

## Management Tools

ONE OF THE KEY ROLES THE NORTH PACIFIC RESEARCH BOARD CAN PLAY IN ALASKA'S SEAS IS TO FOSTER COLLABORATION, DATA SYNTHESIS, AND COORDINATION.

Workshops help bring together regional, national, and international experts to discuss pertinent ecosystem and management questions and develop recommendations to move forward, or to fund the establishment of statewide databases that can be used by researchers and managers to plan and evaluate research needs in a broader context.

Recognizing the importance of this role, the Board has funded a variety of activities related to the different ecosystem components discussed in this report, and specifically, six projects related predominately to fish and invertebrates for almost \$700,000.

## WORKSHOPS

The Arctic is changing. Temperatures are rising, and summer sea ice extent is decreasing. Rivers are discharging more water, sea levels are rising, permafrost is thawing and coasts are eroding. Resident species may shift their ranges and when they reproduce. Ice-dependent species may lose habitat. Hunting cultures may disappear, and access to traditional foods may change. Marine shipping access to natural resources and fisheries may increase.

Despite these potential changes, relatively little is known about the Arctic Ocean and northern Bering Sea ecosystems. We urgently need to synthesize knowledge about the biology and oceanography of this region to have a baseline from which to observe and understand ongoing changes.



## FEATURE PROJECT

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### Arctic Synthesis Workshop

Project 503

PROJECT 503 BROUGHT TOGETHER 30 EXPERTS AS PART OF AN INTERNATIONAL workshop focused on the Chukchi and Beaufort seas. Participants discussed the state of knowledge, information gaps and research needs in physical and chemical oceanography, sea ice, phytoplankton, microbes, zooplankton, benthos sea floor, fish, seabirds, and marine mammals. They noted possible future efforts that might be undertaken by NPRB. In the western Arctic, climate change may affect the environment in two general ways. External changes will be forced through changes in sea ice processes and shifts in the transport rates and properties of Pacific waters through the Bering Strait. Internally forced changes involve the responses of resident biological populations to altered temperatures and the timing of events in their annual life cycles.

Because each mechanism is system-wide, researchers concluded that these changes will ultimately affect all trophic levels. This will lead to further changes in the pathways and amount of energy transferred to fish, seabird, and marine mammal populations, and consequently impact their abundance and distribution.

Based on these two mechanisms, the workshop made several recommendations on how to proceed with future research, including the need for:

- data consolidation and analysis
- interdisciplinary research approaches
- continuation and/or establishment of long-term time-series
- collaboration and cooperation between agencies and programs
- year-round observations
- establishment of research support infrastructure
- biogeochemical and ecological modeling
- training of taxonomic expertise



Sea ice as seen from below can support high densities of amphipods (dark blotches above, with close-up shown in inset). Some species are only found associated with sea ice and may be at risk as summer sea ice declines.

Researchers concluded that climate change will ultimately affect all trophic levels.

## DATABASES

Scientists have been collecting information about the oceans for over a hundred years, yet in many instances these data are scattered throughout published and unpublished reports all over the world, many in paper format, unavailable to the general public and much of the scientific community. As a result, many questions that we might resolve with previously collected data remain unanswered. New studies are being funded that are potentially redundant to previous or ongoing efforts elsewhere in the world. Given a financial climate of limited funding for ocean research, and an ocean climate that is undergoing dramatic changes that affect us all, it has become more important than ever to bring existing information together in a format usable for management, research, and research planning by all.

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### Electronic Warehouse for Salmon Data

Project 311

THROUGHOUT ALASKA, HUNDREDS OF THOUSANDS of salmon are examined annually for sex and size information, and scales are collected for age data. This enormous sampling effort over 40-plus years has resulted in millions of data records and scale samples.

Although useful for local management needs, there has been no common process or protocol for managing and preserving the historical data and scale samples. Project 311 initiated a process for establishing an electronic data

warehouse through which historical salmon sampling and scale pattern data can be maintained and updated annually from collections throughout the state.

Designed to inventory all collections, the project established a steering committee composed of state, federal, and research interests and developed a standardized web-accessible database where the sampling information is now accessible, preserved, and facilitates future research and management (see <http://www.taglab.org/>).

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### Salmon Research and Monitoring Metadata

Project 504

THE COMMERCIAL AND CULTURAL IMPORTANCE OF salmon in Alaska is reflected in the number of projects and amount of money that has been invested into better understanding their biology and forecasting their productivity. Salmon research problems are ecologically complex, cover large expanses of marine, estuarine and freshwater habitats, and are being studied by many different organizations and programs.

