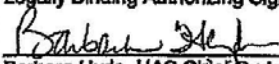



NPRB Use Only Reference No: <u>48</u> Date Received: <u>12/10/04</u>	<b>NPRB PROPOSAL SUMMARY PAGE</b> (To be filled in by applicant)
Project Title: <u>Ice Seal Movements and Stock Structure in a Changing Cryosphere</u>	
Project Period: From Date: <u>May 1, 2005</u> to <u>April 30, 2007</u>	
Name, Address, Telephone Number and Email Address of Applicant: Dr. Brendan P. Kelly 11120 Glacier Highway Juneau, Alaska 99801 907-465-6510 <a href="mailto:brendan.kelly@uas.alaska.edu">brendan.kelly@uas.alaska.edu</a>	
Principal Investigator(s): (Include name, affiliation and email address) Brendan P. Kelly, University of Alaska Southeast <a href="mailto:brendan.kelly@uas.alaska.edu">brendan.kelly@uas.alaska.edu</a> Peter Boveng, National Marine Mammal Lab., NMFS <a href="mailto:peter.boveng@noaa.gov">peter.boveng@noaa.gov</a>	
Component 1 – Specific Project Needs (Goal and need): <u>Project Need 4(2): Ice Seal Studies</u> or Component 2 – General Research Priorities (a-g): One Primary _____ One Secondary _____	
Summary of Proposed Work (250 words or less):  Ice seasonally covers 14,000,000 km <sup>2</sup> of northern seas and supports an ecosystem that includes spotted, ribbon, ringed, and bearded seals. These ice-associated seals are the main prey of polar bears and have been vital to the subsistence economy of northern people for thousands of years. The sea ice ecosystem and subsistence economies in the arctic are threatened by decreases in sea ice cover associated with climate change. Assessing the impacts on the ice-associated seals requires knowledge of their movement patterns and population biology. Understanding the population structure of ice-associated seals will help the NMFS and Alaska Natives to manage and protect these important components of "the ecologically diverse marine ecosystems of the North Pacific, and provide long-term, sustained benefits to local communities and the nation," a research goal of the NPRB. A primary need is to understand the vulnerability of local subpopulations of seals to extinction. If immigration occurs from other populations, vulnerability is low, but if immigration is absent or very rare, the potential for local extinction is high. We propose to use satellite-linked transmitters to determine whether ringed seals return to the same breeding locations in successive breeding seasons, an indication that immigration rates are low. We also will collect and analyze DNA samples as a further indication of the frequency of immigration. If DNA extraction from shed hair or skin collected on the ice is successful, we will develop protocols for extending the method to other species of ice-associated seals.	
Funding: Total NPRB Funding Requested: Total Cost: \$203,644 (UAS) Total Matching Funds Used: \$ 228,642	
Legally Binding Authorizing Signature and Affiliation:  Barbara Hyde, UAS Chief Budget Officer  Douglas DeMaster, Director, Alaska Fisheries Science Center, NMFS	

1 Research Plan

- 2
- 3 A. Project Title: Ice seal movements and stock structure in a changing cryosphere
- 4 B. Short title: Ice seal movements
- 5
- 6 C. Proposal Summary:
- 7

8 Ice seasonally covers 14,000,000 km<sup>2</sup> of northern seas and supports an ecosystem that includes spotted,  
9 ribbon, ringed, and bearded seals. These ice-associated seals are the main prey of polar bears and have  
10 been vital to the subsistence economy of northern people for thousands of years. The sea ice ecosystem  
11 and subsistence economies in the arctic are threatened by observed and predicted decreases in sea ice  
12 cover associated with climate change. Assessing the impacts on the ice-associated seals requires  
13 knowledge of their movement patterns and population biology. A better understanding of the population  
14 biology and population structure of ice-associated seals will help the NMFS and Alaska Natives to  
15 manage and protect these important components of “the ecologically diverse marine ecosystems of the  
16 North Pacific, and provide long-term, sustained benefits to local communities and the nation.” A primary  
17 need is to understand how vulnerable local subpopulations of seals are to extinction. If immigration  
18 occurs from other populations, then the vulnerability is low, but if immigration is absent or very rare, then  
19 the potential for local extinction is high. We propose using satellite-linked transmitters to determine  
20 whether ringed seals return to the same breeding locations in successive breeding seasons, an indication  
21 that immigration rates are low. We also will collect genetic samples in the form of small skin samples  
22 taken from captured ringed seals and samples of shed skin and hair found on the ice. Those samples will  
23 be analyzed for DNA markers as further indication of the frequency of immigration. If DNA extraction  
24 from shed hair or skin is successful, we will develop protocols for extending the method to other species  
25 of ice-associated seals.

26

27

- 28 D. Project Responsiveness to NPRB Research Priorities or identified project needs:
- 29

30 Spotted seals (*Phoca largha*), ribbon seals (*Phoca fasciata*), ringed seals (*Phoca hispida*), and bearded  
31 seals (*Erignathus barbatus*) breed, rest, and molt on the seasonal sea ice of the Bering, Chukchi, and  
32 Beaufort Seas (Burns 1970; Fay 1974). Their dependence on sea ice puts them at risk as the arctic climate  
33 changes and seasonal ice cover decreases (ACIA 2004). Changes in sea ice thickness, extent, and snow  
34 cover associated with climate change have been non-uniform (Serreze et al. 2000, 2003; Overland 2002;  
35 Stone et al. 2002), and the effects on ice-associated seals thus are likely to vary on regional scales (Tynan  
36 and DeMaster 1998; Kelly 2001). Ringed seals are thought to be particularly vulnerable because of their  
37 especially strong dependence on sea ice as breeding habitat and on snow cover for protection from cold  
38 and predators (Kelly 2001; Smith and Stirling 2003; ACIA 2004). Ice-associated seal populations may be  
39 negatively impacted by offshore oil and gas development (Smith and Geraci 1975; Geraci and Smith  
40 1976; Englehardt 1978; Barnes et al. 1979; Kelly 1988; Richardson and Williams 2000) as well as by  
41 climate change. Our ability to predict impacts, however, is limited by inadequate knowledge of seal  
42 population structure (Angliss and Lodge 2002) and foraging ecology (Kelly 1988; Kelly and Wartzok  
43 1996; Simpkins et al. 2001). The population structure of the ice-associated seals is poorly known  
44 (Angliss and Lodge 2002), but recent genetic analyses have revealed a high level of stock structuring  
45 among harbor seals (*Phoca vitulina*) (O’Corry-Crowe et al. 2003), suggestive of pronounced philopatry.  
46 Observations of philopatry in southern elephant seals (*Mirounga leonina*), Weddell seals (*Leptonychotes*  
47 *weddellii*), and grey seals (*Halichoerus grypus*) (Hindell and Little 1988; Siniff et al. 1988; Pomeroy et al.  
48 2000) suggest that it may be a primitive and widely spread trait among phocid seals. Recently, we  
49 reported evidence of strong fidelity to breeding sites among individual ringed seals (Kelly et al. 2003).  
50 We radio tracked 60 ringed seals and demonstrated that they are confined to very small sub-ice home

51 ranges (mean = 1 km<sup>2</sup>) during the breeding season (Figure 1). As the number of identified seals  
52 (recognized by unique pelage patterns and flipper tags) increased, we began to recapture seals caught in  
53 previous years. An adult male captured and tracked in May – June 2001 was recaptured in May 2002. In  
54 April and May 2003, we recaptured another adult male and an adult female first captured in April 2002.  
55 All three seals were recaptured within 2 km of their previous capture site, and each occupied home ranges  
56 that were similar in size, shape, and number of on-ice resting sites during two subsequent breeding  
57 seasons (Figure 2). Such strong inter-annual site fidelity was unexpected and suggests that, as with  
58 harbor seals, the pan arctic ringed seal may be comprised of a great many demographically isolated  
59 stocks. Elsewhere, we have proposed to investigate the implications on ringed seal foraging ecology of  
60 geographically restricted stocks. Here, we propose to investigate the seasonal movements and population  
61 structure of ringed seals. The methods developed and employed in this study will have application in  
62 future studies of other ice-associated seals.

