REQUEST FOR PRE-PROPOSALS

This notice constitutes a call for pre-proposals for an Arctic marine integrated ecosystem research program. The North Pacific Research Board (NPRB) has conducted interdisciplinary marine ecosystem research programs in the Bering Sea (http://www.nprb.org/bering-sea-project) and Gulf of Alaska (http://www.nprb.org/gulf-of-alaska-project). This program aims to build on the success of those programs to implement a similar program in the Arctic (http://www.nprb.org/arctic-program). Integration of data and analyses across disciplines will be central to this Arctic program. The Arctic program will be conducted in partnership with the Bureau of Ocean Energy Management (BOEM), North Slope Borough/Shell Baseline Studies Program (BSP), and the North Pacific Marine Research Institute (NPMRI).

NPRB is cooperating with other funding organizations, including BOEM, BSP, National Science Foundation (NSF), National Oceanic and Atmospheric Administration (NOAA), U.S. Geological Survey (USGS), Alaska Ocean Observing System (AOOS), and others, to formally include some existing projects in the Arctic ecosystem program. The projects that appear in Appendix A will collaborate with projects funded through this call for proposals; the lead Principal Investigators will participate in annual PI meetings, share preliminary data with collaborators, and contribute intellectually to addressing the core hypotheses of the funded research program. Proposers are encouraged to describe how their research would use the data and expertise provided by existing projects. Existing projects are not intended to constrain the direction of the new research projects proposed. NPRB has worked closely with the Interagency Arctic Research Policy Committee (IARPC) Chukchi and Beaufort Sea Ecosystem Collaboration Team and the U.S. Arctic Research Commission (USARC) to develop this highly-collaborative program.

The U.S. Office of Naval Research (ONR) is interested in supporting some aspects of the research program directly if the work proposed addresses the mission of the agency. NPRB may share pre-proposals with ONR, particularly if they include physical science or marine mammal research.

The NPRB-coordinated Arctic program will focus on processes influencing the structure and function of the Arctic marine ecosystem. An Implementation Plan is available on the NPRB website on the Arctic Program page (http://www.nprb.org/arctic-program/resources-for-investigators/) and should be carefully consulted during the development of pre-proposals.

Pre-Proposals responding to this RFP must be sent to ArcticProgram@nprb.org prior to 4:00 PM Alaska Daylight Time, Friday, July 31, 2015

PROGRAM OVERVIEW

This NPRB-led program will involve the integration of multiple streams of marine data, including physical forcing mechanisms, marine ecology, human dimensions, and consideration of ecosystem services. Success of the program will rely on careful coordination and effective collaboration. All participants will be expected to collaborate with colleagues outside of their specific discipline and innovate means of integrating data to achieve ecosystem-level understanding.

Research will be centered in the Chukchi Sea, but will also include the Bering Strait and northern Bering Sea, especially with respect to advective forcing and sea ice dynamics. NPRB is interested in dynamics across the entire expanse of the Chukchi Sea as well as connections to the Beaufort Sea and Arctic basin. NPRB encourages cooperation with programs such as the BOEM-funded Marine Arctic Ecosystem Study (MARES), Russian-American Long-Term Census of the Arctic (RUSALCA) and projects organized through the Russia-U.S. Intergovernmental Consultation Committee. Opportunities to facilitate comparisons between the Chukchi Sea and other marginal or regional seas throughout the Arctic will also be encouraged. NPRB is also interested in integrating global-and regional-scale atmospheric and climate data into models, analyses, and projections.

Pre-proposals are solicited in several categories. We encourage both multidisciplinary proposals that address multiple elements of the Arctic marine environment as well as discrete projects that focus on a particular element of the ecosystem but integrate into larger initiatives. Each pre-proposal is expected to demonstrate how that proposal might integrate in a multidisciplinary program that considers physical drivers and trophic linkages. A selection of pre-proposals in each category will be invited to submit full proposals that will compete for funding. Those invited to submit full proposals will be encouraged to illustrate linkages to the proposals competing in other categories to demonstrate how projects funded in each category would integrate to form a cohesive program. Toward that end, the titles of successful pre-proposals may be made public, as well as the identities and e-mail addresses of the lead Principal Investigators.

Following review of pre-proposals, invitations will be released for full proposals in October 2015 and final funding decisions will be made in May 2016. Some field sampling may proceed in fall 2016 if proposers leverage logistical resources in place. Most field observations are anticipated to occur 2017-2019. At least two years of integrated analysis and synthesis will follow.

Additional funding for synthesis may be provided for 2019-2021.

NPRB is committed to regularly communicating the research plans, intermediate progress, final results and management applications of the Arctic program to the broader scientific community, stakeholders, and the public. NPRB will dedicate resources to facilitating this communication. Program participants will be called upon to engage in outreach activities.

The core hypotheses to be tested by the overall Arctic research program will be determined in meetings involving all PIs after funding decisions have been announced. Applicants are strongly encouraged to articulate testable hypotheses that could be addressed by the work proposed.

RESEARCH PRIORITIES

The NPRB Arctic Program will focus on the Chukchi Sea and will include Bering Strait and the northern Bering Sea. The program will explore system processes and species dynamics relevant to ecosystem structure and function in Arctic marine systems, resource management, subsistence use, and human impacts. Research questions should be posed in the context of developing a mechanistic understanding of how physical processes (e.g., sea ice dynamics, advection patterns, seasonal patterns, winter conditions and seasonal reset) influence ecosystem structure and function, define temporal or spatial hotpots, influence relative shifts in benthic and pelagic systems, and influence the persistence, abundance, distribution, and life history of apex predators, species important to subsistence, and species or species guilds that are essential to ecosystem function. Research should inform a baseline understanding of current processes as well as an understanding of how systems might shift in the context of a changing climate. In developing an Arctic Program, NPRB and funding partners aim to:

(1) encourage the development of analyses and models that can be scaled down to localized phenomena and up to regional/global scales (e.g., physical forcing and climate models);
(2) create opportunities for collaboration across the Chukchi Sea shelf with scientists and initiatives in Russia through existing mechanisms (e.g., RUSALCA, US/Russia Intergovernmental Consultative Committee) and enhance those collaborations and/or explore new mechanisms for collaboration with research conducted across the US/Russia maritime boundary in the western Chukchi Sea;
(3) structure research to inform or facilitate comparisons of mechanisms and processes relevant to areas not directly encompassed in the program, potentially including the Beaufort Sea, Arctic basin, and Bering Sea; and
(4) create opportunities that enable comparisons to other Arctic systems and research in Arctic regional seas (e.g., Barents Sea Nansen's Legacy Project).

