prehistoric animal population  
227 levels using zooarchaeology is difficult (e.g., Grayson 1984; Lyman 1994); our approach will examine  
228 trends by comparing herring abundance relative to other taxa (e.g., other fish, marine mammals, etc.),  
229 following methods outlined in Butler and Campbell (2004). Reviewing the entire faunal record will also  
230 allow us to consider ways Native people relied on broader food webs and how this may have varied over  
231 time and space. The data base will list the published and unpublished site reports, excavation methods,  
232 including screen size, volume excavated, condition and location of curated samples, age estimate from  
233 radiocarbon or other methods, and site location that will be linked with GIS. We estimate that  
234 zooarchaeological records from 20-25 archaeological sites will be available for this synthesis.  
235 Importantly, excavation methods, particularly screen size used to recover bones and teeth, affect measures  
236 of taxonomic abundance (e.g., Casteel 1976; Wheeler and Jones 1989). Given their small size, herring  
237 remains are especially prone to loss and are biased against unless fine mesh sieving and laboratory  
238 analysis of bulk samples are undertaken (Moss 1989). After the records are compiled, we will consider  
239 variation in analytic decisions and sampling approaches across the site records to insure comparability.

240 Data gathered from focus groups, participant observation, historical fisheries and biological records  
241 and zooarchaeological records will then be incorporated into the GIS database and the new results  
242 mapped and analyzed. Final maps will be produced showing historical changes in herring fisheries and  
243 spawning extent in relation to other environmental and human variables over time (see Figure 1). Key  
244 ecological events will be marked on a historical timeline and analyzed using an event ecology framework  
245 in which key variables contributing to the event are assessed as means of building a long term model for  
246 understanding herring stock and spawning dynamics and managing herring fisheries.

#### 247 248 E. Timeline and Milestones

249 The timeline for this project is two years. Outreach through an informational webpage and  
250 educational links with communities would be carried out in Year One to solicit input from local residents  
251 and community organizations on the project, especially the role of LTK. We also will explore the

252 possibility of connecting this project via the website to high school students in two communities well  
 253 endowed with herring fisheries: Sitka and Craig. The remainder of the year would be dedicated to the  
 254 literature review and the synthesizing of the previously collected information from LTK anthropological,  
 255 historical, biological, and other relevant data sources, published and unpublished, and the development of  
 256 a spatiotemporal database and multi-scale mapping framework within which to analyze these data in light  
 257 of our hypotheses. The preliminary maps and database will be completed by Spring 2008 in time for the  
 258 herring spawning season. Focus groups will be organized in conjunction with the selected spring  
 259 fisheries, if possible. The second year will be devoted to work with the focus groups, integrating the  
 260 results of these meetings and participant observation in selected fisheries, and preparation of publications  
 261 and the final products for education and outreach.

262 Tasks and milestones will be organized as follows.

Months	Tasks	Milestones
1-8	Literature review and data compilation in spatiotemporal database; outreach via community consultations and webpage highlighting research design and objectives.	Draft GIS maps; multi-scale spatial and historical database of the socio-ecological system
9-10	Data analysis and representation of interim results; outreach via community consultations and communications of preliminary results.	Develop Interview schedules based on data analysis and community outreach.  Compile zooarchaeological data into tables, text, and database.  Compile historical data into tables, text, and database.
10-11	Focus groups, key respondent interviews, and participant observation to assess preliminary results and fill data gaps.	Recordings and written summaries of focus group meetings and fieldwork in communities.
12-20	Data analysis and integration of focus group and fieldwork results	Final maps and database compiled; draft report on results circulated to communities.
21-24	Revisions and submission of final products; dissemination of results through outreach and education.	Final report, scientific poster, and journal articles (submitted); updated webpage summarizing results for community education and outreach.

264  
 265 The final results will be disseminated in a summary report to the NPRB, communities, and management  
 266 agencies; scientific posters and papers presented at professional meetings; a GIS “project” with a web  
 267 interface, and multiple scientific journal articles appropriate professional journals in anthropology,  
 268 fisheries science, and human ecology, such as *Current Anthropology*, *Journal of Archaeological Science*,  
 269 *Fisheries Oceanography*, and *Human Ecology*.

270 . Outreach and education will be conducted via a mass-produced poster designed for the public  
 271 summarizing the project’s objectives and results in an accessible and attractive format that emphasizes the  
 272 importance of herring--past, present and future--to humans and the marine ecosystem. These materials  
 273 will be disseminated in quantity to local tribes and community schools as aids to promote place-based  
 274 educational curricula and the utility of integrating LTK and scientific perspectives in understanding the  
 275 historical ecology of local resources. Results from the project and relevant supplemental materials will  
 276 also be presented on a website that will be maintained through Portland State University.