63  
64 Ringed seals have long been important in the subsistence economy of indigenous arctic people, and  
65 human colonization of the arctic was facilitated by the year-round presence of ringed seals, which served  
66 as a source of food, fuel, and skins used for clothing and tents (Hall 1866; Boas 1888; Stefansson 1913;  
67 Manning 1944; Wenzel 1984). Today, an estimated 10,000 ringed seals are taken each year by  
68 subsistence hunters in Alaska (Angliss and Lodge 2002), but Inuit hunters have reported decreased  
69 availability of ringed seals associated with decreasing sea ice cover (ACIA 2004). The ability of ringed  
70 seals to inhabit the high arctic throughout the winter, when other ice-associated seals move south, is  
71 largely a function of their habits of excavating breathing holes in the ice and lairs in the snow above those  
72 holes (Chapskii 1940; McLaren 1958a). Maintaining those breathing holes allows ringed seals to remain  
73 in areas of otherwise continuous ice cover. The subnivean lairs provide protection from cold and  
74 predators, especially for the young which are born (late March – late April) and nursed (April and May)  
75 within the lairs.

76  
77 Early snowmelts expose ringed seal pups prematurely and increase their mortality rates due to thermal  
78 stress (Smith and Stirling 2003) and predation (Lydersen and Gjertz 1986; Lydersen and Smith 1989). In  
79 our radio tracking study near Prudhoe Bay, we observed that ringed seals began abandoning their lairs  
80 earlier every year between 1999 (7 June) and 2003 (2 June) (Kelly et al. 2003). Furthermore, the date on  
81 which the last tagged seal abandoned its lair was accurately predicted by snowmelt dates determined with  
82 passive microwave imagery ( $r^2 = 0.982$ ,  $p < 0.001$ ). In recent decades, the onset of snowmelt has  
83 advanced at an even faster pace to the west near Point Barrow where it now occurs about 10 days earlier  
84 than in 1941 (Stone et al. 2002). The earlier melts correspond to a rapid increase in variability of May air  
85 temperatures on the Alaskan North Slope since 1990 (ACIA 2004). At the same time, winter snow  
86 accumulation has decreased near Barrow. The combination of low snow accumulation and early melts is  
87 likely to threaten ringed seals near Barrow with especially high rates of juvenile mortality.

88  
89 The NMFS is legally mandated to manage seal stocks, and the Ice Seal Working Group and the Alaska  
90 Nanuuq Commission, as representatives of seal hunters, are keenly interested in seal management.  
91 Effective management of exploited populations depends on proper identification of stock structure and  
92 accurate estimates of population size and harvest levels. While population estimation and harvest rates  
93 have received considerable attention from researchers and managers (McLaren 1958b; Fedoseev 1968;  
94 Burns and Harbo 1972; Stirling et al. 1975; Riewe and Amsden 1979, Frost et al. 1988: 2002; Wright  
95 1989, Smith 1999, Harwood et al. 2000), investigation of population structure has only recently begun  
96 (Palo et al. 2001, 2003). The NMFS and the ADFG have been collecting tissue samples for genetic  
97 analysis from the subsistence harvest. Unfortunately, little of that harvest takes place during the breeding  
98 season, and it is not possible to relate those samples to dispersal or stock structure. We believe that  
99 accurate population and harvest estimates will be of little value without proper identification of stock  
100 structure. Nor will it be possible to gauge the impacts of climate change without knowledge of at least the

101 scale of population structuring.

102  
103 We propose to investigate stock structure by tracking the movements of satellite-tagged adult seals  
104 between breeding seasons and by sampling the genetic structure of the population at breeding locations.  
105 We shall develop protocols, applicable to other ice-associated seals, to collect and analyze mitochondrial  
106 and micro-satellite DNA, collected from ringed seals along the arctic coast of Alaska, for evidence of  
107 restricted dispersal.

108  
109 This project will contribute to understanding the importance of shore fast sea ice and snow cover to  
110 ringed seals, a “key ecological component of arctic marine ecosystems.” The distribution and density of  
111 ringed seals is highly sensitive to suitable sea ice conditions, and as such, may be particularly vulnerable  
112 to climatic change.

113  
114 Legislative Criteria: Environmental Improvement and Restoration Fund;  
115 Section 401(e) Marine Research Activities

116  
117 Research Priorities: Component 1: Specific Project Needs  
118 Project Need 4(2): Ice Seal Studies

119  
120  
121 E. Soundness of Project Design and Conceptual Approach.

122  
123 Based on their vagility and minimal geographic barriers in their marine environment, seals were predicted  
124 to have minimal population structuring (Arnason 1974a,b). The evidence for philopatry and population  
125 structuring at a fine scale among phocid seals, however, is mounting (Hindell and Little 1988; Siniff et al.  
126 1988; Pomeroy et al. 2000). Harbor seals appear to rarely exchange genes beyond distances of about 50  
127 km (O’Corry-Crowe et al. 2003), and application of the phylogeographic approach (Dizon et al. 1992)  
128 suggests that the three provisionally recognized harbor seal stocks in Alaska (Angliss and Lodge 2002)  
129 should be separated in to more than 12 stocks. The site fidelity demonstrated by the three tagged ringed  
130 seals we unintentionally recaptured suggests that ringed seals also are philopatric, but we need to verify  
131 that with a larger sample of seals tagged with satellite transmitters that will permit us to collect negative  
132 as well as positive evidence of site fidelity. Our null hypothesis will be that ringed seals will be equally  
133 likely to breed at any location visited during the year. The alternative hypothesis will be that a breeding  
134 location will be a better predictor of a subsequent breeding location than would be expected if all  
135 locations had an equal probability of serving for breeding.

136  
137 We propose tracking 20 seals per year in each of two years to determine the frequency with which they  
138 return to the same breeding sites. The resulting sample of 40 seals should be more than adequate to test  
139 our hypothesis. Loss of seals or tags, however, may well decrease the sample. Based on previous  
140 experience with this sort of tag, we do not expect tag loss or malfunction to exceed 10%. The seals will be  
141 captured in breathing holes (Kelly 1996) during the breeding seasons of 2005 and 2006 and tracked  
142 through the subsequent breeding season. The tags (Wildlife Computers “SPOT”; Smart, Position-Only  
143 Tags), measuring 6.2 X 2.0 X 1.2 cm and weighing approximately 30 gm, will be attached by a plastic  
144 cattle tag (“Temple tag”) to the hind flippers of the seals. Two of the seals we recaptured after one year  
145 carried VHF radios attached in the same manner and both of those tags were intact in the second year  
146 (one was still transmitting). The SPOT tags will be tracked via the ARGOS system ([www.argosinc.com](http://www.argosinc.com)).  
147 These tags feature a new, extremely compact and efficient transmitter coupled to a micro-processor that  
148 provides precise control over the duty cycling of transmissions. The 10,000 transmissions expected over  
149 the life of the battery will be allocated to the dates that are most likely to yield information about breeding  
150 philopatry and stock structure. Because the Argos satellite coverage is very high in polar regions, high-

151 quality locations (<1 km RMS) can be expected frequently enough to detect returns to breeding sites.  
152 Previous tracking studies of ringed seals and other ice-associated seals have relied on larger satellite-  
153 linked transmitters glued to the hair of the seals (Heide-Jørgensen et al. 1992; Teilmann et al. 1999; Bjørn  
154 et al. 2000; Harwood et al. 2000; Lowry et al. 2000; Born et al. 2002). Those larger devices typically store  
155 and transmit additional data such as dive records, but, by virtue of being attached to the hair, they  
156 necessarily are lost at the subsequent molt. Thus, it has not been possible to track seals from a breeding  
157 site to the site used in the subsequent annual breeding period. The small SPOT tag we are using will only  
158 report location for each seal, but they will last one year or more and allow us to identify the seals'  
159 breeding locations in subsequent years.