Approximately 8 million dollars will be made available for this Arctic program by those funding this RFP. Research related to the program would initiate in spring 2016 and Principal and Co-Investigators must remain engaged through spring 2021. NPRB will reserve $600,000 for program management, $500,000 for data management, and $150,000 for communication and outreach. Remaining funds may be disbursed in each of the funding categories outlined below.

The overarching questions that this program will address are the following:

> How do physical, biological and ecological processes in the Chukchi Sea influence the distribution, life history, and interactions of species or species guilds critical to subsistence and ecosystem function? How might those processes change in the next fifty years?

The goal of the program is to better understand the mechanisms and processes that structure the ecosystem and influence the distribution, life history, and interactions of biological communities in the Chukchi Sea. NPRB is interested in research that addresses phenology and the alignment in space and time of primary production, secondary producers, and upper trophic level predators. NPRB is also interested in better understanding how mechanistic processes currently influence the ecosystem, and how they may change on the timescale of decades. The pelagic and benthic components of the Chukchi Sea ecosystem are strongly linked. While proposals that seek to elucidate processes or elements of either the benthic or pelagic components of the system alone will be considered, NPRB also encourages studies that

address benthic-pelagic coupling. This program aims to produce a series of peer-reviewed scientific manuscripts and outreach materials to inform policy-makers and the interested public.

Individual funding categories are described below. Proposers must identify one category under which to compete. NPRB intends to fund 1-5 proposals under each category. Target funding for each category is meant to serve as guidance. On the basis of proposals received or other considerations, the board may adjust the funding allocated to each category. Please note that the questions listed under each category are intended to direct applicants towards relevant questions. These questions are not prescriptive nor necessarily inclusive of all types of research that might be funded. Applicants may address more than one question within a research category. Also, please note that although there is a category explicitly oriented towards development and application of models, proposals that incorporate and implement a modelling approach towards research questions that address issues within other categories are welcome to submit proposals categories other than ″Modeling″.

Research Categories	**Target Funding**
1. Patterns in subsistence use and potential shifts in response to ecosystem change	$500,000
• What are local people's perceptions of the natural physical and ecological drivers of changes in the availability of animals for subsistence harvest? Studies are sought that will a) achieve iterative exchange of information and relationship building between local people and scientists and b) develop processes and analytical methods that use local and traditional knowledge and western science in concert to achieve greater understanding of the system. • What are the primary drivers (natural, social, cultural, economic) of shifts in subsistence use patterns? Have shifts in harvest patterns affected food security and, if so, how? • How resilient are human communities to variability, anomalies, and shifts in the marine environment?	
2. Species distribution and interaction: Physical, biological and ecological drivers and important thresholds/tipping points relevant to the distribution and life history of apex predators, species importance to subsistence, and species or species guilds critical to ecosystem function	$2,500,000
• How are the distribution and life history of upper trophic predators (including those that represent important subsistence resources for local communities) influenced by changes in the abundance, density, location, and timing of lower trophic level resources (benthic and pelagic) and what are the mechanisms that determine the availability of lower trophic level resources? • What are the mechanisms that create and maintain biological hotspots? Are the primary drivers static (e.g., bathymetry, topography), and will these hotspots persist or shift? To what extent are hotspots associated with specific annual, seasonal, or finer-scale temporal fluctuations (e.g., hot-times)? Are benthic or pelagic hotspots related to areas where nutrient-rich winter water is retained on the shelf and, if so, what are the mechanisms that influence winter water retention? • How important are hotspots in maintaining the ecological structure of the ecosystem and to what degree do species or species guilds critical to ecosystem function or subsistence species rely on them?	

• Is the range of variability in key parameters observed at hotspots the same as the range of variability observed elsewhere? To what degree are patterns observed at hotspots representative of patterns in the broader ecosystem? • Does the structure and function of the Chukchi Sea ecosystem (in its current form) rely on one or more species (e.g., forage fish)? What are the species and why are they important? What ecosystem-level effects might we expect if these species were substantially reduced at local or system-wide geographic scales? • How sensitive and resilient are species to variability, anomalies, and shifts in the physical environment? Studies should focus on species or species guilds critical to ecosystem function or subsistence. • Do tipping points exist that could cause major shifts in distribution, population-level survival, or the role of species in this environment? Consider tipping points that go beyond trophic interactions (e.g., habitat requirements, association with sea ice). Studies should focus on species or species guilds critical to ecosystem function or subsistence.	
3. Oceanography and lower trophic level productivity: Influence of sea ice dynamics and advection on the phenology, magnitude and location of primary and secondary production, match-mismatch, benthic-pelagic coupling, and the influence of winter conditions	$2,750,000
• What are the mechanisms that determine the availability of lower trophic level resources? How will changes in the abundance, density, location, and timing of lower trophic level resources (benthic and pelagic) influence the distribution and life history of upper trophic predators, including those that provide important subsistence resources for local communities? • What are the rates of consumption, growth, reproduction, and mortality of secondary producers (benthic and pelagic) and to what extent are these rates limited by primary production, water properties, and other factors? • How do variation in the timing and location of sea ice breakup/retreat, the strength of advection, and the properties of advected water influence primary production patterns? What factors limit primary production in this system? How does stratification influence primary production, and how variable are stratification patterns in time (seasonally and inter-annually) and space? • Are changes in advective forcing over the Chukchi Sea shelf dominated by remote forcing (e.g., pressure fields in the Bering Sea that control flow through Bering Strait) or local conditions? What are the implications for our ability to predict flow patterns at various scales? • To what extent do winter conditions "reset" the Chukchi Sea ecosystem each year? Do anomalous summer conditions in a given year influence spring phenology the following year? Are the impacts of seasonal warming cumulative across years? What are the rates of consumption, reproduction, and survival of organisms during winter and how do they affect spring production? • How will changes in sea ice dynamics, strength and patterns of advection, and phenology of biological production influence pelagic-benthic coupling in the Chukchi Sea? What are the mechanisms that determine the partitioning of energy between the pelagic and benthic realms and how are they affected by changes in sea ice dynamics and advection?	

• Do thresholds exist that, if crossed, would cause significant shifts in the balance of energy between the pelagic and benthic components of the Chukchi Sea ecosystem? Is it possible to predict such shifts through monitoring key parameters and, if so, what are those parameters and on what scale (geographically and temporally) would observations be required?	
4. Modeling	$500,000
• NPRB may fund a fully-coupled ice-atmosphere-oceanography model that examines the feedbacks and interactions of processes relevant to each of these physical systems and improves understanding of the processes driving the ecology of the Chukchi Sea. To the extent possible, models should utilize field data collected by moorings in the Bering Strait and northeast Chukchi Sea and remotely-sensed sea ice data. • NPRB solicits proposals for modeling efforts that address questions related to interactions among the biological components of the system and interactions between biological components and physical drivers (e.g., nutrient-phytoplankton-zooplankton models that include sea ice algae; network modeling; multispecies models).	
5. Other areas of research that align with categories 1-4 above	$500,000
• Proposals to conduct work that does not fit clearly within categories 1-4 above may be considered if a compelling case is made and if these proposals articulate specifically how the proposed work would align with the areas of research detailed above.	