277  
278  
279  
280  
281  
282  
283  
284  
285  
286  
287  
288  
289  
290  
291  
292  
293  
294  
295  
296  
297  
298  
299  
300  
301  
302  
303  
304  
305  
306

F. Project Management

Dr. Thomas Thornton (Portland State University), a cultural anthropologist with more than 15 years research experience in Southeast Alaska, will serve as principal investigator and provide overall direction for the project, including outreach, literature review, data synthesis and analysis, focus groups interviews and participant observation. Dr Virginia Butler (PSU) and Dr. Madonna Moss (University of Oregon), archaeologists with a combined 40 years of experience in working with faunal remains in the North Pacific will serve as co-investigators and coordinate the aggregation and analysis of archaeological and paleoenvironmental data. Two graduate students (PSU) will assist in carrying out the data compilation of the data, analysis, and development of the GIS spatiotemporal database in Year One, and one will assist in carrying out the focus groups and final analysis and production of deliverables in Year Two.

Mr. Fritz Funk, a retired Alaska Department of Fish and Game biologist with more than 20 years of experience in managing fish stocks, will collaborate with the team in compiling and analyzing the biological and historical data on herring populations and commercial harvesting. Although the PI and collaborators have experience with GIS mapping and spatial analysis, a local consultant may also be retained to assist with linking the various data into a GIS data frame.

Through cooperative agreements, Sitka Tribe of Alaska (see attached letter of support) and, pending approval, the Organized Village of Kake, Hoonah Indian Association, Angoon Community Association, Craig Indian and-Klawock and Hydaburg Cooperative associations, Ketchikan Indian Corporation and Organized Village of Saxman, Metlakatla Indian Community, Tlingit and Haida Indians of Juneau and Douglas Indian Association, and the Southeast Alaska Intertribal Fish and Wildlife Commission will collaborate as community and regional partners in project design and outreach, LTK data collection and interpretation, and dissemination of results.

G. Figures and Tables

Figure 1 below shows contemporary assessments of major herring stocks in Southeast Alaska, and Table 1 correlates these stocks with the human communities that have historically interacted with them. We propose to conduct focus group meetings and selected interviews in Angoon, Craig-Klawock, Hydaburg, Ketchikan-Saxman, Kake, Juneau-Douglas, Hoonah, and Sitka.

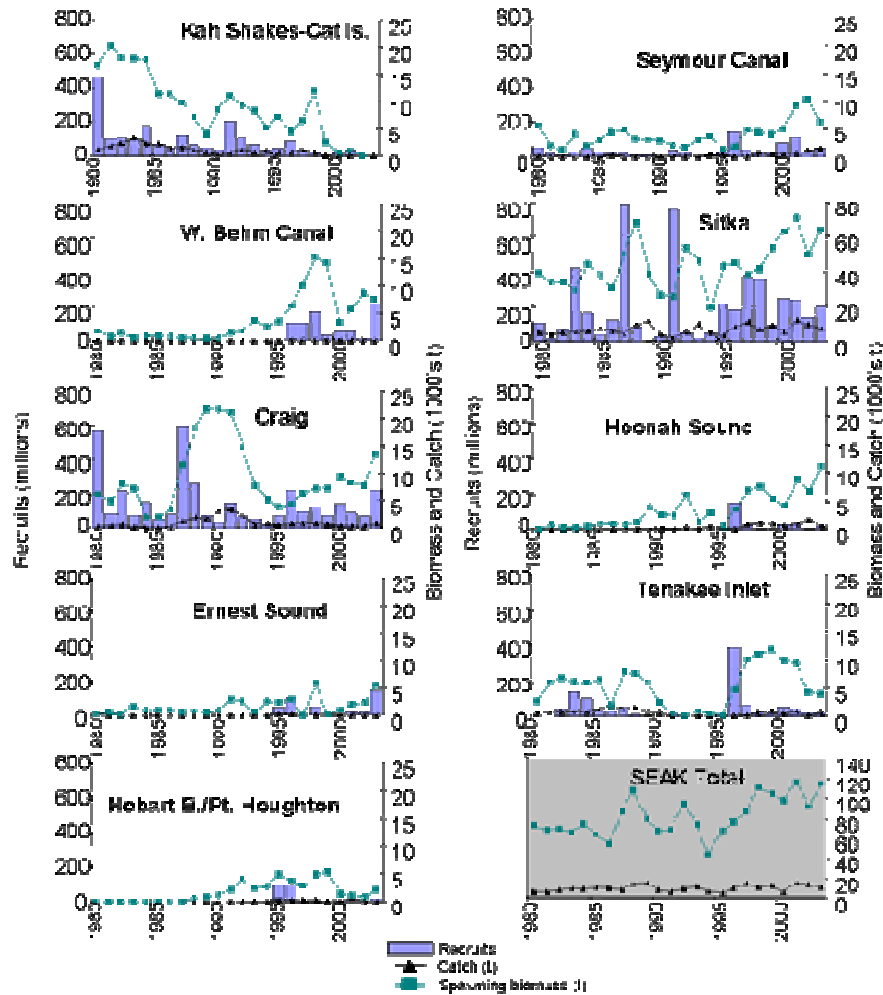


Figure 1. Herring Stock Assessments from Dressel, et al (2005).