160  
161 Each seal also will be fitted with a VHF radio tag attached in the same manner as the SPOT tag but to the  
162 opposite hind flipper. We have deployed over 40 radio tags in this manner and had consistent results. The  
163 radio tags will allow us to ground truth locations indicated by the SPOT tags and to map the seals'  
164 breeding home ranges (Figure 1).

165  
166 Ringed seals fitted with visual tags (Smith et al. 1973; Smith and Hammill 1981; Kelly 1996; Kapel et al.  
167 1998) and with satellite-linked tags (Heide-Jørgensen et al. 1992; Teilmann et al. 1999; Harwood et al.  
168 2000; Born et al. 2002) have made movements of thousands of kilometers, but only one seal visually  
169 identified by Smith and Hamill (1981) and the three visually identified by us (Kelly et al. 2003) have been  
170 relocated between successive breeding seasons and those four seals bred within a couple of kilometers of  
171 their previous breeding site. Observing site fidelity by breeding seals in two or more years provides strong  
172 evidence but not proof of philopatry. Proof of philopatry would require tracking seals from their birth site  
173 to their own breeding sites five or more years later, an unlikely scenario with current technology and  
174 methods.

175  
176 The genetic diversity within a breeding location, however, could provide strong evidence for or against  
177 philopatry, and we shall rely on our ability to capture ringed seals in their breeding sites (Kelly 1996) to  
178 obtain genetic samples and to test the feasibility of sampling hair at breeding and molting sites on the ice  
179 as a method for collecting large samples from populations of ringed seals and other ice-associated seals.  
180 Ringed seals typically molt on the ice at resting sites within their breeding home ranges (Kelly et al.  
181 2003), and, in this study, we will obtain genetic samples from skin samples taken from live-captured seals  
182 and from shed epidermal tissue (hair and skin) left on the ice by the seals. DNA will be extracted by Dr.  
183 Brad Swanson whose laboratory specializes in carnivore genetics and has been especially successful in  
184 extracting DNA from hair samples. The degree to which the DNA in the shed tissues will have degraded  
185 will depend on the duration and intensity of their exposure to UV radiation and moisture. By sampling  
186 shed epidermis and fresh skin samples from the animals we capture for the tagging study, we will be able  
187 to test the practicality of using shed epidermis for extracting DNA. In this study, we shall sample in two  
188 locations (near Pt. Barrow and near Prudhoe Bay, Alaska) and focus the DNA study on determining the  
189 most suitable protocols for obtaining samples. We are developing a proposal to be submitted elsewhere  
190 to expand the number of sampling locations for the population genetics study, and the results of this study  
191 will determine whether those samples will be in the form of shed tissue collected at on-ice resting sites or  
192 from skin samples taken from captured seals. If the shed tissue proves useable, we will propose to expand  
193 the approach to studying the stock structure of bearded, spotted, and ribbon seals.

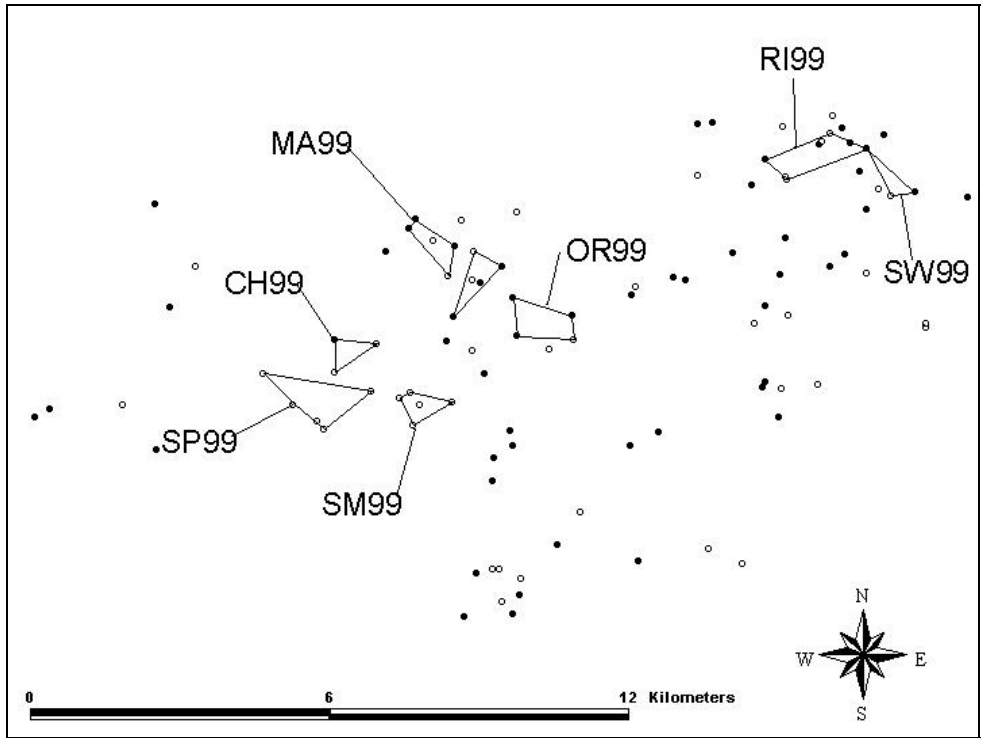
194  
195 Field work will be conducted near Peard Bay, between Barrow and Wainwright, Alaska in April – May  
196 2005 and 2006. Subnivean breathing holes will be located by trained Labrador retrievers (Smith and  
197 Stirling 1975; Kelly and Quakenbush 1987). Ringed seals will be captured in nets that purse beneath them  
198 when the surface at their breathing holes in the ice (Kelly 1996). Each year, 20 ringed seals will be fitted  
199 with a satellite-linked transmitter and a conventional VHF radio transmitter attached to the hind flippers  
200 using cattle ear tags (Kelly et al. 2003).

201 Skin samples for genetic analysis will be taken from the flippers when inserting the tags. An additional 20  
202 or more genetic samples will be collected by harvesting shed epidermal tissues (skin and hair) from the  
203 ice around seal resting sites. Dry samples will be collected and frozen shortly after a seal leaves its resting  
204 site in order to minimize the possibility of sample degradation. The success of this project will be  
205 enhanced by local knowledge and assistance provided by the Alaska Ice Seal Working Group, the Alaska  
206 Nanuuq Commission, and the Department of Wildlife Management of the North Slope Borough.

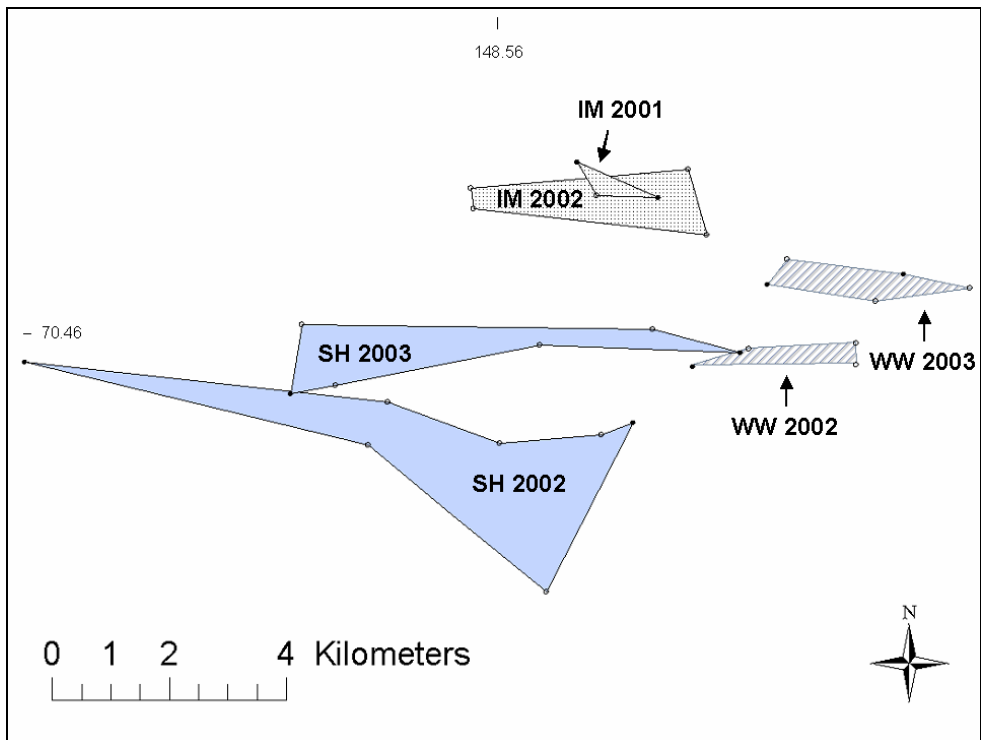
207  
208 Satellite-linked tracking data will be received daily and processed at least monthly at the National Marine  
209 Mammal Laboratory upon receipt of data from Service Argos. Dr. Cameron has developed location  
210 analysis and mapping techniques that allow rapid production of GIS maps showing seal movements,  
211 bathymetry, and sea ice. For example, maps of the movements of bearded seals recently tagged in  
212 Kotzebue Sound are being distributed on a weekly basis to project collaborators and interested members  
213 of the Kotzebue community.