PRE-PROPOSAL SUBMISSION INSTRUCTIONS

Pre-Proposals must be sent to ArcticProgram@nprb.org prior to 4:00PM ADT, July 31, 2015

Templates for the **Research Plan and Supplementary Materials** (MS Word format), **Timeline and Milestones** (MS Excel format), **Logistics Summary** (MS Word format), **Budget Narrative** (MS Word format), and **Budget Summary** (MS Excel format) are all available on the NPRB website (http://www.nprb.org/arctic-program/request-for-proposals/templates/). These forms are also included as PDF attachments to this proposal. Proposal applicants must use the online templates. All elements of all five templates must be completed. Explicit instructions for each element are provided in the templates. For reference, the information below provides a general overview of the elements in each template.

Research Plan and Supplementary Materials
Research plans are limited to five pages (excluding tables, figures, and literature cited, all of which should follow the five pages of project description) and must include the following elements:

A. Project title
B. Research category
C. Rationale and justification
D. Hypotheses
E. Objectives
F. Expected outcomes and deliverables
G. Project design and conceptual approach
H. Linkages between field and modeling efforts

The information in (A−H) must be less than five-pages in the research plan template.

The Research Plan and Supplementary Materials should also include the following elements:

Tables (up to five tables)
Figures (up to five figures)
Literature Cited
Integration with existing projects and reliance on other sources of data
Project Management

Timeline and Milestones
Complete the timeline and milestones table. Please refer to the template.

Logistics Summary
Complete the logistics summary template to provide a detailed accounting of logistical needs (including ship time, vessel type and capabilities) as well as a description of logistical resources you will provide as in kind-support. Please refer to the template for detailed instructions. Complete one logistics summary for the project as a whole.

Budget Narrative
Complete a separate budget narrative for each organization. Please refer to the template.

Budget Summary
Complete the budget summary excel template. Budgets must be organized according to federal fiscal years (Oct. 1-Sep. 30) and the budget for each institution should be described separately. Subawards will be issued to each participating institution directly. Each institution may receive incremental subawards, (i.e., the total amount of funding may not be awarded at the beginning of the project, but rather in two or three increments throughout the project). NPRB expects that funds issued through each subaward will be

spent on schedule. Please note that all funds are disbursed on a reimbursable basis. *Do not include costs associated with vessel charter in your budget. Do complete the logistics summary template to provide a detailed accounting of your needs and available in-kind resources with respect to logistical support*.

Budgets must include:

- Funds for all PIs to travel to a kickoff meeting in Anchorage, AK in June 2016 for three days during which the core hypotheses of the program will be decided.
- Funds for lead PIs to travel to logistics planning meetings in Anchorage, AK for two days in October 2016 and 2017.
- Funds for all PIs, Co-PIs, and graduate students to travel to annual PI meetings in Alaska for four days in March 2017-2021.
- Funds for the lead PIs to travel to the Alaska Marine Science Symposium in Anchorage for four days annually in January 2017-2021.
- Detailed budgets for field data collection if applicable to the project. Coordinated field data collection is expected to occur in 2017 and 2018. Field work will only be possible in 2016 if logistics are supported by in-kind contributions from existing projects (i.e., funds awarded through this call for pre-proposals may not be available in time for field work in 2016). Include here costs associated with salary and equipment specific to your project.
- Anticipated other support and cost leveraging per year and organization.
- Support for analyses and synthesis activities for at least two years following completion of field data collection, including development of manuscripts for special issue publications.

PI descriptions
Provide a one-page curriculum vitae (that includes current activities and publications relevant to the work proposed) for all Principal Investigators (PIs) and Co-Investigators (CIs) associated with the proposal. PIs and CIs are those who will receive funds. Collaborators are those who will participate in the project but will not request funds; a curriculum vitae is not required for collaborators.

INFORMATIONAL TELECONFERENCE

NPRB will hold a teleconference on Thursday, May 28 at 10AM Alaska Time to provide an overview of the prospective program and RFP and to answer questions from participants. A list of interested individuals will be posted on the NPRB Arctic program website following the call. If you are unable to join the call and would like your name added to the list of interested individuals or groups, contact Senior Program Manager Danielle Dickson [Danielle.Dickson@nprb.org]. To join the call, please dial 1-855-257-8693 and enter the PIN 8277783 when prompted. If you are calling from outside of the U.S. or Canada, please dial (262) 912-0552 and use the same PIN.

OTHER RESOURCES

The NPRB Arctic Program website includes a list of resources that proposers may find helpful, including reports of recent synthesis efforts and documents that outline federal research priorities. Please visit: http://www.nprb.org/arctic-program/resources-for-investigators/. Also please feel free to contact Science Director Matthew Baker [Matthew.Baker@nprb.org] or Senior Program Manager Danielle Dickson [Danielle.Dickson@nprb.org] with any questions.

PRE-PROPOSAL REVIEW PROCESS

Pre-proposals will be evaluated by the NPRB science and advisory panels, which will make recommendations to the board. The board will decide which pre-proposals to invite to submit full proposals on September 25, 2015, and staff will notify proposers of the board's decisions shortly thereafter. Representatives of the other institutions contributing money to the program (BOEM, BSP) will be represented at panel and board meetings and will participate in discussions but will not vote during pre-proposal selection.

Initial Screening of Pre-Proposals

Upon receipt, the NPRB staff will screen pre-proposals for conformance with requirements set forth in this RFP. This review will consider whether the pre-proposal meets the format and structure requirements in the RFP, and will assess whether it is responsive to the RFP. Pre-proposals identified by staff as having questionable responsiveness will be reviewed by an ad hoc committee of science panel members who will determine which of these pre-proposals, if any, to carry forward. If the ad hoc committee cannot agree on whether a pre-proposal is responsive to the RFP, it will be fully reviewed. Pre-proposals that are found to not comply with the requirements of the RFP or that are determined to be unresponsive will be returned without further processing. Notification of non-compliance will be sent to the applicant.

