



SCIENCE PROGRAM

*Furthering Knowledge
about Alaska's Seas*

PART II SCIENCE PROGRAM





The North Pacific Research Board has developed a comprehensive program of marine research based on three major program components. First, there is the *Science Plan* developed in 2004-2005, which serves as the foundation for the annual requests for proposals. Second, there are the annual requests for proposals that have resulted in most of the funded projects, which are numbered by year funded (e.g., #201 funded in 2002 through #829 funded in 2008). Third, there are the integrated ecosystem research programs that the Board is fielding in the Bering Sea and is developing for the Gulf of Alaska.

As of December 2008, 200 numbered research projects have been funded and the Board anticipates annually funding \$3.7-5 million in new research projects over the next few years. The Board's integrated ecosystem research program in the Bering Sea involves a \$52 million partnership with the National Science Foundation. The Gulf of Alaska integrated ecosystem research program is under development and likely will be funded at the \$9 million level for 2010-2014. These research activities, beginning with the *Science Plan*, are described below to explain how the Board is furthering knowledge about Alaska's seas.

The Science Plan

The Board identified the need for a comprehensive science plan early in 2002. The executive director interviewed each member of the Board about their expectations of NPRB's future role in marine research. Many expressed the need for a high-quality research plan that would have long-term scientific credibility. In February 2002, the Executive Committee followed up on a suggestion by one of the Board members that the National Research Council (NRC) of the National Academy of Sciences be contracted to perform a fast-track study of the regions and topics under the Board's purview, using an outside expert committee to provide recommendations on the components of a successful and comprehensive research plan.

The Board contacted the NRC and requested that they provide guidance on how to write a good science plan, but not write it themselves. This approach was taken because NRC normally establishes an independent scientific committee to write a science plan or review one drafted by others. The Board believed that if such a committee wrote its plan, the plan might not reflect its legislated mandates. NPRB did not view itself as a curiosity-based science organization like the National Science Foundation. NPRB's enabling legislation calls for research that addresses pressing fishery management and marine ecosystem information needs. The Board also did not want to invest their own or staff time in drafting a science plan without NRC guidance. The previous year, another Alaska research organization had drafted a science plan that was then heavily criticized by an NRC committee.

This led to the expenditure of significant staff, time, and fiscal resources to revise the plan in light of NRC's comments, and the Board did not want to repeat that experience with its own plan. The NRC was initially hesitant to engage in an iterative guidance process that involved a plan drafted by someone else for their review. Eventually, a draft statement of work with NRC won Board approval in June 2002. The Board set aside \$474,000 to fund the effort, although the budget was increased to nearly \$500,000 to cover additional site visits.

National Research Council

The statement of work called for the NRC to establish a study committee of about 12 experts from Alaska, other parts of the nation, and other high-latitude countries. It would include individuals with expertise in biological, physical, chemical and geological oceanography, marine biology, and fisheries science, with an emphasis on Arctic research. The committee would attend a workshop in Anchorage to hear presentations describing existing research programs, review progress on previously proposed research plans, and discuss the issues of greatest concern to the participants, with particular emphasis on critical resource management issues. The NRC then would draft a white paper, summarizing the discussions and identifying the broad research themes that emerged. The paper also would summarize previously identified attributes of a successful research plan, based on existing reports.



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Breaking into smaller groups, the committee would conduct site visits in Barrow, Juneau, Kotzebue, Dillingham, Fairbanks, Anchorage, Bethel, and Seattle to hear from local residents and stakeholders about their concerns and experiences regarding the North Pacific ecosystem and important research needs. The NRC would provide an interim report that outlined essential components of a successful, long-term science plan; summarize existing research plans relevant to the NPRB; refine workshop themes into high-level goals for the science plan; and identify research questions that should be addressed to achieve each goal. Building on the interim report, the NPRB would draft a detailed science plan, working with other agencies and organizations, as appropriate. The NRC committee would then review the draft plan and offer comments.

NRC announced its committee on January 3, 2003, which proceeded to hold meetings and site visits throughout the spring of 2003. In October 2003, Jim Schumacher (aka Two Crow), under contract to NPRB, presented his review of other science plans to the Board, along with his recommendations on how to proceed. Dr. Lynda Shapiro, Chairman of the NRC Committee, provided their plan guidance to the Board in January 2004, in an interim report titled "Elements of a Science Plan for the North Pacific Research Board."

The NPRB executive director then established a drafting team comprised of himself, Jim Schumacher, David Fluharty, Henry Huntington, and Gordon Kruse, which worked iteratively with the Board and its science and advisory panels. They presented initial outlines in March, and shared major content at intensive work sessions in July and September 2004. Summaries of those meetings reported the major considerations by the Board and its panels.

The team forwarded a draft plan to the NRC for comment in October 2004 and received final comments in mid-February 2005. The plan was finalized in spring 2005 with significant help from Misty Ott and Francis Wiese, and from graphic designer Eric Cline of TerraGraphica. In October 2005, the NPRB *Science Plan* was published and remains the foundation for the Board's activities, including annual requests for proposals.