Herring Fishery Stocks	Associated Communities
Kah Shakes-Cat Island	*Ketchikan-Saxman, Metlakatla
West Behm	*Ketchikan-Saxman, Wrangell-Petersburg
Craig	*Craig-Klawock, Hydaburg
Ernest Sound	*Kake, Wrangell-Petersburg
Hobart/Pt. Houghton	*Juneau-Douglas, *Kake
Seymour Canal	*Juneau-Douglas, *Kake
Sitka	*Sitka
Hoonah Sound	*Sitka, *Hoonah, Pelican
Tenakee	*Angoon, *Hoonah, Tenakee

Table 1. Herring Stocks & Associated Communities (\* proposed focus group)

307  
308  
309  
310  
311  
312  
313  
314  
315  
316  
317  
318  
319  
320  
321  
322  
323  
324  
325  
326

## H. References

- Ames, T. 2006. Putting Fishers' Knowledge to Work. 2006. Reconstructing the Gulf of Maine Cod Spawning Grounds on the Basis of Local Ecological Knowledge. In *Fisheries Knowledge in Fisheries Science and Management.*, pp. 351-354. UNESCO.
- Brown, E. D., J. Seitz, B. L. Norcross, and H. P. Huntington. 2002. Ecology of Herring and Other Forage Fish as Recorded by Resource Users of Prince William Sound and Outer Kenai Peninsula, Alaska. *Alaska Fishery Research Bulletin* 9(2):75-101.
- Butler, V.L. and S.K. Campbell 2004. Resource Intensification and Resource Depression in the Pacific Northwest of North America: A Zooarchaeological Review. *Journal of World Prehistory* 18:327-405.
- Carlson, H.R. 1980. Seasonal Distribution and Environment of Pacific Herring near Auke Bay, Lynn Canal, Southeastern Alaska. *Transactions of the American Fisheries Society* 109:71-78.
- Casteel, R. W. 1976. *Fish Remains in Archaeology*. Academic Press, New York.
- Dressel, S., K. Hebert, M. Pritchett, and D. Carlisle. 2005. *Ecosystem Status Indicators: Herring*. Alaska Department of Fish & Game, online document,

327 <http://access.afsc.noaa.gov/reem/EcoWeb/html/EcoContribution.cfm?ID=29>, accessed November  
328 21, 2006.

329 Dyer, C.L., D.A. Gill, and J.S. Picou. 1992. Social disruption and the Valdez Oil Spill: Alaskan Natives  
330 in a Natural Resource Community. *Sociological Spectrum* 12(2): 105-126

331 Emmons, G.T. 1990. *The Tlingit Indians*. Edited with additions by F. de Laguna. Seattle: University of  
332 Washington Press and the American Museum of Natural History.

333 Grayson, D.K. 1984. *Quantitative Zooarchaeology*. Academic Press, New York.

334 Huizer, E.J. 1952. History of the Alaska Herring Fishery, pp. 65-76. Alaska Department of Fish, *Annual*  
335 *Report for 1952*. Juneau.

336 Johannes, R. E. 1981. *Words of the Lagoon: Fishing and Marine Lore in the Palau District of*  
337 *Micronesia*. Berkeley: University of California Press.

338 Johannes, R.E. 1993. Integrating Traditional Ecological Knowledge and Management with  
339 Environmental Impact Assessment. In J.T. Inglis, editor, *Traditional Ecological Knowledge:*  
340 *Concepts and Cases*, pp. 33-39. Canadian Museum of Nature. Ottawa.

341 Lyman, R.L. 1994. *Vertebrate Taphonomy*. Cambridge University Press, Cambridge.

342 Lyman, R.L. and K.P. Cannon 2004. (eds.). *Zooarchaeology and Conservation Biology*. University of  
343 Utah Press, Salt Lake.

344 Monks, G. G. 1987. Prey as Bait: The Deep Bay Example. *Canadian Journal of Archaeology* 11:119-142.

345 Moss, M.L. 1989 Archaeology and Cultural Ecology of the Prehistoric Angoon Tlingit. Ph.D.  
346 Dissertation, Univ. California-Santa Barbara, Dept. of Anthropology.

