

# NORTH PACIFIC RESEARCH BOARD RESEARCH SERIES



## HUMANS *People and the Sea*

2002-2008 RESEARCH SUMMARY



The North Pacific Research Board (NPRB) was established by Congress in 1997 to develop a comprehensive science program of the highest caliber that provides a better understanding of the North Pacific, Bering Sea, and Arctic Ocean ecosystems and their fisheries.

The NPRB carries out science planning, prioritizes pressing fishery management and ecosystem information needs, coordinates with other ocean science programs, competitively selects research projects, and communicates research results to diverse audiences.

Since its founding, the North Pacific Research Board has developed a comprehensive program of marine research. The *Science Plan*, developed with guidance from the National Research Council of the U.S. National Academies of Sciences, serves as the foundation for annual requests for proposals organized by major research themes, including:

- Lower Trophic Level Productivity
- Fish Habitat
- Fish and Invertebrates
- Marine Mammals
- Seabirds
- Humans
- Other Prominent Issues
- Integrated Ecosystem Research
- Other Research and Partnerships

The annual requests for proposals result in the majority of the funded projects, which are numbered by the year they were funded (e.g., #201 funded in 2002). The Board also supports integrated ecosystem research programs that look in-depth at Alaska's major ocean ecosystems, with a program ongoing in the Bering Sea and in development for the Gulf of Alaska.

This research summary describes research funded from 2002 through 2008.

# HUMANS

In structuring large marine ecosystem research programs, humans are often overlooked except for their impacts on commercially fished species, marine mammals, the benthic habitat, or other aspects of the ecosystem. As NPRB developed its *Science Plan*, the National Research Council made it clear that one of the main reasons to study marine ecosystems is to determine their effect on human societies.

The *Science Plan* covers a wide array of topics related to humans, from policy analysis of living marine resource management, baseline assessments, resource protection and human health to potential impacts of climate variability and change. The Board intends for its science program to be a source of unbiased, high-quality information incorporating both western science and traditional knowledge.

The Board has worked throughout its first eight years to develop a robust program of local and traditional knowledge (LTK) research. Information, understanding and wisdom, accumulated over time, based on experience and shared within a group or community, offers new perspectives and paradigms for understanding Alaska's marine ecosystems.

The Board has supported projects focused on the role of humans in the ecosystem, and the impacts on humans of resource management decisions and variability in resources, including the following categories:

- protecting marine mammals and managing ecosystems
- crab fisheries and social issues
- stakeholder perceptions
- making fishing safer
- subsistence use of marine resources, and local and traditional knowledge
- social and economic baselines
- human health and marine resources



## HUMAN PROJECTS

312	Ice seal bio-monitoring in the Bering-Chukchi Sea region. <i>L. QUAKENBUSH, G. SHEFFIELD</i>
318	Development of comprehensive baseline commercial fishing community engagement and dependency profiles for the Bering Sea, Aleutian Islands, and Western Gulf of Alaska regions. <i>M. DOWNS</i>
423	An International market model for red king ( <i>Paralithodes camtschaticus</i> ), blue king ( <i>P. platypus</i> ), golden king ( <i>Lithodes aequispinus</i> ), tanner ( <i>Chionoectes Bairdi</i> ) and snow ( <i>Chionoectes opilio</i> ) crab. <i>J. GREENBERG, M. HERRMANN</i>
528	Socioeconomic baseline information for the Pribilof Islands. <i>A. SCHOLZ</i>
529	Valuation of habitat closures. <i>M. BERMAN, U. SUMAILA</i>
530	Institutions for ecosystem-based management: Alaska. <i>D. FLUHARTY</i>
533	Safety evaluation of fisheries management. <i>J. LINCOLN</i>
639	Extending lessons from the Steller sea lion controversy: Getting ahead of the northern fur seal curve. <i>M. HERSHMAN</i>
640	Comprehensive baseline commercial fishing community engagement and dependency profiles: Adak, St. George, St. Paul, and Sand Point, Alaska. <i>M. DOWNS</i>
641	Role of walrus in distribution of human trichinellosis disease among indigenous people in Chukchi Peninsula. <i>L. BUKINA, A. KOLEVATOVA</i>
643	Bering Strait region local and traditional knowledge pilot project. <i>A. AHMASUK</i>
644	Response and intervention system for climate change induced paralytic shellfish poisoning in Aleut communities. <i>V. GOFMAN, B. WRIGHT, R. RALONDE</i>
645	Alaska rockfish: Subsistence harvests and local knowledge of Alaska rockfish (genus <i>Sebastes</i> ). <i>J. DIZARD</i>
725	Fisheries "rationalization" and crew: Workplace dynamics and compensation, what can we learn? <i>S. MACINKO</i>
728	Herring synthesis: Documenting and modeling herring spawning areas within socio-ecological systems over time in the southeastern Gulf of Alaska. <i>T. THORNTON, F. FUNK</i>
822	Mercury levels in murre and gull eggs harvested for food in the Norton Sound region and potential sources of contamination. <i>A. AHMUSAK, P. BECKER, D. ROSENEAU</i>
823	Cultural models of Copper River salmon biology. <i>J. BRADY, D. HICKS, M. LOWE, E.M. VALENTINE, L. NAVES, W. SIMEONE, G. STICKWAN</i>