Concerns have been raised about the efficacy of the millions of dollars annually dedicated to this topic, and whether the most important management-oriented questions are being addressed. Project 504 gathered the necessary metadata on salmon research and monitoring, and designed an online database that is easily searchable so that decision-makers could determine whether additional funding is warranted for salmon research and for what research topics. The database contains 457 recent salmon research studies, and 13,533 records of salmon monitoring programs in

Alaska, and can summarize the information by species, life history stage, bioregion, disciplinary topic, research issue, and management information needs.

Although much effort was spent to collaborate and coordinate with all of the relevant organizations involved in salmon research, many researchers did not respond to the request to share their project information. Also, the Alaska Department of Fish and Game, which contributes the largest number of salmon research studies in Alaska, asked to be withdrawn from the survey.

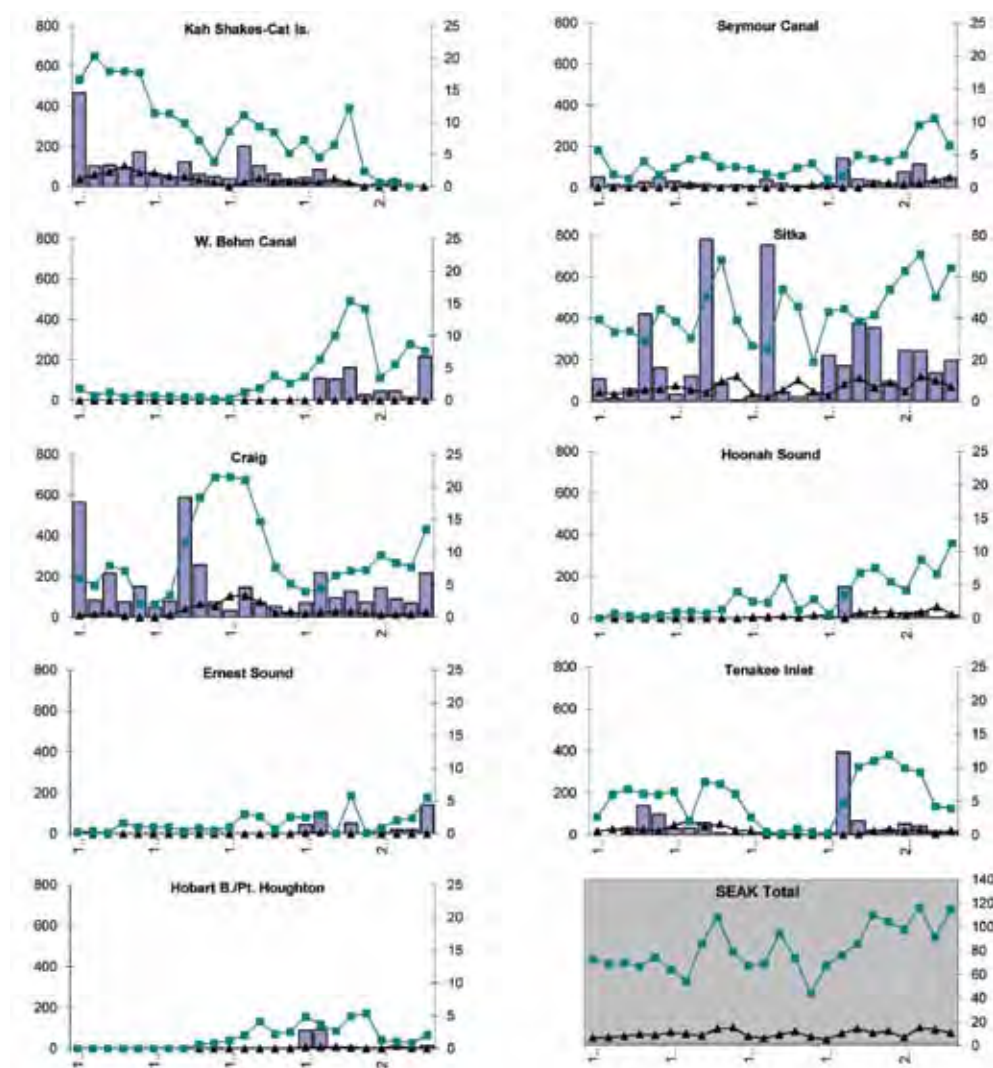
Although the project reported an annual funding level of over \$11 million for salmon, it is likely only a portion of what is actually spent. Future efforts to create a living compendium of research projects on this or other topics will clearly need established agreements between organizations and a commitment by all involved before going forward.

## 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.



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