347 Redman, C.L., J. M. Grove, and L. H. Kuby. 2004. Integrating Social Science into the Long-Term  
348 Ecological Research (LTER) Network: Social Dimensions of Ecological Change and Ecological  
349 Dimensions of Social Change. *Ecosystems* 7:161-171.

350 Reid, Gerald M. 1971. Age Composition, Weight, Length, and Sex of Herring, *Clupea pallasii*, Used for  
351 Reduction in Alaska, 1929-66. *NOAA Technical Report NMFS SSRF 634*. Seattle Washington.

352 Rounsefell, G. A. 1930 Contribution to the Biology of the Pacific Herring, *Clupea pallasii*, and the  
353 condition of the fishery in Alaska. *Bulletin of the U.S. Bureau of Fisheries* 46:225-320. Document  
354 No. 1080.

355 Schroeder, R. F. and M. Kookesh. 1990. *Subsistence Harvest of Herring Eggs in Sitka Sound*. Alaska  
356 Department of Fish and Game, Division of Subsistence Technical Paper #173. Juneau.

357 Sepez, J., C. Package, J. Isaacs, K. Nixon (compilers). 2003. *NOAA Fisheries Alaska Native TEK*  
358 *Database: A Compilation of Existing Source Material Documenting the Traditional Ecological*  
359 *Knowledge of Alaska Natives, with a Focus on Marine Resources*. Unpublished database accessed  
360 through the National Marine Fisheries Service, Alaska Fisheries Science Center, Economics and  
361 Social Science Research Program, Seattle.

362 Skud, B E.1959. *Herring Spawning Surveys in Southeastern Alaska*. U.S. Fish and Wildlife Service  
363 Special Scientific Report Fisheries No. 321.

364 Skud, B.E., H.M. Sakuda, and G.M. Reid. 1960. Statistics of the Alaska Herring Fishery 1878-1956. U.S.  
365 *Fish and Wildlife Service Statistical Digest* 48.

366 Stewart, Hillary. 1977. *Indian Fishing: Early Methods on the Northwest Coast*. Seattle: University of  
367 Washington Press.

- 368 STA (Sitka Tribe of Alaska). n.d. *Herring Files*. Documentary and interview records housed at tribal  
369 offices, Sitka, AK.
- 370 Swanton, J. R. 1905. Tlingit Method of Collecting Herring Eggs. *American Anthropologist* 7(1):172.
- 371 Thornton, T. F. 2007. *Traditional Cultural Property Evaluation of Auke Cape, Alaska*. Unpublished  
372 report and interview files in author's possession.
- 373 Thornton, T. F. 2005. Last of the Sealers or Last of the Seals? *Natural History* ("Picks from the Past"  
374 online feature, [www.naturalhistorymag.org](http://www.naturalhistorymag.org)), June.
- 375 Thornton, T.F. and A. Midgett. 1996. Tlingit Traditional Ecological Knowledge: An Elder's Perspective,  
376 Herman Kitka Sr. Sitka Kaagwaantaan. Alaska Native Knowledge Network website  
377 ([www.ankn.uaf.edu](http://www.ankn.uaf.edu)).
- 378 Vayda, P. and B. B. Walters. 1999. Against Political Ecology. *Human Ecology* 27: 167-79.
- 379 Victor, A-M. n.d. *Subsistence Harvest and Trade of Herring Eggs on Macrocystis Kelp in Hydaburg,*  
380 *Alaska*. Alaska Department of Fish and Game, Division of Subsistence Technical Paper #225  
381 (forthcoming). Juneau.
- 382 Wheeler, A. and A.K.G. Jones. 1989. *Fishes*. Cambridge University Press, Cambridge.
- 383 Williams, E.H. and T.J. Quinn. 200. Pacific Herring, *Clupea Pallasii*, recruitment in the Bering Sea and  
384 North-east Pacific Ocean, II: Relationships to environmental variables and implications for  
385 forecasting. *Fisheries Oceanography* (9):300-315.

## NPRB BUDGET SUMMARY FORM - MULTIPLE ORGANIZATIONS

<b>PROJECT TITLE:</b>	Herring Synthesis			
<b>PRINCIPAL INVESTIGATOR(S):</b>	Thomas F. Thornton; PI names from 2nd organization; PI names from 3rd organization; PI names from 4th organization			
<b>FUNDING SOURCE</b>	<b>YEAR 1</b>	<b>YEAR 2</b>	<b>YEAR 3</b>	<b>TOTAL</b>
<b>NPRB Funding</b>	51,741	#VALUE!	#VALUE!	#VALUE!
<b>Other Support</b>				0
<b>TOTAL</b>	51,741	#VALUE!	#VALUE!	#VALUE!