214  
215 Upon arrival at the Applied Technologies in Conservation Genetic Laboratory, all tissue samples will be  
216 stored in a  $-80^{\circ}\text{C}$  freezer with nitrogen cooled back up until time of use. DNA extraction and analysis in  
217 the laboratory will be done using QIAGEN DNeasy kits. Following extraction we will amplify the DNA  
218 at 8 – 10 microsatellite loci developed for harbor seals (*Phoca vitulina vitulina*) (Goodman 1997) and  
219 shown to amplify microsatellites in several seal species (Coltman et al. 1996; Kretzmann et al. 2001; Palo  
220 et al. 2001). All amplified product will be analyzed on an ABI 310 automated DNA sequencer. All  
221 extraction and PCR preparation will occur in a room devoted to working with low copy DNA and all  
222 equipment used for this project, including the DNA sequencer, will be dedicated to this project. The  
223 room is fully equipped with UV lights for decontamination of all equipment between uses. All disposable  
224 supplies will be PCR-grade (sterile, as well as DNase, RNase and Prion free). Population structure will  
225 be evaluated using the program STRUCTURE (Pritchard 2000). STRUCTURE estimates the number of  
226 populations, and the individuals comprising each population, from a genetic data set without needing *a*  
227 *priori* information regarding the number or locations of populations.

228 Figure 1. Minimum convex polygons show the small sub-ice home ranges of 8 ringed seals during the breeding  
229 season, 1999.



230  
231 Figure 2. Home ranges of two adult male (IM and WW) and one adult female (SH) ringed seals  
232 captured and telemetrically tracked in multiple years.



233

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349 the North Water polynya during fast-ice formation. Can. J. Zool. 77(12), 1934-1946.

350

351 F. Project Management.

352

353 Overall project management will be the responsibility of Dr. Brendan P. Kelly, Associate Professor of  
354 Marine Biology and Dean of Arts and Sciences at the University of Alaska Southeast. Dr. Kelly has been  
355 studying the ecology and behavior of marine mammals, primarily ice-associated seals in Alaska, for the  
356 past 28 years. He has conceived, conducted, and published on field studies of many aspects of ringed seal  
357 biology including methods of capturing and handling them, their under-ice diving behavior, assessment of  
358 their populations, their use of subnivean lairs, and their responses to noise disturbance, predation, and  
359 climate change. The co-Principal Investigator, Dr. Peter Boveng, leads the Polar Ecosystems Program at  
360 the National Marine Mammal Laboratory, NOAA, Seattle. He has been studying the ecology of Antarctic  
361 and arctic seals for the past 15 years, and has extensive experience using satellite-linked transmitters to  
362 track marine mammals in polar environments.

363

364 Mr. Charlie Johnson, Executive Director of the Alaska Nanuq Commission, Nome, will advise the  
365 project on traditional knowledge and will coordinate interaction with local communities and the hire of  
366 local hunters to assist in the study. Mr. Johnson is an Alaska Native with extensive experience hunting,  
367 observing, and studying marine mammals. He founded the Eskimo Walrus Commission and the Alaska  
368 Nanuq Commission, and he advises the NMFS and the U.S. Fish and Wildlife Service on marine  
369 mammal stocks as a member of the Alaska Scientific Review Group.

370

371 Dr. Bradley Swanson, Assistant Professor of Biology at Central Michigan University, will extract and  
372 analyze DNA from seal tissues collected in this study. His research experience is in conservation genetics,  
373 molecular ecology, and population dynamics. He heads the Applied Technology in Conservation Genetics  
374 Laboratory and specializes in wildlife forensic analysis.

375

376 Mr. John Moran (M.S. Fisheries) will have responsibility for the day-to-day management of the field  
377 camp, and he will participate in data analysis and reporting. Mr. Moran has studied fish, seabirds, and  
378 marine mammals throughout coastal Alaska. His graduate work was in population dynamics of harbor  
379 seals and he has strong quantitative skills. His considerable field experience includes establishing and  
380 running a field camp on the arctic sea ice and the capture, tagging, and tracking of ringed seals.

381

382 Dr. Michael Cameron will assist in the capture and tagging of seals and in the acquisition of satellite-  
383 linked tracking data. Dr. Cameron has extensive experience from 10 years of polar field work in the

384 capture, handling, and tagging of seals. His Ph.D. research on population dynamics of Weddell seals  
385 included consideration of the effects of variation in sea ice extent on breeding site fidelity and  
386 immigration.

387  
388 Local knowledge and field assistance will be provided by Mr. Rex Snyder, Alaska Nanuuq Commission  
389 and one or more other locally hired hunters. Mr. Snyder is an Alaska Native from Barrow and an active  
390 hunter. He studied natural resource policy while earning his B.A. degree at the University of Alaska  
391 Fairbanks.

392  
393 Additional field assistance will be provided by undergraduate students funded by the University of Alaska  
394 Southeast. Dr. Kelly is funded by the National Science Foundation to run a Research Experiences for  
395 Undergraduates Program (REU) which, each year, pairs 8-10 students from around the country with a  
396 faculty mentor at UAS. To date, 18 undergraduates have developed research skills assisting Dr. Kelly in  
397 field studies of ringed seals. If this study is funded, Dr. Kelly will apply to NSF (at the urging of the NSF  
398 director for the REU Program) for a supplemental grant to support involvement of local high school  
399 teachers and students in the project.

400  
401 Our colleagues in Canada (Dr. Thomas Smith and Louis Harwood) and in Norway (Drs. Christian  
402 Lydersen and Kit Kovacs) are studying ringed seals movements within a single year using satellite-linked  
403 transmitters. We are in frequent contact with them, and we have a long history of sharing methods with  
404 each of them. Their preliminary results have been useful in identifying the range of movements that  
405 ringed seals make within a year, and our project will amplify on those results by using smaller, longer-  
406 lived satellite tags to test the hypothesis that ringed seals regularly demonstrate fidelity to breeding sites.

407  
408 Similarly, colleagues in Alaska, Canada, Norway, and Finland are initiating population genetic studies of  
409 ringed seals using DNA markers, and we intend to explore the possibility of increasing the sample size of  
410 those studies (as well as for other ice-associated seals) by developing methods and protocols for obtaining  
411 samples from molted epidermal tissues. We have already reached an agreement with Dr. Mervi  
412 Kunnasranta (Finnish Game and Fisheries Research Institute, Turku, Finland) to share DNA samples, and  
413 we will propose a similar arrangement to other colleagues collecting ringed seal DNA samples. We intend  
414 to propose, as an International Polar Year project, a pan arctic network of investigators studying ringed  
415 seal population structure and responses to climate change.