## Protecting Marine Mammals and Managing Ecosystems

ONE OF THE MOST CRITICAL ISSUES FACED BY FISHERY MANAGERS RESPONSIBLE FOR MANAGING THE VAST AND PRODUCTIVE GROUND FISH FISHERIES OFF ALASKA CONCERNS HOW FISHING ACTIVITIES MIGHT BE IMPACTING STELLER SEA LION POPULATIONS, WHICH ARE PROTECTED UNDER THE ENDANGERED SPECIES ACT.

The North Pacific Fishery Management Council implemented a series of protective measures throughout the 1990s to give further protection to Steller sea lions, but the whole issue came to a head in 2000 when the Council and National Marine Fisheries Service contemplated closing areas to protect sea lion prey fields from fisheries. Although millions of research dollars went towards trying to determine the exact cause of the sea lion decline, relatively little information was available to assess the economic damages to fishermen of these extensive closures of their fishing grounds.

The Board attempted to address that situation by funding research to develop more exact quantitative methods to estimate the cost of closing groundfish fisheries in Steller sea lion critical habitat in the Bering Sea and Gulf of Alaska.

HUMANS :: *Protecting Marine Mammals and Managing Ecosystems*

### Costs of Closing Fisheries in Steller Sea Lion Habitat

Project 529

SCIENTISTS EXPLORED WAYS TO EXPLICITLY LINK THE spatial variability of fisheries biomass and profitability over time to environmental variables to estimate the opportunity costs to the fishing industry of closures at scales relevant to management in Project 529.

By looking at environmental conditions, including bathymetry and oceanographic observations at two different spatial and temporal scales, and at fish biomass data, researchers sought to predict how catches might change if specific areas were closed to fishing. They related these data to economics of the fishing fleet to determine the impacts of

the closures. The results suggested that the 2001 Steller sea lion closures cost the groundfish trawl fisheries five to 40% of potential net earnings, with most of the impact felt by the pollock and Pacific cod catcher boats.

Improved methods for estimating opportunity costs of fisheries closures could be helpful if managers propose future closures to protect marine mammals. If further research demonstrates the robustness and stability of the estimated relationships over time, these methods may prove useful in projecting spatial fishery effects of climate variability and change.



Linda Robinson

Gulf of Alaska: Graves Rock. Sea Lions and Fairweather Range: Summer 1999.



Randy Stauffer

Steller sea lions on a research capture.

## FEATURE PROJECT

HUMANS :: Protecting Marine Mammals and Managing Ecosystems

### Northern Fur Seal Management

Project 639

WE NEED TO ASSESS WHAT WE HAVE LEARNED FROM FASHIONING protective measures for sea lions to see how to do a better job with other marine mammals where there may be a conflict with fisheries. Northern fur seal populations around the Pribilofs have declined 80% since their peak in the 1950s and 45% since 1974.

Commercial fisheries operate in fur seal habitat and target some of the same fish species that fur seals eat. Project 639 assessed the legal, policy, and scientific factors affecting Northern fur seal management, based on lessons learned from the experience with Steller sea lions.