Implementation Plan

Associated with the *Science Plan*, the Board in 2004 developed and approved an implementation plan based on an overview of projects funded for each major ecosystem component and gave recommendations on next steps in setting research priorities. The Board also referred to a matrix indicating the types of research that could be accomplished and funding targets for 2005-2008. The implementation plan was updated in March and September 2005 to guide research priorities for the 2006 RFP while the science plan was being developed. Once the science plan was published and became the foundation for annual research priorities, the Board used it, along with research recommendations from agencies, organizations and stakeholders, to guide drafting of its annual requests for proposals, and the implementation plan was no longer used.

For more information about other program and policy issues, read "Part III: Evolution of a New Marine Science Research Program." Table 1 gives an overview of annual requests for proposals and funding. In Appendix IIA, you will find research topics included in annual requests for proposals, showing how the emphasis changed over time as the research program evolved and requests for proposals became more refined to reflect changing priorities and lessons learned from previous funding requests.

Table 1: RFP Funding Summary 2002-Present

RFP Year	Release Date	RFP Amount (\$M)	Proposals Received	Funds Proposed (\$M)	Proposals Funded	Funds Granted (\$M)	Approval Date
2002	8-Mar-02	\$1.50	41	\$6.30	15	1.64*	15-Mar-02
2003	8-Nov-02	14.00	156	70.00	30	7.00**	18-Mar-03
2004	7-Oct-03	3.00	87	>17.00	23	3.62	17-Mar-04
2005	8-Oct-04	4.50	103	>24.50	35	5.96	15-Mar-05
2006	7-Oct-05	5.15	126	>24.00	44	6.70	29-Mar-06
2007	29-Sep-06	3.90	93	14.20	29	4.56	25-Apr-07
2008	3-Oct-07	4.00	89	15.85	25	4.13	30-Apr-08
2009	3-Oct-08	3.70	85	13.50	TBD	TBD	TBD

* In 2002, \$434,000 was provided from NPMRI funds and \$1.21 million from EIRF funds. The Board also approved continuation of five North Pacific Marine Research Program projects for \$571,000. Therefore, the Board funded just over \$2.2 million in research beginning in 2002.

** In 2003, a reduced amount of \$7 million was made available for new research due to interest earnings from the EIRF that were lower than expected.

North Pacific Research Board Science Program through 2008

The Board has funded a broad array of research projects during its first eight years, touching on all aspects of the marine ecosystems off Alaska. Thus far, research projects are currently distributed among regions with 8% to the Arctic, 56% to the Bering Sea and Aleutians, and 36% to the Gulf of Alaska (see Figure 1 for a breakdown of the percentage of funds spent per region 2002-2008).

Seventy agencies and institutions and more than 275 principal investigators have been awarded funds by NPRB, with academic institutions garnering 47% and federal agencies receiving 33%, as shown in Table 2. (For a detailed breakdown of funding per institution, see Appendix IIB.) Through 2008, 168 papers have been published, all of which are available in the NPRB Publication Library found online at www.nprb.org, or in Appendix III.

Figure 1: Percentage of Funds by Region Per Year 2002-2008

Year	Arctic Ocean	Bering Sea/ Aleutian Islands	Gulf of Alaska
2002	0.00	65.52	34.48
2003	0.00	73.70	26.30
2004	5.67	46.27	48.06
2005	12.23	47.01	40.76
2006	7.09	57.78	35.13
2007	9.17	53.87	36.96
2008	12.92	51.10	35.98
2002-2008	7.61	55.91	36.49

Table 2: Institutional Funding

Institution Type	Percentage of Funding
Academic	47
Alaska village	1
Consultant	3
Federal	33
International	1
NGO	8
NPRB*	4
State	3
Grand Total	100

* used for ship time and tags for BSIERP

In this report, we summarize projects by research theme following the structure of the *Science Plan*. By the end of 2008, projects funded through the annual requests for proposals total just over \$33 million. The proportion spent on each primary ecosystem component is as follows:

- 15% lower trophic level productivity
- 10% fish habitat
- 42% fish and invertebrates
- 16% marine mammals
- 10% seabirds
- 5% humans
- 2% other prominent issues

Table 3 shows the number of projects for each category, and additional tables summarizing projects by year, funding level, principal investigator and institution are provided in Appendix IIC.

Descriptions of NPRB's comprehensive integrated ecosystem research programs for the Bering Sea and the Gulf of Alaska are included later in this report, although the latter project will not come online until the fall of 2009.

For more in-depth information about individual research projects summarized in this report, please visit www.nprb.org, where a dynamic searchable project browser gives you access to full statements of work, progress and final reports, project synopses, and any other available information related to each project. You can search by year, by project number, by principal investigator, or by key word.