NPRB Science Panel Review

NPRB staff will assign two science panel members with the relevant expertise to each pre-proposal (a Primary and a Secondary). Science panel members will conduct their own independent review using the following technical review criteria:

a. Soundness of Project Design/Conceptual Approach *(50%)*: Is there a clear statement of project objectives, explanation of what the project will accomplish, and why it is important? Have the applicants articulated hypotheses that explore mechanistic processes in detail? Have the applicants demonstrated a clear understanding of the problem being addressed, the present state of knowledge in the field, the project's relation to other work, including their own, and the measurable benefits that will result from the proposed work? Is there sufficient information to evaluate the project technically? What are the strengths and/or weaknesses of the technical design relative to securing productive results?

b. Integration with Other Projects *(20%)*: Have the applicants identified how the proposed research would integrate with existing projects listed in the RFP appendix or other proposals submitted in response to the RFP? Have the applicants proposed to leverage data or logistics provided by other such projects and have these other projects provided letters of support? Have the applicants proposed means to integrate data or analyses from multiple subject areas or disciplines and consider results in the context of understanding broad-scale processes or the system as a whole? Did the applicants articulate how the data would integrate with modeling efforts?

c. Timeline and Milestones *(10%):* Is there a clear table detailing appropriate timelines and associated measurable milestones, objectives, accomplishments, and deliverables that can be used to track and evaluate project performance through the entire award period? Is there a description of the product or result that may be used to measure project success (e.g., report, published paper, management implementation) and how the research results will be disseminated?

d. Project Management *(10%)*: Are the experience and qualifications of the principal/co-investigator(s) matched to the project? Is the organization and management of the project appropriate to ensure the overall success of the research? Have the applicants identified a lead Principal Investigator who would serve on the program's steering committee and have they budgeted time for this individual to participate in steering committee activities (e.g., monthly teleconferences, serving as guest editor for special issue publications)?

e. Project Costs *(10%)*: Is the budget allocation and justification sufficient to support the work to be performed? Is the project cost unreasonably high or low?

Please note the contents of the logistics summary will be evaluated by the Science Panel as well and will be considered in the context of the review process.

NPRB Science Panel Proposal Ranking

These science panel reviews are completed and made available to all panel members in advance of the science panel meeting. The Primary and Secondary summarize the pre-proposal for the entire panel. The entire panel then discusses the pre-proposal and its evaluations further and determines, by consensus, a tier ranking as follows:

Tier 1:

Pre-proposals that are considered highly meritorious based on the science panel reviews (based on the criteria outlined above) will be designated Tier 1 pre-proposals. Highly meritorious will be defined as pre-proposals that generally score an average of Very Good to Excellent and do not require any scientific alterations to the proposed work to go forward (although suggestions for improvements may be made). The science panel may decide to go back over the Tier 1 list to determine if there are any scientific nuances amongst them that may be relevant to the board when making their final funding decisions. Such criteria will be only science-based and may include relative comparisons between highly ranked pre-proposals such as: more technically robust, more specifically on target with what the RFP was looking for, or more time sensitive in terms of increasing scientific knowledge base. Accordingly, pre-proposals placed in this category may be separated into Tier 1a or Tier 1b.

Pre-proposals that are highly meritorious as defined above but have minor non-science related issues that, once fixed, would place the pre-proposal in the Tier 1a or Tier 1b category, will be categorized as Tier 1a conditional or Tier 1b conditional pre-proposals respectively. In such instances, the science panel will clearly identify the conditions they believe need to be met before the pre-proposal goes forward.

Tier 2:

A Tier 2 ranking will be given to pre-proposals that are good scientifically but not exceptional. Additionally, pre-proposals that have minor science issues of a simple or straightforward nature, for example, simple changes to sample size or study design, will be categorized as Tier 2 conditional. A Tier 2 pre-proposal that has non-science issues will also be placed in the Tier 2 conditional category. For conditionally ranked pre-proposals, the science panel will clearly identify the conditions they believe need to be met before the pre-proposal goes forward.

Tier 3:

Pre-proposals that are found to have fatal flaws or those that are simply not competitive scientifically even with minor changes and should not be funded, are designated Tier 3 pre-proposals. These will generally be pre-proposals with some Poor and Fair ratings or those that are mixed, depending on the

issues. Tier 3 pre-proposals are those that require substantial revision to be competitive and thus they should not be funded.

NPRB Science Panel Recommendations

Staff, Primary and Secondary panel members will take notes on the discussion of their assigned pre-proposals. Following the meeting, the Primary, in consultation with the Secondary and any other panel member identified during the discussions, is responsible for drafting a summary paragraph for the specific pre-proposals for the board. This paragraph will follow a pre-determined template and be submitted to the NPRB staff within a few days of the meeting. Staff will compile all paragraphs and submit Tier 1 and Tier 2 summary paragraphs to the NPRB advisory panel, and all summary paragraphs to the board as soon as possible.

NPRB Advisory Panel Input

NPRB maintains an advisory panel to provide community input for all NPRB activities (http://www.nprb.org/about/advisory.html). The NPRB advisory panel review of pre-proposals is intended to highlight those pre-proposals that have special stakeholder, community and other societal relevance and public interest value. The advisory panel will be provided with pre-proposal materials and the science panel summary paragraphs for all pre-proposals that the science panel has determined to be responsive to the RFP and to have scientific merit. The advisory panel will review Tier 1 and Tier 2 pre-proposals and provide a short summary of the attributes of a subset of these pre-proposals that they wish to highlight as having significant stakeholder, community or other societal relevance. These summaries will be brought to the attention of the board for consideration. It is not the intent of the advisory panel to comment on all Tier 1 and Tier 2 pre-proposals, but rather to highlight those they identify as having special value to stakeholders. The advisory panel contribution is also not intended to rank pre-proposals, to provide comment on the scientific merit of pre-proposals, nor the alignment of such pre-proposals with category budgets.

Board Review

The chair and/or vice-chair of the science panel will present the science panel summary paragraphs to the board and be present at the meeting to answer technical questions. The board will consider technical evaluations, science panel recommendations and advisory panel input. The board will use scientific merit as defined by the science panel rankings as their primary criterion, but may consider other factors at the time of final decisions. Such factors include, but are not limited to:

1. Ecosystem information needs;
2. Other projects currently funded on a similar topic;
3. Overlap with other ongoing programs;
4. Previous performance of applicants (evaluation of previous NPRB funded projects will involve project management, adherence to project budgets, timelines, and reporting requirements, as well as achievement of previously funded project objectives).

The board requires proposers to articulate how their project would leverage existing resources and how linkages would be made between field and modeling efforts. Proposers are also encouraged to articulate any plans for international cooperation.

While these factors will be considered, scientific merit remains the primary consideration for determining which applicants should be invited to submit full proposals. Thus, the board will accept science panel recommendations for Tier 3 pre-proposals and will not invite those applicants to submit full proposals.