The study concluded that scientific research, while beneficial and necessary, may be fraught with uncertainty in terms of shedding a direct light on an issue as complex as fur seal and fishery prey field interactions, making it difficult to identify the appropriate level of precautionary management. The study concluded that using independent stakeholder-driven bodies, such as the Pribilof Islands Cooperative, offers an excellent opportunity to negotiate a politically acceptable resolution in face of considerable scientific uncertainty.

Northern fur seal populations around the Pribilofs have declined considerably since the middle of the last century.



Mike Sigler

Northern fur seals at St. George Island.



Alison Banks

HUMANS :: Protecting Marine Mammals and Managing Ecosystems

## Ecosystem Management in Alaska Waters

Project 530

THIS IS A STUDY THAT EXAMINES THE ENTIRE ARRAY OF MANAGEMENT ENTITIES RESPONSIBLE FOR ECOSYSTEM-based management in the waters off Alaska. Project 530 is evaluating the past and present use of ecosystem-based management by major federal and state management institutions. Researchers are developing profiles that will let them explore how various alternative arrangements, such as cooperative or collaborative management, or lead entity management, can result in better-informed management. The study relies on six factors to examine agencies: jurisdiction, structure, function, decision processes, trends in issues and decisions over time, as well as interagency linkages with respect to ecosystem-scale decision-making. This evaluation should provide a composite understanding of the current status and trends of institutional arrangements in Alaska in terms of implementing ecosystem-based management.

## Crab Fisheries and Social Issues

WHENEVER MANAGERS PROPOSE TO IMPOSE NEW RESTRICTIONS ON MANAGING A FISHERY, THEY NEED TO CONSIDER THE ECONOMIC AND SOCIAL IMPLICATIONS OF THOSE DECISIONS

To assess those potential impacts, they need to know how the current fisheries operate and the major forces that shape their profitability. The Board has supported a major study of the economics of the Bering Sea crab fishery and a study of impacts of crab rationalizations.

HUMANS :: Crab Fisheries and Social Issues

## Market Models for Crab

Project 423

PROJECT 423 DEVELOPED AN INTERNATIONAL MARKET model for king and Tanner crab to allow us to compare the fishery before and after the implementation of rights-based management in 2005. This equilibrium supply and demand model established a baseline for future evaluations of the economic impacts of fishery rationalization to fishery participants. It was the first study of its kind to simultaneously model the international allocation and demand for king and Tanner crab in a partial equilibrium framework, and learn how crab prices and revenues are affected by various market determinants.

The model demonstrated that the Alaska crab industry faces major competition from Canadian, Russian and Greenland snow crab, and Russian king crab fisheries. Alaska crab revenues have been severely impacted by dramatic increases in snow crab from Canada and the recent emergence of Greenland and Russia as major crab producers has further dragged down Alaska crab prices and revenues.



**Pribilof blue king crab, caught by F/V Aleutian Beauty for Alaska King Crab Research and Rehabilitation Program, St. Paul Island.**

Unless there is a significant boost from crab rationalization or declines in foreign harvests, the model does not foresee substantial economic improvement in Alaska crab prices in the near future. This project is important to managers and participants in the crab rationalization process at the North Pacific Fishery Management Council level because it identifies market factors which affect price determination.

HUMANS :: Crab Fisheries and Social Issues

## Impacts on Bering Sea Crab Fishermen

Project 725

RESEARCHERS PARTICIPATING IN AN ONGOING STUDY OF THE BERING SEA CRAB FISHERY, PROJECT 725, ARE CONDUCTING INTERVIEWS WITH CREWMEMBERS TO DETERMINE HOW RATIONALIZATION OF THE CRAB FISHERIES AND REDUCTION IN THE NUMBER OF PARTICIPATING VESSELS FROM 300 TO 100 HAS IMPACTED THEIR WORKPLACE DYNAMICS AND PAY.



NOAA-AFSC

## Stakeholder Perceptions

GETTING MANAGERS AND STAKEHOLDERS TO FIND COMMON GROUND AND AGREE ABOUT THE STATE OF THE RESOURCES AND SPECIFIC MANAGEMENT ACTIONS IS OFTEN DIFFICULT , BUT NECESSARY TO ENSURE NEEDS ARE MET AS BEST AS POSSIBLE AND IN THE MOST SUSTAINABLE WAY.