Annual cost category breakdowns will be requested for other support only if project is funded

<b>Cost Categories</b>	<b>NPRB Year 1</b>	<b>NPRB Year 2</b>	<b>NPRB Year 3</b>	<b>NPRB TOTAL</b>	<b>Match/In kind TOTAL (all years)</b>
<b>1. Personnel Salaries</b>	29,436	17,445	#VALUE!	#VALUE!	0
<b>2. Personnel Fringe Benefits</b>	4,999	2,710	0	7,709	0
<b>3. Travel (include 1 trip to review mtg in Anchorage each year plus for the year following project conclusion)</b>	980	8,240	0	9,220	0
<b>4. Equipment</b>	0	#VALUE!	#VALUE!	#VALUE!	0
<b>5. Supplies</b>	190	0	0	190	0
<b>6. Contractual/Consultants</b>	5,000	8,000	0	13,000	0
<b>7. Other (Include \$2000 for education and outreach)</b>	500	1,500	0	2,000	0
<b>Total Direct Costs</b>	<b>41,105</b>	<b>#VALUE!</b>	<b>#VALUE!</b>	<b>#VALUE!</b>	<b>0</b>
<b>Indirect Costs</b>	10,636	10,364	0	21,000	0
<b>TOTAL PROJECT COSTS</b>	<b>51,741</b>	<b>#VALUE!</b>	<b>#VALUE!</b>	<b>#VALUE!</b>	<b>0</b>

**VIRGINIA L. BUTLER**  
Professor, Department of Anthropology  
Portland State University  
November 2006

**Education**

Ph.D., 1990, interdisciplinary program in Paleolithicology, University of Washington

M.A., 1983, Anthropology, University of Washington

B.A., 1977, Anthropology, University of Georgia, *magna cum laude* with honors in Anthropology

**Employment**

1994-present: Professor (9/06), Associate Professor (9/00), Assistant Professor (9/94), Department of Anthropology, Portland State University

NORCUS Fellow, Postdoctoral Research Associate, U.S. Dept. Energy Laboratory, Richland, WA., Feb. 1992-Feb. 1993

Research Associate, University of Colorado Museum and Department of Anthropology, June 1990-Dec. 1993

From 1980-1994, as graduate student Research Assistant or private consultant, analysis of faunal remains (primarily fish) from over 25 locations in Washington, Oregon, Nevada, Missouri, Cook Islands, New Guinea, and Pakistan.

From 1977-1994, as a student Research Assistant, private consultant, or employee, employed as field archaeologist on projects in Alaska, Washington, Missouri, Oregon, and the Cook Islands. Employers included State of Alaska, National Park Service, U.S. Fish & Wildlife Service, and State of Washington.

**Selected Publications**

**Butler, V.L.** and S.K. Campbell (2004). Resource intensification and resource depression in the Pacific Northwest of North America: a zooarchaeological review. *Journal of World Prehistory* 18(4): 327-404.

**Butler, V.L.** (2004). Where have all the native fish gone? The fate of the fish that Lewis and Clark encountered on the lower Columbia River. *Oregon Historical Quarterly* 105(3):438-463.

**Butler, V.L.** and J. E. O'Connor. (2004). 9,000 years of fishing on the Columbia River. *Quaternary Research* 62 (1):1-8.

**Butler, V.L.** (2001) Changing Fish Use on Mangaia, Southern Cook Islands: Resource Depression and the Prey Choice Model, *International Journal of Osteoarchaeology*. 11:88-100.

**Butler, V.L.** (2000) Resource depression on the Northwest Coast of North America. *Antiquity* 74:649-661.

**Butler, V.L.** and R. A. Schroeder (1998) Do Digestive Processes Leave Diagnostic Traces on Fish Bones? *Journal of Archaeological Science* 25:957-971.

**Butler, V.L.** and N. J. Bowers (1998) Ancient DNA from Salmon Bone: A Preliminary Study, *Ancient Biomolecules*. 2:17-26.

**Butler, V.L.** (1996) Tui chub taphonomy and the importance of marsh resources in the western Great Basin of North America. *American Antiquity* 61(4):699-717.

Chatters, J.C., **V.L. Butler**, M.J. Scott, D.M. Anderson, and D.N. Neitzel (1995) A paleoscience approach to estimating the effects of climatic warming on salmonid fisheries of the Columbia River basin. *Canadian Special Publication of Journal of Fisheries and Aquatic Sciences* 121:489-496.

**Butler, V.L.** & J.C. Chatters (1994) The role of bone density in structuring prehistoric salmon bone assemblages. *Journal of Archaeological Science* 21:413-424.

**Butler, V.L.** (1994) Fish feeding behaviour and fish capture: the case for variation in Lapita fishing strategies. *Archaeology in Oceania* 29:81-90.