Further, if the board decides to invite full proposals from those ranked Tier 1 conditional or Tier 2 conditional by the science panel, the board will carry forward all of the science panel conditions. The board reserves the right to put any additional conditions on any pre-proposal invited to submit a full proposal. Full proposals that received conditional rankings will be asked to specifically address in their full proposal all concerns raised and specified during the review and decision-making process.

The board will document their decision-making process, in particular where it deviates from the science panel recommendations. This information and science panel summary paragraphs will be provided as written feedback to the applicants.

Invitations for full proposals

Based on the board's decision, invitations for full proposals will be issued by October 9, 2015. The titles of successful pre-proposals may be made public, as well as the identities and e-mail addresses of the lead Principal Investigators. Full proposals will be encouraged to discuss how they envision integrating with other potential aspects of the program. Full proposals will likely be due by January 15, 2016. Full proposals will be sent out for peer review, reviewed by the NPRB science and advisory panels in spring 2016, and the board will make funding decisions in May 2016.

Program Integration

Full integration of the funded elements of the program will occur after funding decisions have been announced. NPRB will organize a kick-off meeting in June 2016 for all funded PIs and collaborators, during which the core hypotheses for the program will be decided and the expected contributions of participants identified. A leadership group will be established that includes a representative from each of the main components of the funded program. This leadership group will work closely with the NPRB program manager and will be responsible for overall program management and integration.

TIMELINE

Call for pre-proposals released	May 20, 2015
Pre-proposal submission deadline	July 31, 2015
Invitations for full proposals issued	October 2015
Full proposal submission deadline	January 15, 2016
Proposers notified of funding decisions	May 2016
Initial meeting of Principal Investigators	June 21-23, 2016
Initial sampling and data synthesis	June 2016
First coordinated field season	June 2017

NPRB anticipates announcing funding decisions in May 2016. Field data collection will only occur in 2016 if logistics are provided through separately-funded projects. Otherwise, field data collection supported through this program will occur beginning in 2017. NPRB anticipates announcing the availability of additional funds to support synthesis in 2020, however, projects proposed in response to this call should include in their budgets support for synthesis activities for two years following the completion of data collection.

Appendix A−Collaborating Projects

North Pacific Research Board is cooperating with other funding organizations to formally include the existing projects listed here in the Arctic ecosystem program. These projects will collaborate with projects funded through this call for proposals; the lead Principal Investigators will participate in annual PI meetings, share preliminary data with collaborators, and contribute intellectually to addressing the core hypotheses of the funded research program. Proposers are encouraged to describe how their research would use the data and expertise provided by existing projects. Existing projects are not intended to constrain the direction of the new research projects proposed.

Bering Strait mooring program

Funding provided by National Science Foundation

A physical oceanographic year-round mooring program has been maintained in the Bering Strait since 1990, with measurements for other disciplines being incorporated in recent years. For an overview of this prior mooring and accompanying section work, please see Woodgate, Stafford and Prahl (submitted) http://psc.apl.washington.edu/HLD/Bstrait/BStraitMooringSynthesis2015.html. Under National Science Foundation Arctic Observing Network (NSF-AON) funding, a set of 3 Bering Strait moorings will be maintained in the strait from summer 2014 to recovery in summer 2018, with annual mooring turn-around cruises, which (as time and weather allow) run accompanying CTD sections (no water samples) in the strait.

Lying all in US waters, the three mooring sites are:

- A2 (center of US channel);
- A4 (east side of US channel, measuring the Alaskan Coastal Current); and
- A3 (central to the strait about ~ 35km north of the Diomede Islands, at a site found to give a useful average of the flow through the Russian and US channels of the strait).

The data from the 3 moorings sites (combined with some satellite data) allow hourly quantification of the volume, heat and freshwater fluxes through the strait and an estimate of the physical water properties of the mean flow, of the waters in the US and Russian channels, and of the Alaskan Coastal Current. These data are being combined with modeling results (Heimbach and Nguyen, MIT) and traditional knowledge (Raymond-Yakoubian, Kawerak, Inc) to yield a fuller understanding of the properties of the throughflow.

Each mooring carries lower level (~45m) and upper level (~17m) temperature and salinity sensors and an upward looking ADCP measuring water velocity in 2m bins to the surface, and some measure of ice thickness and ice velocity. (All instruments are internally recording, thus data are only available after recovery, and data calibration.) All calibrated data and data products are available via our website (psc.apl.washington.edu/BeringStrait.html), ACADIS and NODC. See e.g., the 2014 cruise report for full details, including mooring locations, cruise maps, and preliminary results (Woodgate et al., 2014, Bering Strait Norseman II 2014 Mooring Cruise Report, 73 pp, available at http://psc.apl.washington.edu/BeringStrait.html).

For further details (e.g., re data collaborations or possible additions to the moorings), contact Rebecca Woodgate.

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Arctic Marine Biodiversity Observing Network (AMBON)

Funding provided by Bureau of Ocean Energy Management, National Oceanic and Atmospheric Administration, and Shell

This study will build on emerging distributed biological observatories (DBOs) by developing a prototype ecosystem-based marine biodiversity network over offshore oil and gas lease areas in the Chukchi Sea, monitoring multiple trophic levels and species, and informed by historical data and past modeling efforts. Such a network will: expand upon planned and recently-launched observing sites, systems, and programs; employ innovative techniques for data discovery and methods that dynamically interrelate data sets and add value to existing monitoring data; collaborate with the U. S. Integrated Ocean Observing System (U.S. IOOS) participants and funding agencies to optimize data management and modeling capabilities.

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Aerial Survey Arctic Marine Mammals (ASAMM)

Funding provided by Bureau of Ocean Energy Management

Bowhead whales, gray whales, beluga whales, Pacific walrus, polar bears, bearded seals, and other species of ice seals are known to seasonally occupy the Chukchi Sea. All of these species are subject to changes in environmental variables such as oceanographic currents, sea temperature, sea ice cover, prey availability, and anthropogenic impacts. Having a good understanding of the seasonal distribution, relative abundance, and habitat use of marine mammals in the Chukchi Sea is fundamentally important to evaluating the potential environmental impacts associated with oil and gas exploration and development and other anthropogenic activities. Aerial surveys of marine mammals are an efficient tool because they offer quick coverage of large marine areas. Past surveys are available for comparison with new data to assess whether changes in distribution or abundance have occurred since the earlier surveys were completed.