HUMANS :: Stakeholder Perceptions

## Traditional Knowledge about Sustainable Fish Populations

Project 823

IN OUR REGION, AN ONGOING STUDY IS ASSESSING local and traditional knowledge as it pertains to salmon biology in the Copper River near Cordova, Alaska, and how it may differ in perspective from State of Alaska fisheries managers. Project 823 is examining knowledge held by Ahtna Native and commercial fishermen to determine how their perceptions of what is necessary to keep the salmon populations sustainable are shaped by their culture, training, and experience in the fisheries. This will allow investigators to determine how local scientific perceptions differ from the views held by fisheries scientists and managers, which could lead to finding common ground, improving communications, and making long-term improvements in the fishery.



Deborah Mercy

## Making Fishing Safer

THE U.S. CONGRESS WANTED MANAGERS TO CONSIDER SAFETY WHEN THEY DEVELOPED NATIONAL STANDARD #10 OF THE MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT THAT GOVERNS OUR NATION'S FISHERIES.

The Act states that conservation and management measures shall, to the extent practicable, promote the safety of human life at sea. But the question arises: Did safety actually improve with the imposition of rights-based management off Alaska?

Comprehensive rationalization of the fisheries off Alaska and the introduction of rights-based management starting in the mid-1990s were highly contentious issues. A major justification for managing the sablefish and halibut longline fisheries with individual fishing quotas (IFQs) was that it would stop the race for fish and significantly improve the safety of fishing operations. Fishing vessels would be in a better position to pick the right weather to take their catch and would not have to be in the middle of a frenzied fishing opener when a storm struck.



At-Sea Processors Association

HUMANS :: Making Fishing Safer

### Assessing Safety in Halibut, Sablefish, and Pollock Fisheries

Project 533

THE BOARD FUNDED PROJECT 533 TO SYSTEMATICALLY assess whether safety improved after quota-based management systems were established in the Alaska halibut and sablefish, and pollock fisheries. Researchers measured safety improvements by identifying declines in fatalities and search-and-rescue missions. Their results demonstrated a statistically significant decline in rates of fatalities (-81%) and search-and-rescue missions (-47%) for halibut and sablefish fishermen since the introduction of IFQs. Non-fatal injuries in the Bering Sea pollock fishery declined by 76%. These results provide valuable information to guide future management decisions on whether to use rights-based management as the preferred approach to ameliorate safety problems inherent in the "race for fish."



John Home



## Subsistence Use of Marine Resources and Local and Traditional Knowledge

RESIDENTS IN RURAL COASTAL COMMUNITIES DO NOT HAVE THE SAME ACCESS TO COMMERCIAL FOOD SUPPLIES AS MORE POPULATED AREAS, AND RELY ON SUBSISTENCE USE OF ALASKA'S LIVING MARINE RESOURCES. FISHING, HUNTING, AND OTHER FORMS OF FOOD GATHERING ARE CRITICAL ACTIVITIES THAT SUSTAIN RURAL AREAS, MOST OF WHICH ARE OFF THE ROAD SYSTEM.

The Board has funded studies relating to subsistence use and local and traditional knowledge, including projects 643 and 645, 728 and 823, and others that have examined contaminants in subsistence foods (projects 534, 644, and 822) or used subsistence hunters to collect samples for analysis (Project 312).

HUMANS :: Subsistence Use of Marine Resources and Local and Traditional Knowledge

### Changes in Bering Strait Harvests

Project 643

IN PROJECT 643, RESEARCHERS SET OUT TO DOCUMENT SUBSISTENCE HARVESTS AND GATHER LOCAL AND TRADITIONAL knowledge in the Bering Strait region in communities along the coast of Norton Sound, in the southern Chukchi Sea, and on St. Lawrence Island. The study documented the views of local residents about the many changes they have experienced since Statehood. They've witnessed a warming of their region, the appearance of new fish species, marine mammals with reduced blubber thickness, and more prevalence of beavers and willows on the Seward Peninsula. More frequent violent storms wreak havoc with coastal communities, and melting permafrost shrinks tundra ponds and lowers river levels. Changes in sea ice impact the availability of marine mammals and hunting operations that depend on stable ice conditions. The surveys also found that marine mammals and seabird eggs were prominent components in the diets of people living in villages within the sampled area.