416  
417 Arctic field work and satellite-tracking entail high costs, and we shall be able to bring substantial support  
418 from this project from UAS, the NMML/NOAA, and the Native community reflecting the strong interest  
419 in ringed seal populations and the potential effects of climate change. The P.I. possesses Labrador  
420 retriever dogs trained to locate by smell ringed seal breathing holes and lairs hidden under the snow. The  
421 P.I. invented and perfected a method of live-capturing ringed seals in their breathing holes, and he and  
422 UAS Research Associate, John Moran, are practiced at the technique. Drs. Boveng and Cameron have  
423 extensive experience in satellite-linked tracking of seals and the Polar Ecosystem Program of  
424 NMML/NOAA will provide their expertise, 40 satellite-linked transmitters, and ARGOS fees. The North  
425 Slope Borough's Department of Wildlife Management has numerous on-going studies of wildlife on the  
426 North Slope and the Arctic Ocean, and they will be able to make equipment and housing from those  
427 studies available to this project.

428  
429 Field camps will be established on the ice near Pt. Barrow in May of 2005 and April 2006. Seals will be  
430 captured and tagged in late April and early May and tracked for the duration of the tags (1 or more years).  
431 Maps showing updates of the seal locations will be shared via the web with North Slope communities and  
432 our scientific colleagues.

433

434 Skin samples for genetic analysis will be taken when tagging seals. Molted hair and skin samples will be  
435 collected from on-ice resting sites primarily in May. Movement and genetic data analyses will be  
436 completed in Fall 2006 and submitted for publication in peer reviewed journals by Spring 2007.

437  
438 Project Costs.

439  
440 PERSONNEL

441  
442 The P.I. and the co-P.I. each will put in 1 month per year of time on this project at no cost to the NPRB.  
443 Research Associate John Moran will put in 7 months per year as he will have primary responsibility for  
444 organizing and preparing for the field expeditions, the day-to-day operation of the field camp, and he will  
445 take a major role in data management and analysis. Dr. Cameron and Rex Snyder will each put in 2  
446 months per year paid by the NMML/NOAA and the Nanuuq Commission, respectively.

447  
448 TRAVEL

449  
450 Travel is budgeted for UAS personnel between Juneau and the field site and for travel to North Slope  
451 Communities for outreach and to attend meetings. NMML/NOAA will provide travel for Boveng and  
452 Cameron.

453  
454 SERVICES

455  
456 Aircraft charter time is budgeted to move field supplies from Barrow to the ice camp.

457  
458 Subcontracts to the Nanuuq Commission and Central Michigan University will cover the hiring of local  
459 hunters to assist in the field study and for DNA analysis (Dr. Swanson).

460  
461 The NMML will pay the data fees to ARGOS.

462  
463 SUPPLIES

464  
465 VHF radios are budgeted at \$200 each, and \$7,600 is budgeted for field groceries and supplies.

466  
467 The cost of satellite-linked transmitters (\$80,000) will be borne by the NMML/NOAA.

468  
469 OUTREACH

470  
471 We have budgeted \$2,000 for outreach. The P.I. already traveled to Barrow and Anchorage to meet with  
472 Native organizations about this project. If this project is funded, he intends to supplement the outreach  
473 funds with additional funding from the National Science Foundation as discussed in the proposal

CURRICULUM VITAE  
**BRENDAN PATRICK KELLY**

**Mailing Address:** School of Arts and Sciences  
University of Alaska Southeast  
11120 Glacier Highway  
Juneau, AK 99801

**Education:** B.A. University of California Santa Cruz, 1975 (Biology)  
M.S. University of Alaska Fairbanks, 1979 (Biology)  
Ph.D. Purdue University, 1996 (Biology)

**Professional Memberships:** Arctic Institute of North America (Life Member)  
International Society for Behavioral Ecology  
The Society for Marine Mammalogy (Charter Member)  
National Center for Science Education  
Sigma Xi  
National Association of Underwater Instructors - SCUBA

**Awards and Fellowships:** Ida L. Goebel Undergraduate Research Award  
University of California Santa Cruz - 1974  
National Science Foundation Undergraduate Research Fellow  
Stanford University - 1974  
Highest Honors in Biology  
University of California Santa Cruz - 1975  
Research and Advanced Study Grants  
University of Alaska Fairbanks - 1977 and 1978  
David Ross Fellow  
Purdue University - 1990-1992

**Professional Experience:**

Dean of Arts and Sciences, University of Alaska Southeast, 2003 – present  
Associate Professor of Marine Biology, University of Alaska Fairbanks, 1996-present  
Associate Professor of Biology, University of Alaska Southeast, 1996-present  
Research Associate, Institute of Marine Science, University of Alaska, Fairbanks, 1982-96  
Research Assistant, Biological Sciences, Purdue University, West Lafayette, IN, 1990-91  
Marine Mammals Biologist, Alaska Department of Fish and Game, Fairbanks, 1981-1982  
Biological Technician, National Marine Mammal Laboratory, Seattle, Washington, 1980

**Professional Service:**

Alaska Scientific Review Group - marine mammal stocks (NMFS/USFWS): 1994 - present  
Marine Mammal Steering Committee, U.S.- Russia Environ. Agreement: 1996 - present  
Scientific advising, Alaska Native Harbor Seal Commission: 1995 - present  
Scientific advising, Alaska Sea Otter Commission: 1991 - 1997  
Co-chair for Biology, American – Norwegian Arctic Research Opportunities (NSF): 1999

**Collaborators (last 4 years):**

Dr. John Bengston Director, Natl. Marine Mammal Lab., NMFS, Seattle, WA  
Dr. Peter Boveng Polar Ecosystem Program, NMML, NMFS, Seattle, WA  
Dr. David Douglas U.S. Geological Survey, Juneau, Alaska  
Dr. Mervi Kunnasranta University of Joensuu, Joensuu, Finland  
Mr. Greg Marshall National Geographic Society, Washington, D.C.  
Dr. Son Nghiem Jet Propulsion Laboratory, NASA, Pasadena, Calif.  
Ms. Lori Quakenbush Alaska Department of Fish and Game  
Dr. Gennady Smirnov Walrus Biologist, TINRO, Russia  
Dr. D. Wartzok Dean of the Graduate School, Univ. Missouri, St. Louis

**Graduate advisors:**

Ph.D. – Purdue University: Drs. Douglas Wartzok and Peter Waser (co-chairs)  
M.S. – University of Alaska Fairbanks: Dr. Francis H. Fay

**Graduate student advisees:**

Jill Anthony (M.S. 1995) - Habitat utilization by sea otters in Prince William Sound, AK  
Gay Sheffield (M.S. 1997) - Walrus feeding - a re-examination.  
Lauri Jemison (M.S. 1997) - Recent history & demography of harbor seals on Tugidak Is.  
Michael Simpkins (Ph.D. Ph.D. 2000) – Three-dimensional diving behavior of ringed seals  
Stephanie Haverlack (M.S. program) - Diving behavior of sea otters  
Jamie Womble (M.S. 2003) – Seasonal Distribution of Steller Sea Lions  
Johanna Vollenweider (M.S. 2004) – Fatty acid composition in Steller sea lions

**Related Publications:**

**Kelly, B. P.** 2001. Climate change and ice breeding pinnipeds. Pages 43-55 in G.-R. Walther, C. A. Burga and P. J. Edwards, editors. "Fingerprints" of climate change: adapted behaviour and shifting species' ranges. Kluwer Academic/Plenum Publishers, New York and London.  
Simpkins, M. A., **B. P. Kelly**, and D. Wartzok. 2001. Three-dimensional analysis of search behaviour by ringed seals. *Animal Behaviour* 62:67-72.  
Simpkins, M. A., **B. P. Kelly**, and D. Wartzok. 2001. Three-dimensional diving behaviors of ringed seals (*Phoca hispida*). *Marine Mammal Sci.* 17:909-925.  
**Kelly, B. P.** 1996. Live capture of ringed seals in ice-covered waters. *J. Wildl. Manage.* 60:678-684.  
**Kelly, B. P.**, and D. Wartzok. 1996. Ringed seal diving behavior in the breeding season. *Canadian Journal of Zoology* 74:1547-1555.