**Butler, V.L.** (1993) Natural vs. cultural salmonid remains: origin of The Dalles Roadcut bones, Columbia River, Oregon. *Journal of Archaeological Science* 20:1-24.

### **Synergistic Activities**

2005-currently, Editorial Board, *Journal of Coastal and Island Archaeology*, Routledge

2005- currently. Distinguished Lecturer, Sigma Xi. Presentations to professionals and lay public about science research to Sigma Xi chapters in the U.S.

1996- currently. Practitioner/Role Model for AWSEM (Advocates for Women in Science, Engineering, and Mathematics), a NSF-funded project to support a regional network for practitioners, school groups, and parents committed to science education for girls and young women. Butler has given workshops, invited girls into her lab, made presentations to school groups, and moderated sessions at science fairs.

1998-2000. PSU campus advisor for AISES (American Indian Sciences and Engineering Society).

### **Collaborators**

Jim O'Connor, USGS, Portland

Sarah Campbell, Western Washington University

James C. Chatters, Tetrattech FW

### **Thesis Advisor**

Donald Grayson, University of Washington

### **Students Supervised**

K. McDonald, M. Martin, N. Stutte, M. Carter, K. Easton, M. Adams, R. Smith (Portland State University)

## MADONNA L. MOSS

Complete vita can be found: <http://darkwing.uoregon.edu/mmoss/>

Professor, Department of Anthropology, University of Oregon

### EDUCATION:

B.A. 1976 College of William and Mary, Williamsburg, Virginia  
M.A. 1982 University of California, Santa Barbara  
Ph.D. 1989 University of California, Santa Barbara

### POSITIONS HELD:

1990- present Professor (9/04), Associate Professor (9/97), Assistant Professor (9/94), Visiting Assistant Professor (9/90), Department of Anthropology, University of Oregon

1989-1990 Visiting Assistant Professor  
Department of Anthropology, University of Alaska, Fairbanks

1989 Field Archaeologist, Exxon, USA. Archaeological survey and site evaluations after 1989 oil spill. Prince William Sound & Kodiak Island, Alaska.

1983 Archaeologist, Admiralty Island National Monument, Juneau, AK. Managed CRM program on 1.1 million acres; directed oral history project involving 20 Tlingit elders in 5 Native communities.

1983-1982 Archaeologist, Tongass National Forest, Sitka, AK.

### SELECTED PUBLICATIONS

Moss, M. L., Yang, D. Y., Newsome, S. D., Speller, C. F., McKechnie, I., McMillan, A. D., Losey, R. J., and Koch, P. L. (2006). Historical Ecology and Biogeography of North Pacific Pinnipeds: Isotopes and Ancient DNA from Three Archaeological Assemblages. *Journal of Island and Coastal Archaeology* 1:165-190.

Moss, Madonna L. (2005) Tlingit Horticulture: an Indigenous or Introduced Development? In: *Keeping it Living: Traditions of Plant Use and Cultivation on the Northwest Coast of North America*, edited by Douglas Deur and Nancy J. Turner, pp. 274-295. University of Washington Press, Seattle.

Newton, Richard G. and Madonna L. Moss (2005) *Haa Atxaayi Haa Kusteeyix Sitee, Our Food is our Tlingit Way of Life: Excerpts of Oral Interviews*. USDA Forest Service, Alaska Region, R10-MR-30, March 2005. Juneau, AK.

Moss, Madonna L. (2004) The Status of Archaeology and Archaeological Practice in Southeast Alaska in Relation to the Larger Northwest Coast. *Arctic Anthropology* 41(2):177-196.

Moss, Madonna L. (2004) Island societies are not always insular: Tlingit territories in the Alexander Archipelago and the adjacent Alaskan mainland. In *Voyages of Discovery: the Archaeology of Islands*, edited by Scott M. Fitzpatrick, pp. 165-183. Greenwood Press, Westport, CN.

Moss, Madonna L. (2004) *Archaeological Investigation of Cape Addington Rockshelter: Human Occupation of the Rugged Seacoast on the Outer Prince of Wales Archipelago, Alaska*.

University of Oregon Anthropological Paper No. 63. University of Oregon, Eugene. For order information, see: <<http://darkwing.uoregon.edu/~anthro/pubs/UOpapers03.html>>

Moss, Madonna L. and Robert J. Losey 2003 Resource Use on the Northwest Coast: Case Studies from Southeast Alaska and Oregon. *Proceedings of the 17th International Abashiri Symposium: People and Culture in the North Pacific from the Viewpoint of the Use of Biological Resources*, pp. 39-46. Hokkaido Museum of Northern Peoples, Abashiri, Japan.