HUMANS :: Subsistence Use of Marine Resources and Local and Traditional Knowledge

### Halibut and Rockfish Harvests

Project 645

IN 2003, THE NORTH PACIFIC FISHERY MANAGEMENT Council allowed rural community residents to use longlines for subsistence halibut much more extensively than previously allowed by the State of Alaska. Questions immediately arose about the impacts of these new activities on bycatch and discard of rockfish and their populations. Were fishermen catching and discarding more rockfish while targeting halibut? How were rockfish populations faring? What types of gear were being used and how had the fisheries changed?

To determine how halibut subsistence fishing may be impacting local rockfish stocks, Project 645 collected local information about rockfish harvests in four communities on the Gulf coast: Sitka in Southeast Alaska, and Nanwalek, Port Graham, and Tatitlek in Southcentral. They learned that fishermen tended to catch certain rockfish species such as quillback, yelloweye, and black rockfish, but to retain just the larger ones because of the relatively low meat recovery rate (about 30% of the smaller individuals). Longlines were used more off Sitka than up in Southcentral, where rod and reel was the gear of choice.



J. Rosenthal

Investigators also learned the local Native names for rockfish species, how they prepared and stored it for winter, and how they shared the catch among families. Fishermen also talked about spreading their fishing over broader areas to reduce the chances of overfishing particular concentrations of rockfish, and voiced their concerns over heavy competition from non-local recreational and commercial fishermen. The study concluded by recommending that further effort be put into developing practical rockfish avoidance strategies in the subsistence halibut fisheries.

HUMANS :: Subsistence Use of Marine Resources and Local and Traditional Knowledge

## Community Monitoring for Shellfish Poisoning

Project 644

PARALYTIC SHELLFISH POISONING (PSP) IS THE MAJOR harmful algal bloom (HAB) concern in Alaska. Caused by dinoflagellates, PSP toxins accumulate in filter-feeding shellfish and transfer through the food web to those who feed on shellfish. People with PSP poisoning feel symptoms that can include tingling or numbness in the lips and extremities, nausea, dizziness, shortness of breath, and in extreme cases, paralysis and death. Through project 644, the Board supported an effort to educate local residents in the Aleutians and Commander Islands about PSP and train them to use test kits to monitor the toxin. Shellfish specimens were collected and analyzed from 21 communities extending the length of the Aleutians. Only low levels of PSP were found. Test kits provided an efficient method for rapid screening for PSP, but the technique had a high percentage of false positives.

The project also included interviews of 13 local residents in Sand Point, Alaska, and 30 in Nikolskoye on Bering Island in Russia. The respondents were asked about learning and teaching about shellfish, indicators of shellfish safety, and shell collection and preparation habits. The project sought to develop a complementary relationship between scientific research and traditional knowledge, and between natural and social sciences that would improve understanding of the risks of PSP to human health in Aleut communities. Researchers concluded that local and traditional knowledge, on its own, cannot equip local residents with sufficient knowledge about safe harvesting of shellfish.



Bruce Wright

**A Sand Point technician and her assistant prepare a sample of butter clams to be tested for PSP.**



Ray Rolonde

**These developed Jellett PSP test strips are from the first shellfish samples ever tested for PSP in Sand Point, Alaska.**

HUMANS :: Subsistence Use of Marine Resources and Local and Traditional Knowledge

## Assessing Mercury Levels in Murres and Gulls in Norton Sound

Project 822

RELATED TO STAMP (PROJECT 534), PROJECT 822 supports an assessment of mercury contamination in murre and gull eggs in the Norton Sound region to determine if contaminant levels correlate with large estuarine wetlands, river outflows, or historical gold mining sites. When completed in 2010, the study will provide local residents with important information about the contaminant levels in bird eggs used for subsistence purposes. It will also help identify potential sources of contaminants and the presence of those contaminants at traditional egg harvesting locations.



Rann Paplich

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 HUMANS :: Subsistence Use of Marine Resources and Local and Traditional Knowledge
 

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## Herring Database

Project 728

PACIFIC HERRING IS A 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. Productive spawning areas and times are limited, and the historical population dynamics and technology of herring are not well understood. Many communities with local and traditional knowledge of herring fisheries claim that historical stocks were larger and spawning areas more numerous, but that they have dwindled due to over-harvesting, predation, disease, development, and climate change.