**Other Significant Publications:**

Jemison, L. A., and **B. P. Kelly**. 2001. Pupping phenology and demography of harbor seals on Tugidak Island, Alaska. *Marine Mammal Science* 17:585-600.  
Fay, F. H., L. L. Eberhardt, **B. P. Kelly**, J. J. Burns, and L. T. Quakenbush. 1997. Status of the Pacific walrus population, 1950-1989. *Marine Mammal Science* 13:537-565.  
Mathews, E. A., and **B. P. Kelly**. 1996. Extreme temporal variation in harbor seal *Phoca vitulina richardsi* numbers in Glacier Bay, a glacial fjord in southeast Alaska. *Marine Mammal Science* 12:483-489.  
Wartzok, D., R. Elsner, H. Stone, **B. P. Kelly**, and R. W. Davis. 1992. Under-ice movements and sensory basis of hole finding by ringed and Weddell seals. *Canadian Journal of Zoology* 70:1712-1722.  
**Kelly, B. P.**, and L. T. Quakenbush. 1990. Spatiotemporal use of lairs by ringed seals (*Phoca hispida*). *Canadian Journal of Zoology* 68:2503-2512.

## **PETER L. BOVENG**

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### **EDUCATION:**

B.A., Biology Major, 1980, Cornell University, Ithaca, New York.  
M.S., Biological Sciences, 1985, Montana State University, Bozeman, Montana.  
Ph.D., Biological Sciences, 1993, Montana State University, Bozeman, Montana.

### **PROFESSIONAL POSITIONS:**

PROGRAM LEADER, Polar Ecosystems Program, Alaska Fisheries Science Center, National Marine Fisheries Service. Design and direct research on the population status and ecology of pinnipeds in Alaska and Antarctica. Supervise a staff of 12 employees and contractors. Develop and manage an annual budget of ~\$2 million in agency funds and outside grants. Communicate conclusions and scientific advice to the scientific and management communities through reports and peer-reviewed publications. August 2004 – present.

OPERATIONS RESEARCH ANALYST, National Marine Fisheries Service, National Marine Mammal Laboratory, Polar Ecosystems Program. Advised the Program on quantitative aspects of experimental design, implementation, and analysis. Analyzed data and model systems. Ensured integrity of databases and specimen collections. Supervised biologists and technicians. Provided statistical and analytical advice to other Programs. 1989-present.

OPERATIONS RESEARCH ANALYST, National Marine Fisheries Service, Southwest Fisheries Center, La Jolla, California. Stock assessments of harbor seals, California sea lions and northern elephant seals. Analysis of population trends and density dependent changes in growth rates. Computer modeling and statistical analysis of population data. Design and implementation of field experiments. Radio- and satellite-telemetry studies. 1986-1989.

### **PUBLICATIONS:**

#### **Five most closely related to proposal:**

Bengtson, J. L., L. M. Hiruki-Raring, M. A. Simpkins, and P. L. Boveng. *Submitted*. Ringed and bearded seal densities in the eastern Chukchi Sea, 1999-2000.

Ackley, S.F., J.L. Bengtson, P. Boveng, M. Castellini, K.L. Daly, S. Jacobs, G.L. Kooyman, J. Laake, L. Quetin, R. Ross, D.B. Siniff, B.S. Stewart, I. Stirling, J. Torres, and P.K. Yochem. 2003. A top-down, multidisciplinary study of the structure and function of the pack-ice ecosystem in the eastern Ross Sea, Antarctica. *Polar Record* 39 (210): 219-230.

Simpkins, M. A., D. E. Withrow, J. C. Cesarone and P. L. Boveng. 2003. Stability in the proportion of harbor seals hauled out under locally ideal conditions. *Marine Mammal Science* 19:791-805.

Hooker, Sascha K., Ian L. Boyd, Mark Jessopp, Oliver Cox, John Blackwell, Peter L. Boveng,

and John L. Bengtson. 2002. Monitoring the prey-field of marine predators: combining digital imaging with datalogging tags. *Marine Mammal Science* 18(3):680-697.

Pistorius, Pierre A., Marthán N. Bester, Stephen P. Kirkman, and Peter L. Boveng. 2000. Evaluation of age- and sex-dependent rates of tag loss in southern elephant seals. *Journal of Wildlife Management* 64(2):373-380.

**Other related publications:**

Hiruki, Lisa M., Michael K. Schwartz, and Peter L. Boveng. 1999. Hunting and social behaviour of leopard seals (*Hydrurga leptonyx*) at Seal Island, South Shetland Islands, Antarctica. *Journal of Zoology* 249(1):97-109.

Boveng, Peter L., Lisa M. Hiruki, Michael K. Schwartz, and John L. Bengtson. 1998. Population growth of Antarctic fur seals: Limitation by a top predator, the leopard seal? *Ecology* 79(8): 2863-2877.

Boveng, P.L. and J.L. Bengtson. 1997. Crabeater seal cohort variation: demographic signal or statistical noise? Pp. 241-247 *In* B. Battaglia, J. Valencia, and D.W.H. Walton (eds.), *Antarctic Communities. VI SCAR Biology Symposium.* Cambridge University Press.

Boveng, P.L., B.G. Walker, and J.L. Bengtson. 1996. Variability in Antarctic fur seal dive data: implications for TDR studies. *Marine Mammal Science* 12:543-554.

Walker, B.G. and P.L. Boveng. 1995. Effects of time-depth recorders on maternal foraging and attendance behavior of Antarctic fur seals (*Arctocephalus gazella*). *Canadian Journal of Zoology* 73:1538-1544.

**COLLABORATORS AND CO-AUTHORS IN PAST FOUR YEARS:**

Steve Ackley, Clarkson University  
John L. Bengtson, NOAA Fisheries  
Marthán Bester, University of Pretoria  
Gail Blundell, Alaska Department of Fish and Game  
Ian L. Boyd, Sea Mammal Research Unit  
John J. Burns, Living Resources, Inc.  
Michael Castellini, University of Alaska, Fairbanks  
Kendra L. Daly, University of South Florida  
Kathryn J. Frost, Univ. of Alaska Fairbanks  
Sascha K. Hooker, Sea Mammal Research Unit  
Stanley Jacobs, Lamont-Doherty Earth Observatory  
Gerry Kooyman, Scripps Institution of Oceanography  
Jeff Laake, NOAA Fisheries  
Pierre Pistorius, University of Pretoria  
Langdon Quetin, University of California at Santa Barbara  
Robin Ross, University of California at Santa Barbara  
Michael A. Simpkins, U.S. Marine Mammal Commission  
Donald B. Siniff, University of Minnesota  
Brent S. Stewart, Hubbs-SeaWorld Research Institute  
Ian Stirling, Canadian Wildlife Service  
Joseph Torres, University of South Florida  
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**EDUCATION:** Ph.D. Conservation Biology, University of Minnesota, December 2001  
B.S., Zoology, University of Washington, June 1993

**EXPERIENCE:        Research Biologist**

January 2002- National Marine Mammal Laboratory / NOAA

Present

Polar Ecosystems Program

- Project lead for ecological research on Arctic ice seals
- Project lead for estimating the abundance of seals on glacial sites
- Project member of harbor seal ecology project in the Gulf of Alaska
- GIS analyst for the Antarctic Pack Ice Seal (APIS) project
- Survey Alaskan pinnipeds from fixed-wing aircraft
- Assisted with the Alaskan harbor seal tourism disturbance project

**Field team leader / Research Assistant / Graduate Student**

October 1996- University of Minnesota / Conservation Biology Program

December 2001

Weddell Seal Population Dynamics Project -- (October 1996 – December 2001)

Antarctic Pack Ice Seals (APIS) Project -- (April 1997 – December 2001)

**Wildlife Biologist**

June 1993- National Marine Mammal Laboratory / NOAA

September 1996 Antarctic Ecosystem Program

**PUBLICATIONS IN REVIEW:**

- Harcourt, R.G., Kingston, J.J., Cameron, M.F., Waas, J.R., and Hindell, M.A. *In Review*. Paternity analysis shows experience, not age, enhances mating success in an aquatically mating pinniped, the Weddell seal (*Leptonychotes weddellii*). *Behavioural Ecology and Sociobiology*.
- Mori, Y., Watanabe, Y., Mitani, Y., Sato, K., Cameron, M.F., and Naito, Y. *In Review*. A comparison of image data and diving profile methods used to estimate prey richness in Weddell seals. *Journal of Animal Ecology*.