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Chukchi Acoustic, Oceanography and Zooplankton Study (CHAOZ)

Funding provided by Bureau of Ocean Energy Management

Baleen whales are subject to changes in environmental variables such as oceanographic currents, sea temperature, sea ice cover, prey availability, and anthropogenic impacts. Extreme ice-retreat and climate warming in the western Arctic over the last decade is anticipated to lead to changes in species composition and distribution, evidenced already through local knowledge and opportunistic observations. Hanna Shoal in the northeast Chukchi Sea is an area of special biological concern bordering the boundary between Chukchi and Arctic Ocean waters and its importance bowhead, gray and other whales, as well as walruses and ice seals, is not well known. The shallower waters of the shoal have long been known as traps for grounding of sea ice, and the creation of reoccurring polynyas. In most recent years, floating pack ice in summer persists in this area longer than elsewhere in the Chukchi, often surrounded by open water even to the north. Biological "hot spots" in the Chukchi Sea are thought to be related to coupled pelagic and benthic productivity.

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Characterization of the Circulation on the Continental Shelf Areas of the Northeast Chukchi and Western Beaufort Seas

Funding provided by Bureau of Ocean Energy Management

This study is a continuation and expansion of the existing surface circulation study within the northeast Chukchi Sea. Prior to 2009, surface current observations on the Chukchi shelf were extremely limited. Through a joint Industry/BOEM supported study, the University of Alaska Fairbanks (UAF), Coastal Marine Institute began measuring surface currents during the open water period on the Chukchi shelf beginning in September 2009 with the deployment of long range, High Frequency (HF) radar systems located at the villages of Barrow and Wainwright. In 2010, coverage was expanded to the southwest to include additional offshore lease areas. The surface current data was supplemented by water column profile data collected by Slocum Gliders. Acoustic Doppler current profilers (ADCPs) were also deployed across the Alaska Coastal Current at the head of Barrow Canyon to assess the annual flow regime, the connectivity between surface and subsurface currents during the open water season, and the changes in subsurface currents beneath the mobile pack ice and lead system during the winter months. This study will expand present efforts to improve understanding of the flow regime and shelf dynamics between the inner and outer Chukchi shelf, the exchange of waters between the Chukchi Sea and western Beaufort shelf through Barrow Canyon, and the upwelling of Atlantic Waters.

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Distribution of Fish, Crab and Lower Trophic Communities in the Chukchi Sea Lease Area

Funding provided by Bureau of Ocean Energy Management

This study proposes to develop a broader understanding of abundance and distribution of demersal and pelagic fish, crab, and lower trophic communities needed to evaluate and mitigate the effects of offshore oil and gas development. Formerly, several BOEM funded studies have identified temporal, seasonal, and spatial gaps in data on fish in the Chukchi Sea near the lease areas. This study is designed specifically to fill these information needs. It will build upon recent information on invertebrate communities in the Chukchi offshore lease area obtained by the 2009 study "Chukchi Sea Offshore Monitoring in Drilling Area (COMIDA): Chemistry and Benthos (CAB)." It will create a similar survey design such that data sets are compatible, comparable, and extend the time series and contribute to further knowledge of pelagic fishes in the northeast Chukchi Sea.

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Marine Arctic Ecosystem Study (MARES)

Funding provided by Bureau of Ocean Energy Management

This project intends to collect additional comprehensive and integrated information in the Arctic on the spatio-temporal distribution of fundamental physical, biological and chemical variables, their associated interactions and regulating mechanisms, as well as the distribution of cultural and subsistence resources which sustain local communities. This information will be used to better understand and assess arctic ecosystem sensitivities and vulnerabilities as a function of space and time to aid decision-makers in minimizing the impact of the oil and gas industry on the Outer Continental Shelf. The resulting information will support NEPA analyses, environmental impact assessments, in validating models, as well as in Oil-Spill Risk Analysis. Additionally, these observations and improved description and understanding of biogeochemical and physical interactions will aid to improve the accuracy of model simulations and forecasts. Coordinated observational and modeling efforts will produce information that will be analyzed from different perspectives: a) ecosystem understanding and environmental protection, b) climate change and monitoring, and c) Oil-Spill Risk Analysis.

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Hanna Shoal Project

Funding provided by Bureau of Ocean Energy Management

The Hanna Shoal Project complements the earlier BOEM-supported COMIDA CAB project. Field work for the Hanna Shoal Project is complete and the PIs are synthesizing the results.

Hanna Shoal is a shallow topographic feature of the northeastern Chukchi Sea that lies about 100 mi northwest of Barrow, Alaska at latitude 72° N. Water depths on various parts of the Shoal are as shallow as 20 m (60 ft), compared to 55 to 60 m (180 ft) on the surrounding seabed. The deeper flanks of the shoal

are biologically rich, as reflected in the historically high concentration of walruses there in the summer that actively feed on the abundance of molluscs, crustaceans, polychaete worms, and other benthic fauna.

Oceanographers attribute the high productivity of Hanna Shoal, and the northeastern Chukchi Sea shelf in general, to the unique physics that steer highly productive water masses into the region, the relatively shallow average depth (42 m on the northeastern Chukchi Shelf), and weak grazing pressure from low zooplankton abundance during spring. These factors facilitate the deposition of a large proportion of pelagic primary production to the seabed, thus providing a major carbon subsidy to the benthic food web. The result is an extraordinary high diversity and biomass of benthic fauna that coincides with high water column chlorophyll a in localized "hotspots" of the Chukchi Sea. Benthic grabs revealed chlorophyll a concentrations among the highest ever reported in marine sediments (up to 665 mg m-2) and levels varied depending on the overlying water mass type.

Estimates of epibenthic and infaunal organisms around Hanna Shoal, collected using plumb staff beam trawls and van Veen grabs (respectively), were enormous. Epibenthic assemblages ranged to 500 g m-2 (and thousands of individuals m-2); infaunal biomass and abundances approached 820 g m-2 and 5,500 individuals m-2, respectively. In both sampling years, the greatest biomass was not on the Shoal itself, but on its northwest and southeast flanks (or both), which receive Bering Sea water that originates in the North Pacific.

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NE Chukchi Sea Moored Ecosystem Observatory

Funding provided by Alaska Ocean Observing System, North Pacific Research Board, Olgoonik-Fairweather, University of Alaska Fairbanks, Université Laval, and University of Washington

A multi-institutional, multi-investigator partnership operates and maintains a subsurface moored observatory on the NE Chukchi shelf near 71.6N, 161.5W. The first deployment occurred in September 2014 and the mooring will be re-deployed annually through at least 2018.