Moss, Madonna L. (2003) Comment on Huna Tlingit Traditional Environmental Knowledge, Conservation, and the Management of a "Wilderness" Park. *Current Anthropology* 44(4):96-97.

Lepofsky, Dana, Natasha Lyons, and Madonna L. Moss 2003 The Use of Driftwood on the North Pacific Coast: an Example from Southeast Alaska. *Journal of Ethnobiology* 23(1):125-141.

Moss, Madonna L. and Jon M. Erlandson 2002 Animal Agency and Coastal Archaeology. *American Antiquity* 67(2):367-369.

Erlandson, Jon M. and Madonna L. Moss (2001) Shellfish Feeders, Carrion Eaters, and the Archaeology of Aquatic Adaptations. *American Antiquity* 66(3):413-432.

Moss, Madonna L. and Jon M. Erlandson 2001 The Archaeology of Obsidian Cove, Suemez Island, Southeast Alaska. *Arctic Anthropology* 38(1):27-47.

Lepofsky, Dana, Madonna L. Moss, and Natasha Lyons 2001 The Unrealized Potential of Paleoethnobotany in the Archaeology of Northwestern North America: Perspectives from Cape Addington Rockshelter, Southeast Alaska. *Arctic Anthropology* 38(1):48-59.

Bowers, Peter M. and Madonna L. Moss 2001 The North Point Wet Site and the Subsistence Importance of Pacific Cod on the Northern Northwest Coast. In *People and Wildlife in Northern North America: Essays in Honor of R. Dale Guthrie*, edited by S. Craig Gerlach and Maribeth S. Murray, pp. 159-177. BAR- British Archaeological Report International Series 944.

Moss, Madonna L. and Jon M. Erlandson 2000 Wolf's Lair: Middle and Late Holocene Wooden Artifacts from a Sea Cave on Baker Island, Alaska. *Canadian Journal of Archaeology* 24:107-128.

Erlandson, Jon M. and Madonna L. Moss (1999) The Systematic Use of Radiocarbon Dating in Archaeological Surveys in Coastal and Other Erosional Environments. *American Antiquity* 64(3):431-443.

Moss, Madonna L. 1998 Northern Northwest Coast Regional Overview. In: *North Pacific and Bering Sea Maritime Societies: the Archaeology of Prehistoric and Early Historic Coastal Peoples*. *Arctic Anthropology* 35(1):88-111.

Moss, Madonna L. and Jon M. Erlandson 1998 A Comparative Chronology of Northwest Coast Fishing Features. In *Hidden Dimensions: the Cultural Significance of Wetland Archaeology*, edited by Kathryn Bernick, pp. 180-198. University of British Columbia Press, Vancouver.

***Thomas Fox Thornton***

Associate Professor  
Portland State University  
Email: thomas.thornton@trincoll.edu

**EDUCATION**

1995	University of Washington, Seattle	Ph.D. in Anthropology
1989	University of Washington, Seattle	M.A. in Anthropology
1986	Swarthmore College, Phi Beta Kappa	B.A. in Sociology/Anthropology

**ACADEMIC POSITIONS**

2006- **Associate Professor** of Anthropology, Portland State University.  
2003-06 **Visiting Associate Professor**, Department of Anthropology, Trinity College, Hartford, CT.  
2001-03 **Associate Professor**, Department of Global Studies, Saint Lawrence University, Canton, NY.  
2002 **Fulbright Lecturer** (China), Beijing Normal University, Beijing, China.  
1998-00 **Associate Professor** of Anthropology, University of Alaska Southeast, Juneau.

**RESEARCH APPOINTMENTS AND GRANTS**

2005- *Alaska Rockfish: Subsistence Harvests and Local Knowledge of Alaska Rockfish*. Cooperative project with Alaska Department of Fish & Game, funded by North Pacific Research Board.

2004- *Southeast Alaska Subsistence Fisheries Traditional Ecological Knowledge Database*. Cooperative project on salmon with Sitka Tribe of Alaska (Tlingit) and the Alaska Department of Fish and Game, Division of Subsistence.

2000 *Rockefeller Brothers Foundation Grant for the Development of GIS* technologies for teaching Global Studies at St. Lawrence University. .

1998 *Fellow, National Endowment for the Humanities*. Book project, *Being and Place Among the Tlingit*.

1994-01 *Southeast Alaska Native Place Names Project*, National Park Service grants (3). PI for cooperative project with the Southeast Native Subsistence Commission to document Tlingit and Haida place names and cultural associations in Southeast Alaska.