**IN PRINT**

- Bengtson, J.L. and Cameron, M.F. 2004. Seasonal haulout patterns of crabeater seals (*Lobodon carcinophaga*). *Polar Biology*. 27:344-349
- Cameron, M.F. and Siniff, D.B. 2004. Age-specific survival, abundance and immigration rates of a Weddell seal (*Leptonychotes weddellii*) population in McMurdo Sound, Antarctica. *Canadian Journal of Zoology*. 82:601-615.
- Mitani, Y., Sato, K., Cameron, M.F., Siniff, D.B., and Naito, Y. 2004. 3D diving behavior of Weddell seals with respect to prey availability, accessibility and abundance. *Marine Ecology Progress Series*. 281:275-281.

- Mitani, Y., Sato, K., Shinichiro, I., Cameron, M.F., Siniff, D.B., and Naito, Y. 2003. A method for reconstructing three-dimensional dive profiles of marine mammals using geomagnetic intensity data: Results collected from Weddell seals foraging around a breeding colony. *Polar Biology*. 26: 311-317
- Sato, K., Mitani, Y., Cameron, M.F., Siniff, D.B., and Naito, Y. 2003. Factors affecting stroking patterns and body angle in diving Weddell seals under natural conditions. *Journal of Experimental Biology*. 26:1461-1470
- Watanabe, Y., Mitani, Y., Sato, K., Cameron, M.F., and Naito, Y. 2003. Dive depths of Weddell seals in relation to vertical prey distribution as estimated by image data. *Marine Ecology Progress Series*. 252:283-288
- Sato, K., Mitani, Y., Cameron, M.F., Siniff, D.B., and Naito, Y. 2002. Deep foraging dives in relation to the energy depletion of Weddell seal (*Leptonychotes weddellii*) mothers during lactation. *Polar Biology*. 25: 696-702
- Cameron, M.F. 2001. Dynamics of a Weddell seal (*Leptonychotes weddellii*) population in McMurdo Sound, Antarctica. Ph.D Thesis, University of Minnesota, St.Paul.

### **RECENT COLLABORATORS**

Bengtson, John – National Marine Mammal Laboratory, NOAA Fisheries, USA  
 Boveng, Peter - National Marine Mammal Laboratory, NOAA Fisheries, USA  
 Frost, Kathy – School of Fisheries and Ocean Sciences, University of Alaska Fairbanks, USA  
 Harcourt, Robert – Graduate school for the Environment, Macquarie University, Australia  
 Hindell, Mark – Antarctic Wildlife Research Unit, Dept. of Zoology, University of Tasmania  
 Laake, Jeff - National Marine Mammal Laboratory, NOAA Fisheries, USA  
 Lowry, Lloyd - School of Fisheries and Ocean Sciences, University of Alaska Fairbanks, USA  
 Mitani, Yoko – Dept. of Marine Biology, Texas A & M University, USA  
 Naito, Yasuhiko - National Institute of Polar Research, Tokyo, Japan  
 Sato, Katsufumi - International Coastal Research Center, University of Tokyo, Japan  
 Siniff, Donald – Dept. of Ecology Evolution and Behavior, University of Minnesota, USA  
 Watanabe, Yuuki - National Institute of Polar Research, Tokyo, Japan

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**Education:**

Purdue University - West Lafayette, IN

Ph. D. 2001. Concentration: Ecological Genetics

Thesis: An empirical evaluation of effective population size.

Advisor: Dr. Peter M. Waser.

University of Idaho - Moscow, ID

Masters of Science. 1993. Concentration: Zoology.

Thesis: Trends and micro-geographic periodicity in the red fox (*Vulpes vulpes*) populations of eastern Canada.

Advisor: Dr. Donald. R. Johnson

University of Michigan - Ann Arbor, MI

Bachelor of Science. 1990. Concentration: Biology.

**Positions:**

Central Michigan University	8/2001 – Present
Assistant Professor of Biology	
Gonzaga University	8/2000– 8/2001
Visiting Assistant Professor	
University of Wisconsin - Stevens Point	8/1999 – 8/2000
Visiting Assistant Professor	

**Publications:**

Millions, D. G. and B. J. Swanson. In Review. Evaluation of habitat fragmentation on population structure in bobcats. *Molecular Ecology*.

Millions, D. G. and B. J. Swanson. In Review. Development of a genetic method for detecting bobcat poaching in Michigan. *The Wildlife Society Bulletin*.

\*Swanson, B. J. M. Clay<sup>+</sup>, and N. Neithmuth. Presubmission acceptance 12/17/03. Lek breeding increases genetic variation in metapopulations. ***Nature***

\* Peters, L. R<sup>+</sup>, and **B. J. Swanson**. Submitted 3/30/04. Genetic evaluation of a successful marten reintroduction. ***Conservation Genetics***

\***Swanson, B. J.**, D. R. Johnson. Submitted (3/30/04). Mink, Muskrats, And Microtines: Indirect evidence of prey switching. ***Canadian Journal of Zoology***.

\***Swanson, B. J.**, R. T. Fuhrmann, R. L. Crabtree. In Press - Revision requested. Elevational isolation of red fox populations in the Greater Yellowstone Ecosystem. ***Conservation Genetics***.

Steinwald, M., **B. J. Swanson**, and P. M. Waser. In Press. The effects of spool-and-line tracking on small mammals. *Journal of Mammalogy*. Unknown press date.

Johnson, D. R. and **Swanson, B. J.** Revision Requested. Arctic fox migrations in Quebec and Ontario. *Canadian Field Naturalist*. Unknown press date

- Davis, C., B. Keane, **B. J. Swanson**, S. Loew, P. M. Waser, C. Strobeck, and R.C. Fleischer. 2000. Characterization of microsatellite loci in bannertailed and giant kangaroo rats, *Dipodomys spectabilis* and *Dipodomys ingens*. *Molecular Ecology* 9: 642 - 645.
- Johnson, D. R., **B. J. Swanson**, and J. Eger. 2000. Synchrony and cyclicity in Canadian ermine populations. *Canadian Journal of Zoology* 78: 835 - 839.
- Swanson, B. J.** and D. R. Johnson. 1999. Distinguishing causes of intraspecific synchrony in population dynamics. *Oikos* 86: 265-274.
- Swanson, B. J.** 1998. Autocorrelated rates of change in animal populations and their relationship to precipitation. *Conservation Biology* 12: 801-808
- Swanson, B. J.**, and D. R. Johnson. 1996. Spatial, temporal and population size trends in the frequency of color phenotypes in the red fox. *Canadian Journal of Zoology* 74: 1622-1631.
- Swanson, B. J.**, P. M. Waser, R. T. Fuhrmann, R. L. Crabtree. 1995 Are high elevation populations of the red fox isolated in the Greater Yellowstone Ecosystem? *Proceedings - Greater Yellowstone Predators*.
- = Central Michigan University generated publications.
  - + = Central Michigan University undergraduate student

### Grants And Awards:

- 2004 – Grand Traverse Band of Ottawa - \$123,827  
Genetic Evaluation of Northern Lower Peninsula Marten
- 2004 – Faculty Research and Creative Endeavors Committee - \$7490  
Central Michigan University  
Trackplate fingerprinting of fisher as a method of population estimation
- 2004 – Michigan DNR - \$34,340  
Molecular Population Size Estimation of Marten in Michigan's Northern Lower Peninsula
- 2004 – Michigan DNR - \$6,547  
A genetic evaluation of the eastern massasauga (*Sistrurus catenatus catenatus*) in Michigan
- 2004 – Research Excellence Funds - \$148,406  
Creation of the Applied Technology in Conservation Genetics Center
- 2003 – Presidents Research Initiative Fund - \$24,981  
The influence of reintroductions, dispersal, and population size on genetic variation.
- 2003 – Faculty Research and Creative Endeavors Committee - \$7490  
Central Michigan University  
Estimating rates of loss of genetic variation in free-ranging black footed ferrets and the implications for future reintroductions
- 2002 – Michigan DNR - \$5600  
Movement of yellow perch between drowned river mouth lakes and Lake Michigan.
- 2002 – Research Excellence Funds – \$126,802  
Central Michigan University  
Estimating population characteristics of the bobcat using molecular genetics.
- 2001 - Faculty Research and Creative Endeavors Committee - \$7490  
Central Michigan University  
Estimation of genetic variation in Michigan Sharp-tailed grouse.
- 2000 - University of Wisconsin UPDC \$5000  
Genetic consequences of habitat fragmentation in a lek breeding species.
- 2000 - USDA \$3000  
Consequences of habitat fragmentation in sharp-tailed grouse.