The instruments record with high temporal resolution throughout the year, including the under-sampled and poorly understood seasons when sea ice typically inhibits ship-based sampling. Measurements include ice, ocean physics, nutrient and carbonate chemistry, particulate matter, phytoplankton, zooplankton, fisheries, and marine mammal datasets, thereby providing multifaceted views into the inter-trophic co-variability of the Chukchi shelf ecosystem. The scientific objectives of this monitoring effort are to:

1. Quantify hourly, daily, seasonal, annual, and inter-annual variations in selected physical, chemical, and biological measurement parameters on the shallow Chukchi Sea continental shelf.
2. Relate the timing and magnitude of fluctuations in nutrient and carbonate chemistry, particulate, and fish/zooplankton parameters to the current field and the physical hydrography, wind, light, and ice environment.
3. Provide researchers and resource managers with a broad-spectrum and multi-year set of reference observations that can be applied to evaluating and improving regional and global-scale biogeochemical, ice-ocean circulation, ecosystem, and stock-assessment models.

The observatory consortium welcomes new partners, new applications of the data already being collected, and new instrumentation that can further enhance the value of the existing efforts.

In accordance with the NPRB data policy, all data collected on this mooring are publicly available. There will be two data releases associated with each dataset. The first will come immediately after the recovery cruise and will include raw, unprocessed, data for users with time-sensitive applications. The second release includes fully processed data following requisite calibrations, application of calibration coefficients, and editing, typically within ~6 months of mooring recovery. Additional details about the mooring configuration, data policy, and the observatory consortium are available online at: http://mather.sfos.uaf.edu/~seth/CEO.

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Northern Bering Sea bottom trawl survey

Funding provided by National Oceanic and Atmospheric Administration

Biennial northern Bering Sea (NBS) shelf surveys will start in 2017. This survey will provide long-term monitoring of bottom fishes, crabs, and other demersal macrofauna to help provide a better understanding of how biota and the ecosystem are responding to climate change and loss of sea ice. The ultimate goal is a long time-series of standardized data collections that will provide quantitative indices of abundance for determining how climate change is affecting population trends and community structure. The expanded survey data collections from the NBS will also augment those from the eastern Bering Sea (EBS) shelf and provide new insight into the spatial and temporal response of bottom fish and crab populations to highly variable interannual ice cover and summer bottom temperatures across the entire eastern Bering Sea shelf. Digital data are available online (http://www.afsc.noaa.gov/RACE/groundfish/survey_data/data.htm).

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Northern Bering Sea BASIS (Bering-Arctic Subarctic Integrated Survey)

Funding provided by National Oceanic and Atmospheric Administration

The northern Bering Sea BASIS survey will continue in 2016 and 2018. These surveys will assess the relative abundance, size, and energetic status of late summer/early fall fish species such as western Alaska juvenile Chinook and chum salmon, capelin, herring, juvenile pollock, and saffron cod. Bio/physical oceanographic data will also be collected to assess the impact of climate change and variability on the ecosystem. When combined with the southeastern Bering Sea BASIS survey, the resulting survey effort will cover much of the eastern Bering Sea shelf. Digital data are available from the program leader Ed Farley.

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Chukchi Ecology and Seal Survey (CHESS)

Funding provided by National Oceanic and Atmospheric Administration

A comprehensive survey for the abundance and distribution of bearded and ringed seals in the Chukchi Sea will be conducted in 2016. In collaboration with the U.S. Fish and Wildlife Service, the objectives

may be expanded to include polar bears. The survey will be based on coupled infrared and color imagers. Animals will be detected by infrared video and the species will be identified from high-resolution color photographs, a method demonstrated to be highly effective in recent surveys of the Bering Sea pack ice zone. Because large portions of the bearded and ringed seal populations use the Russian waters of the western Chukchi Sea, the survey will require collaboration with the Russian Federation. The Chukchi survey will complement the results of the Bering Sea survey, leaving only the Beaufort Sea as a gap in complete estimates of the breeding populations of ice seals in the seas surrounding Alaska.

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Influence of sea ice on ecosystem shifts in Arctic seas

Funding provided by U.S. Geological Survey Changing Arctic Ecosystems Initiative

The decline of Arctic sea ice is predicted to promote an ecosystem shift from benthic-dominated to pelagic-dominated communities on Arctic shelves, raising concern for species like walrus and eiders that feed on benthic organisms. Sea ice dynamics are thought to support a rich benthic ecosystem by promoting the export of surface primary production to the ocean floor. As sea ice extent diminishes, more prolonged open-water phytoplankton blooms and increased zooplankton grazing may increasingly route surface primary production to pelagic consumers. The pace of declining benthic production has been difficult to quantify, leaving resource managers with much uncertainty. We propose to relate annually resolved growth increments in benthic bivalves with satellite derived sea ice records to develop a predictive relationship between sea ice and benthic production. Bivalves are a key prey item for both walrus and eiders. The relative contributions of sea ice algae and phytoplankton, the two major sources of surface primary production, will also be described for bivalves using stable isotope analysis. Changes in bivalve size will be converted to differences in caloric content available to predators. Combining these products with model projections of future sea ice cover will allow us to predict the pace of shifts in benthic production, clarify the underlying mechanism, and enhance forecasts of the population response of Department of Interior managed species to a changing Arctic environment. (Funded FY2014-FY2019)

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Regional Arctic System Model (RASM)

Funding provided by U.S. Office of Naval Research

The Regional Arctic System Model (RASM) has been developed to advance capability in simulating critical physical processes, feedbacks and their impact on the Arctic climate system and to reduce uncertainty in its prediction. RASM is a limited-area, fully coupled ice-ocean-atmosphere-land model that uses the Community Earth System Model (CESM) framework. It includes the Weather Research and Forecasting (WRF) model, the LANL Parallel Ocean Program (POP) and Community Ice Model (CICE) and the Variable Infiltration Capacity (VIC) land hydrology model. In addition, a streamflow routing (RVIC) model was recently implemented in RASM to transport the freshwater flux from the land surface to the Arctic Ocean. Finally, marine biogeochemistry components are currently being implemented in the ocean and sea ice components to expand RASM capability into Arctic ecosystem studies. The

model domain is configured at horizontal resolution of 1/12° (or ~9km) for the ice-ocean and 50 km for the atmosphere-land model components. It covers the entire Northern Hemisphere marine cryosphere, terrestrial drainage to the Arctic Ocean and its major inflow and outflow pathways, with optimal extension into the North Pacific / Atlantic to model the passage of cyclones into the Arctic. All RASM components are coupled at high frequency to realistically represent interactions among model components at inertial and longer time scales.