1991-94 *Subsistence Resource Specialist I-II*. Alaska Department of Fish & Game, Division of Subsistence, Juneau, Alaska. Applied research on harvest, use, and management of fish and game resources. Assignments and duties included:

- 1) Field research on subsistence harvests of fish and wildlife resources in rural communities.
- 2) Training and supervision of local researchers for multi-year National Marine Fisheries Service survey of seal and sea lion harvest in Alaska Native communities.
- 3) Cooperative mapping projects with Huna Traditional Tribal Council to document Tlingit place names and subsistence sites in Glacier Bay National Park.
- 4) Major research projects on: a) subsistence use of sockeye salmon, b) harvest and use of bear, and c) traditional harvest and use of marine mammals in Southeast AK.
- 5) Field review, quantitative analysis, and qualitative interpretation of data on subsistence use of fish and game in 30 Southeast AK communities.
- 6) Compiling deer and seal harvest database for Southeast AK and developing computerized (GIS) spatial analysis tools for evaluating harvest patterns.
- 7) Providing review of effects on subsistence of land use plans. Preparing and presenting reports on subsistence to State Boards of Fish & Game and Federal Subsistence Board.

**PUBLICATIONS****BOOKS, MONOGRAPHS, FILMS & CD-ROMS**

- 2007 *Being and Place Among the Tlingit*. Forthcoming, University of Washington Press.
- 2006 *Haa Léelk'w Has Aaní Saax'ú: Our Grandparents Names on the Land*. Editor for cultural atlas based on Tlingit and Haida place names of Southeast Alaska. To published by Sealaska Heritage Institute and University of Washington Press in 2007-08.
- 2004 Klondike Gold Rush National Historical Park Ethnographic Overview and Assessment. Monograph Published by National Park Service (GPO).
- 2000 *Will the Time Ever Come? A Tlingit Sourcebook*. Edited by Andrew Hope III and Thomas F. Thornton. Fairbanks: Alaska Native Indigenous Knowledge Network, University of Alaska.
- 1999 *Southeast Alaska Native Cultural Atlas for Macintosh and Windows*. CD-ROMs combine Native place names with geographic maps, sound files, and other ethnographic links. Project supported by Angoon and Kake tribal governments, University of Alaska Southeast, and the Alaska Rural Systemic Initiative (National Science Foundation and the Alaska Federation of Natives).
- 1999 *A Time of Gathering: Tlingit Berry Picking in Glacier Bay National Park*. Executive Producer and Director for this 20-minute ethnographic film. Distributed by Hoonah Indian Association, Hoonah, AK.
- 1998 *Haa Aaní: Our Land. Tlingit and Haida Land Rights and Use* by Walter R. Goldschmidt and Theodore Haas, edited with Introduction by Thomas F. Thornton. University of Washington Press and Sealaska Heritage Foundation.
- 1998 *Traditional Tlingit Use of Sitka National Historical Park*. Monograph published by National Park Service.

**SELECTED ARTICLES & CHAPTERS**

- 2007 Alaska Native Corporations and Subsistence: Paradoxical Forces in the Construction of Sustainable Communities. In *Sustainability and Communities of Place*, ed. by C. Maida. Berghahn (in press).
- 2005 Last of the Sealers or Last of the Seals? *Natural History* ("Picks from the Past" online feature), June.
- 2005 Huna Tlingit Gull Egg Harvests in Glacier Bay National Park (with E. Hunn, et al.). *Practicing Anthropology* 27(1):6-10.
- 2004 The Geography of Tlingit Character. In *Coming to Shore. Northwest Coast Ethnology. Traditions and Visions*, ed. by M. Mause, et al., pp. 363-384. University of Nebraska Press,
- 2005 Subsistence Research in Alaska: A Thirty Year Retrospective (with Polly Wheeler). *Alaska Journal of Anthropology* 3(1).
- 2003 Huna Tlingit Traditional Environmental Knowledge, Conservation, and the Management of a "Wilderness" Park. (with E.Hunn, et al). *Current Anthropology* 44 (Supp.): S79-103.
- 1999 *Tleikw Aaní, The Berried Landscape: The Structure of Tlingit Edible Fruit Resources at Glacier Bay, Alaska*. *Journal of Ethnobiology*, Vol. 19(1):27-48.
- 1998 Crisis in the Last Frontier: The Alaskan Subsistence Debate. Guest edited (Fall) issue of *Cultural Survival Quarterly* and wrote the lead article, "Alaska Native Subsistence: A Matter of Cultural Survival."
- 1997 Know Your Place: The Organization of Geographic Knowledge among the Tlingit. *Ethnology* 36(4):295-307.
- 1997 Anthropological Studies of Native American Place Naming. *American Indian Quarterly* 21(2):209-228.
- 1995 Tlingit and Euro-American Toponymies in Glacier Bay. *Proceedings of the Second Glacier Bay Science Symposium, 1993*. Anchorage: National Park Service.