## **John R. Moran**

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School of Arts and Sciences

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### **EDUCATION**

**University of Alaska Fairbanks**, M.S. in Fisheries, August 2003.

**University of New Hampshire**, B.A. in Zoology, minor in Marine Biology, May 1989.

### **PROFESSIONAL EXPERIENCE**

**Research Associate**, *University of Alaska Southeast, Juneau, AK*. September 2003-present

- Analyzed ringed seal data and modeled haulout behavior
- Established and operated a field camp on the arctic sea ice
- Captured, tagged, and tracked ringed seals

**Research Assistant**, *University of Alaska Fairbanks, Juneau, AK*. January 2002-May 2003

- Designed and implemented a study evaluating the effects of environmental variables on harbor seal haulout patterns using a photographic mark-recapture experiment
- Captured and tagged harbor and ringed seals
- Surveyed and tracked harbor seals from fixed-wing aircraft and analyzed data

**Weir Crew Leader**, *SWCA, Salt Lake City, UT*. September 2001-November 2001

- Supervised all daily activities and personnel related to operation of the weirs on Jordan and Duck creeks for the Juneau International Airport EIS.
- Estimated populations of juvenile salmonids using mark-recapture techniques

**Graduate Intern**, *Alaska Department of Fish and Game, Juneau, AK*. April 2000-April 2001

- Captured and tagged harbor seals, collected biological samples
- Surveyed and tracked harbor seals from fixed-wing aircraft
- Photographed seal for individual identification

**Teaching Assistant**, *University of Alaska Fairbanks, Juneau, AK*. September 1999-December 2000

- Taught the laboratory section of Ichthyology and Introductory Biology to undergraduates

**Biological Technician (Fisheries)**, *U.S. Fish and Wildlife Service, Togiak NWR, Dillingham, AK*. April 1998-August 1999

- Crew leader for fisheries field program
- Captured and tagged resident and anadromous fish
- Surgically implanted vhf transmitters in Dolly Varden

**Biological Science Technician (Wildlife)**, *U.S. Fish and Wildlife Service, Togiak NWR, Dillingham, AK* May 1993-April 1998

- Project leader for waterfowl, shorebird, and landbird monitoring
- Designed and conducted field inventory and monitoring efforts to determine abundance and habitat relationships of bird species
- Monitored population and productivity of ledge-nesting seabirds
- Compile and analyze data for annual progress report
- Operated 24' boat in the Bering Sea for seabird colony photography
- Assisted with the implementation of the marine mammal monitoring program focusing on the

- abundance, distribution and behavior of Pacific walrus and harbor seals
- Monitored native subsistence harvests of walruses and seals, overseeing compliance with Federal regulations
- Captured feral reindeer from a remote island in the Bering Sea
- Functioned as helicopter crew member and fixed-wing aircraft observer for bear, moose, caribou and marine mammal surveys
- Captured and radio collared brown bears

**Fisheries Technician/Tagger/Diver**, *Prince William Sound Aquaculture, Cordova, AK*. February 1992-April 1993

- Raised pink, chum, coho, and chinook salmon, including egg-take, incubation, and saltwater feeding
- Drysuit/wetsuit SCUBA diver-Quality graded salmon for sale on board tenders and offshore-processors
- Tagged salmon fry with coded wire tags

**PAPERS** (primary author)

Moran, J.R., M.D. Adkison, and B.P. Kelly. Counting seals: Estimating the unseen fraction using a photographic capture-recapture and covariate model. In prep. for the *Canadian Journal of Zoology*.

Moran, J.R. 2003. Counting seals: Estimating the unseen fraction using a covariate and capture-recapture model. M.S. Thesis, University of Alaska Fairbanks.

Moran, J.R., and C. A. Wilson. 1996. Abundance and distribution of marine mammals in northern Bristol Bay and southern Kuskokwim Bay - a status report of the marine mammal monitoring effort at Togiak NWR. Annual report 1995. USFWS report, 19 pp. Dillingham, AK.

Moran, J.R. 1994. Landbird monitoring at Cape Peirce, Alaska, 1994. USFWS report, 4 pp. Dillingham, AK.

Moran, J.R. 1994. Waterfowl and shorebird observations at Chagvan Bay and Cape Peirce, Alaska, 1994. USFWS report, 8 pp. Dillingham, AK.

Moran, J.R. 1994. Small mammal studies and observations at Cape Peirce, Alaska, 1993. USFWS report, 5 pp. Dillingham, AK.

**PAPERS** (co-author)

Wilson C.A. and J.R. Moran 1997. Abundance and distribution of marine mammals in northern Bristol Bay and southern Kuskokwim Bay-a status report of the marine mammal monitoring effort at Togiak NWR. Annual report 1997. USFWS report, 33 pp. Dillingham, AK.

Hagblom, L., and J. Moran 1995. The status of kittiwakes, murre, and cormorants at Cape Peirce, Bristol Bay, Alaska, Summer 1994. USFWS report, 14 pp. Dillingham, AK.

Hagblom, L., and J. Moran. 1994. The status of kittiwakes, murre, and cormorants at Cape Peirce, Bristol Bay, Alaska, Summer 1993. USFWS report, 20 pp. Dillingham, AK.

<b>NPRB BUDGET SUMMARY FORM</b>				
<b>PROJECT TITLE:</b>				Ice Seal Movements and Stock Structure
<b>PRINCIPAL INVESTIGATOR:</b>				Brendan P. Kelly
<b>FUNDING SOURCE</b>	<b>YEAR 1</b>	<b>YEAR 2</b>	<b>TOTAL</b>	
<b>NPRB Funding</b>	\$99,204	\$104,440	\$203,644	
<b>Match/In Kind</b>	\$114,321	\$114,321	\$228,642	
<b>TOTAL</b>	\$213,525	\$218,761	\$432,286	
<b>Cost Categories</b>	<b>NPRB Year 1</b>	<b>NPRB Year 2</b>	<b>NPRB TOTAL</b>	<b>Match/In kind TOTAL (all years)</b>
<b>1. Personnel Salaries</b>	23,706	24,346	48,052	85,372
<b>2. Personnel Fringe Benefits</b>	8,254	8,554	16,808	29,996
<b>3. Travel (include 1 trip to review meeting in Anchorage)</b>	6,000	9,000	15,000	8,000
<b>4. Equipment</b>	0	0	0	0
<b>5. Supplies</b>	7,900	7,700	15,600	80,000
<b>6. Contractual/Consultants</b>	24,000	24,000	48,000	25,274
<b>7. Other (Include \$2000 for education and outreach)</b>	1,000	1,000	2,000	0
<b>Total Direct Costs</b>	70,860	74,600	145,460	228,642
<b>Indirect Costs</b>	28,344	29,840	58,184	0
<b>TOTAL PROJECT COSTS</b>	99,204	104,440	203,644	228,642