Table 3: Funded Projects by Ecosystem Priority

Research Theme	Total Projects	Total Funding (\$)
Fish and Invertebrates	75	13,635,415
Fish Habitat	15	3,388,384
Humans	19	1,657,455
Lower Trophic Level Productivity	31	5,149,748
Marine Mammals	33	5,284,438
Other Prominent Issues	8	762,984
Seabirds	19	3,395,249
Grand Total	200	33,273,673

Synthesis and Database Development

To better inform funding decisions for individual projects, the Board needs to understand the scope and types of information that already exist for particular regions. These data help us identify research gaps and determine priorities for the annual requests for proposals to enhance understanding of the relevant marine ecosystems. To build a foundation of knowledge, NPRB funded two syntheses—one in Southeast Alaska and the other in the Arctic Ocean. The Board also has funded two database projects in the Bering Sea region and one comprehensive effort to bring together all relevant bio-physical data in Alaska—the Alaska Marine Information System (described in “Part II: Other Research Partnerships”).

Southeast Alaska Synthesis

In setting the research priorities for the 2004 request for proposals, the Board identified the need to bring the scientific information about Southeast Alaska up to the status of those for other Alaska waters by completing a synthesis of biological and oceanographic information.

Project 406 supported a workshop in March 2005 at the University of Alaska Southeast to bring together representatives from different marine science disciplines and organizations to develop the synthesis. Thirty-eight individuals participated and the project was completed in 2007. The synthesis concluded that there should be greater

collaborations and partnerships between researchers in Southeast Alaska and the Gulf of Alaska, as well as greater collaborations with Canadian colleagues. Our understanding of the hydrography of the region is poor. More studies need to focus on the interactions between marine, terrestrial, and glacial environments and organisms, and more partnerships need to be developed for research in Southeast. Data from past studies should be archived in a central and easily accessible location. The synthesis also offered research priorities on the range of topics covered in the workshop, from oceanography up through seabirds, fish, and marine mammals.

Arctic Ocean Synthesis

For the 2005 request for proposals, the Board sought to bring Arctic Ocean scientific background up to the status of Alaska’s other large marine ecosystems by completing a synthesis of biological and oceanographic information, including Russian research.

Project 503 brought ten different working groups together for a workshop to develop a synthesis focusing on the Chukchi and Beaufort seas and nearby waters. They summarized the current state of knowledge and identified the most crucial information gaps, the ‘pulse points’ in the biological and physical environment that require monitoring, and how climate change might impact biota through its influence on sea ice, shelf currents through the Bering Strait, coastal currents along Alaska’s north coast and their relationship to various biological processes and life histories.

The resulting synthesis provided detailed overviews and identified research needs for oceanography and sea ice, phytoplankton, microbes, zooplankton, benthos, fishes, seabirds, and marine mammals, with expansive lists of citations. Overarching needs include data rescue and archiving,

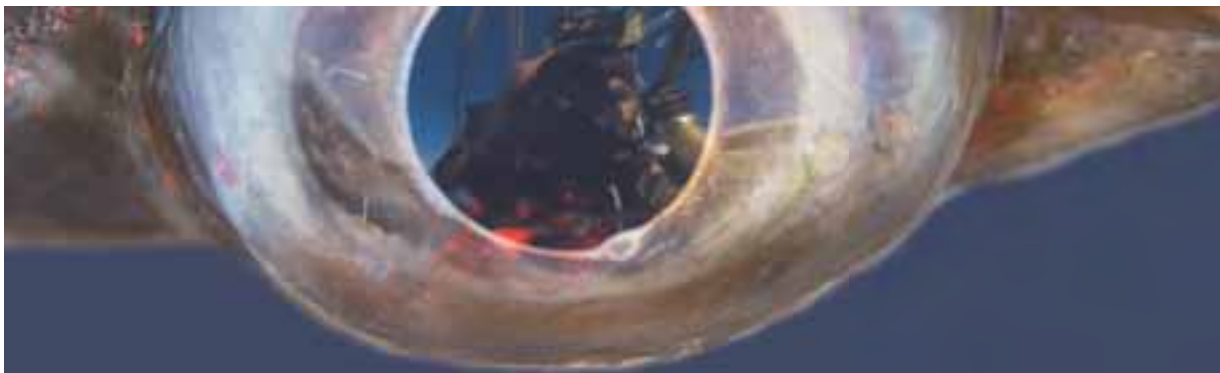
integrated analysis tools, interdisciplinary approaches, long-term time series, integration and collaboration among agencies, year-round observations, infrastructure support for research, modeling, and taxonomic expertise. This report will serve as an important guide to the development of the Board’s future programs in the high Arctic.

Bering Sea Climate Database

Project 207 was principally a retrospective study to design a protocol for detecting and tracking change in the Bering Sea ecosystem. One central product is a database of 47 metrics that characterize different aspects of the ecosystem organized into five groups: climate indices, atmosphere, ocean, fisheries, and biology. The database is available at www.BeringClimate.noaa.gov.

Bering Sea and Strait Sea Ice Database

Project 705 is providing a comprehensive sea ice database for the Bering Sea and Bering Strait. It will help in assessing trends and variability in sea surface temperature, surface air temperature, and sea-level pressure. The project will be completed by the end of 2009.



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