While shifts in stocks and spawning areas have been reasonably well documented since 1980, no one has synthesized the deeper archaeological, historical, and ethno-ecological records on herring spawning areas and their relation to local ecosystems. Project 728 will synthesize this information for Southeast Alaska from Dixon Entrance to Yakutat Bay, where herring and herring roe were traditionally harvested. Using published and unpublished archaeological, ethnological, historical and biological records as well as community focus groups in each historical herring stock region, the project will compile historical and spatial information into a database. This will allow researchers to investigate the extent of historic and prehistoric herring spawning and massing areas, link changes in herring spawn extent and intensity to environmental and human factors in the socio-ecological system, and identify sensitive areas for protection and potential restoration of herring spawning.

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 HUMANS :: Subsistence Use of Marine Resources and Local and Traditional Knowledge
 

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## Health of Ice Seals

Project 312

BEARDED, RINGED, SPOTTED, AND RIBBON SEALS ARE called "ice seals" because they depend upon sea ice for feeding, resting, and pupping. Although these species are important subsistence resources for Alaskans and play an important role in the arctic marine ecosystem, we know little about their biology or population dynamics. They range widely, and conducting marine mammal surveys in remote, ice-covered waters poses serious logistical issues, making it difficult to predict or interpret the impacts of Arctic warming on the population dynamics of these species.

The Board funded Project 312 as a monitoring study to examine the health and status of the four ice seal species in the Bering and Chukchi seas. Working with subsistence hunters in eight coastal Alaska villages (Barrow, Point Hope, Shishmaref, Diomedes, Nome, Gambell, Savoonga, and Hooper Bay), researchers collected biological samples from more than 1,100 ice seals.

An analysis of these samples indicates that individuals of the ice seal populations in northern Alaska are in relatively good health. Contaminant levels found in the tissues of sampled individuals were lower than levels found in samples from the Canadian Arctic, and reproductive rates for all species were relatively high. Between 86-91% of adult females appeared to be reproductively active, with ribbon seals maturing as early as two to three years of age.



Elizabeth Labunski

**Ribbon seal in the Bering Sea.**

By comparing current data to information collected in the 1970s, researchers also found that ringed seals are larger at younger ages in the present population, possibly indicating that current environmental conditions are favorable and promote growth. Genetic analysis shows high levels of genetic diversity in all four species, suggesting that all species belonged to historically large populations.

To address the question of population trend, researchers questioned Native subsistence hunters regarding changes in the number and distribution of ice seals over time, and responses seemed to indicate that populations of these species are stable.

## Social and Economic Baselines

SOCIAL AND ECONOMIC BASELINES ARE NECESSARY FOR REGULATORY, ENVIRONMENTAL, AND SOCIAL IMPACTS STUDIES OF PROPOSED CHANGES IN FISHERIES REGULATIONS.

Social and economic baselines are very important to management entities such as the North Pacific Fishery Management Council, National Marine Fisheries Service, and the Alaska Department of Fish and Game. In partnership with the Council, the Board has funded two major baseline studies.

HUMANS :: Social and Economic Baselines

### Socio-Economic Baseline for the Pribilof Islands

Project 528

IN THE PRIBILOF ISLANDS, THE BOARD FUNDED A STUDY to produce baseline information against which future change could be measured. Project 528 responded to information gaps identified by the Pribilof Islands Collaborative (PIC), a working group that had been working to address a series of Bering Sea fishery and marine resource management issues in a proactive and collaborative setting.

The PIC identified knowledge gaps, such as the value of halibut and other Bering Sea fisheries to the region and the Pribilofs, impacts of changes in fisheries on the communities, history of local marine stewardship, and economic importance of substance harvest of halibut, fur seals, and other resources. Researchers gathered key information from local and governmental organizations and combined it with data from on-island surveys to create a comprehensive socioeconomic baseline for the Pribilofs.

The study showed that while both St. George and St. Paul are fishing communities, fisheries have played a lesser role in recent years. Fishery-related revenues and employment are declining but halibut fisheries remain very important. Subsistence harvests are an important source of community sustenance and culture, and contribute to the communities' sense of health and well-being. The economy of St. Paul has suffered substantially in the last few years but appears to be stabilizing, while the future of St. George appears to be more uncertain. A variety of capital investments and

infrastructure projects have helped create jobs and income, but employment by the City of St. George has dropped sharply and it is unlikely that capital projects will continue indefinitely. Fish processing and ecotourism offer some promise of sustainable economic activity, but other sources of employment and income are likely to be needed as well. One conclusion from both the data and anecdotal evidence was the importance of economic diversification to the long-term health of both communities. Finally, the research showed that while similarities exist between the two communities, they are certainly not identical and changes or perceived changes may impact them differently.



Community meeting at St. Paul.

Asrind Scholz



## HUMANS :: Social and Economic Baselines

## Community Dependence on Fisheries

Projects 318, 640

PROJECTS 318 AND 640 BOTH FOCUSED ON SOCIAL and economic information that demonstrates the engagement and dependence on fisheries resources of Unalaska, Akutan, King Cove, Kodiak, Adak, Sand Point, and St. Paul and St. George on the Pribilof Islands. The studies described the harvesting and processing sectors in each community as well as support services. Data included numbers and size of fishing vessels, numbers of permit holders by fishery, catch and earnings data, crewmember information, quantitative assessment of processing activities, and estimates of the importance of fishery-related revenue to the municipal revenue for each community. For example, fishery-related revenues accounted for 41-47% of total revenues for Unalaska, and 52% for Kodiak, suggesting that managers must heavily weigh impacts of changes in fishing regulations on these communities.



Community fishing at St. Paul Island

Mike Downs



St. Paul in the Pribilof Islands in the Bering Sea.

Mike Downs

## Human Health and Marine Resources

SIGNIFICANT CONCERNS EXIST ABOUT THE RELATIONSHIP BETWEEN HUMAN HEALTH AND SUBSISTENCE AND COMMERCIAL USE OF MARINE RESOURCES.

From 2002-2008, the Board funded one study focused directly on human health.

HUMANS :: Human Health and Marine Resources

### Health Risks of Eating Walrus

Project 641

THE ROLE OF WALRUS IN THE DISTRIBUTION OF HUMAN *trichinellosis* disease among indigenous people on the Chukchi Peninsula in Russia was the focus of Project 641. This research relates to our own Native communities in Alaska where walrus meat may be an important part of the subsistence diet. Subsistence hunting of marine mammals is a primary source of food and carries a health risk associated with consumption of *trichinella*-infected walrus meat in raw or fermented form.

Researchers tested individuals in two Russian communities, Lorino and Lavrentiya, for infections, which were found to be highest in marine mammal hunters and school children, although there were no clinical signs of disease noted. Four mammal species—walrus, red fox, farmed polar fox, and sled dogs—carried the parasite. In Lorino, 6% of the 361 individuals tested were infected. In Lavrentiya, only about 1.3% of the 76 people tested positive for it. The major source of infection in humans was walrus meat, although polar fox meat also played a role.



Hunting walrus.

Lyalya Bukina



Walrus on ice pack.

Anatoly Kochnev

# HUMANS

*People and the Sea*

2002-2008 RESEARCH SUMMARY



## NORTH PACIFIC RESEARCH BOARD

### Mission

NPRB supports research to build a clear understanding of the North Pacific, Bering Sea, and Arctic Ocean ecosystems that enables effective management and sustainable use of marine resources.

**Humans** is one in a series of publications produced by the North Pacific Research Board in support the 2005 *Science Plan* developed with guidance from the National Research Council of the U.S. National Academies of Sciences.



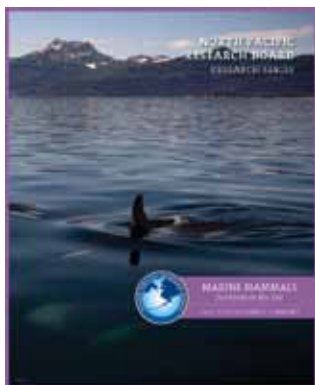
OCEANOGRAPHY & PRODUCTIVITY



FISH HABITAT



FISH & INVERTEBRATES



MARINE MAMMALS



SEABIRDS



HUMANS



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