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Arctic Coastal Ecosystem Survey (ACES)

Funding provided by North Pacific Research Board (project 1229), Bureau of Ocean Energy Management, National Oceanic and Atmospheric Administration, and North Slope Borough/Shell Baseline Studies Program

In response to a rapidly changing Arctic, we developed a multi-faceted approach to examine variation in community structure and trophodynamics of nearshore arctic nekton during the ice-free season of 2013 and 2014. Fish samples were collected weekly via beach seine at 12 stations surrounding Pt. Barrow in three water bodies (Chukchi, Beaufort, Elson Lagoon) from ice breakup (early July) until late August in 2013 and 2014 (also planned for 2015). Juvenile and larval stages (98%) comprise the majority of catch data suggesting nearshore areas might serve as nursery habitat similar to those in similar lower latitude systems. The Elson Lagoon is dominated by euryhaline and amphidromous species, whereas the Beaufort and Chukchi Sea stations were dominated by marine species. Several species of sculpin are common but rarely abundant throughout all sites; catch data from 2007-2009 and 2012-2014 show that availability of high quality forage species (capelin and Pacific sand lance) in the nearshore is linked to fluctuations in temperature, salinity and turbulence. A laboratory study has examined the temporal scale of tissue turnover for nitrogen and carbon stable isotopes, using Arctic sculpin. Results will offer insight into the rates of change in tissue and how landfast ice breakup alter foodweb structure. These different approaches will offer a better understanding of important drivers of spatiotemporal variability in nearshore foodwebs and improve the ability to predict how these systems may shift in the face of Arctic climate change.

Coincident with biological collections was a series of meteorological and oceanographic observations within Elson Lagoon and at the interface between the lagoon and the Beaufort Sea. The primary rationale for these observations was to link the meteorological and hydrodynamic conditions to changes in the biological community. To examine temporal patterns, an ADCP was moored in the inlet between Elson Lagoon and the Beaufort Sea during ice free periods of both 2013 and 2014 (also planned for 2015). Additionally, several mobile ADCP surveys were conducted within this inlet as well as the inlet between Elson Lagoon and North Salt Lagoon near Barrow to characterize flow dynamics between adjacent water bodies. These measurements were linked to a nearby meteorological station to examine coupling from atmospheric and oceanographic processes at local scales. Based on preliminary analyses, responses in the biological community are likely mediated by the strong dependence of physical controls, both meteorological and hydrodynamic, and suggest variation in the temporal and spatial patterns.

For more information about the project, see http://boswelllab.wix.com/boswelllab#!aces-project-summary/ce65.

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Tracing sea ice algae in Arctic benthic food webs using the sea ice diatom biomarker IP25

Funding provided by North Pacific Research Board (project 1503)

Sea ice cover over the Chukchi Sea shelf is continually decreasing with a warming climate and the effects on primary production regimes, especially sea ice algal production and subsequently benthic food webs are still uncertain. Here we propose to use IP25 as an ice-algal specific tracer to reliably track sea ice algal sources in the Chukchi Sea benthic food web and to distinguish ice algae from other production sources such as pelagic phytoplankton. We will combine the IP25 tracer use with the sterol brassicasterol as a biomarker for phytoplankton to identify the relative proportions of sea ice algae (IP25) and phytoplankton (brassicasterol) in consumer diets (PIP25 ratio). Benthic bivalves and polychaetes are used as representatives of benthic food web consumers for their prominence in benthic communities and their wide variety of feeding types. We will use stable carbon isotope composition of dissolved inorganic carbon and of IP25 in sea ice algae, surface sediments and benthic consumers to ground-truth the sea ice origin of IP25 and its specificity for ice algae. This work can significantly advance our ability to project changes in the primary production regime to subsequent lower and higher trophic levels. Many of these higher trophic levels such as walrus and spectacled eiders are of subsistence interest to Alaska Native peoples, and knowledge gleaned from this project can enhance our understanding how these subsistence resources may be affected with continued climate warming.

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Assessing the role of oceanic heat fluxes on ice ablation on the Chukchi Sea Shelf

Funding provided by North Pacific Research Board (project 1504)

This proposal seeks to understand the role of oceanic heat flux convergences in the summertime retreat of sea ice over the central Chukchi Sea. It is motivated by observations and preliminary numerical model results indicating that eddies generated along the marginal ice zone front carry substantial quantities of heat laterally beneath the ice. The lateral eddy heat flux is via intrusions of warm water into the pycnocline separating cold, dilute surface meltwaters and near-freezing, salty bottom waters. This process is potentially important in heating the underside of the ice and thus enhancing summer ice melt and retreat. In addition, the mean summer currents in the Central Channel may be thermodynamically important in the summertime retreat of sea ice directly and, indirectly, as a source of the eddies to other portions of the shelf. This project will support one graduate student and use an ocean-ice circulation model to: 1) determine the proportion of ice melt due to the vertical heat flux from the ocean with that due to the net airsea heat flux at the ice surface; 2) evaluate the role of intra-pycnocline eddies versus the mean flow in providing this sub-surface heat flux; and 3) evaluate the role of winds in modifying the subsurface heat flux to the ice. Outreach consists of developing digital model animations (and explanations) for use in schools and communities to explain how the ocean affects sea ice melt in the Chukchi Sea. The content will be directed at junior high and high school audiences. Weingartner's role on the North Slope Borough-Shell Baseline Studies Science Steering Committee (SSC) will assist in outreach. The SSC includes representatives from six NSB villages and meets four times/year. He will use these meetings to inform the village representatives and present to the communities.

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Growth and dispersal of early life history stages of Arctic cod and saffron cod under variable climate forcing

Funding provided by North Pacific Research Board (project 1508)

We propose to develop a biophysical transport model to simulate the dispersal of early life history stages of the two most abundant fish species, Arctic cod (Boregadus saida) and saffron cod (Eleginus gracilis), in the Chukchi Sea and Beaufort Sea. These species form a crucial link from lower trophic levels to seabirds, marine mammals, and humans and have been recognized as potential target species for new fisheries in the Arctic. We combine observations of late larval and early juvenile stages of both species during the summer of 2012 and 2013 with laboratory-derived estimates of their temperature-dependent growth to parameterize an individual particle tracking model (TRACMASS) that includes growth and vertical movement. The model will be linked to a recently developed pan-arctic ocean circulation model (PAROMS) to test hypotheses about the origin and fate of young-of-the-year Arctic and saffron cod. Specifically, we aim to (1) identify likely spawning locations by tracking particles backward in time from known summer aggregations in the Chukchi Sea and (2) simulate pathways of dispersal from these aggregations to downstream nursery areas, which may include areas in the Beaufort Sea. Improved understanding of the growth, distribution, and movements of early life history stages of Arctic cod and saffron cod in the region, and of the connectivity between the Chukchi Sea and Beaufort Sea, has several immediate and long-term benefits. It directly addresses research priorities identified in the Arctic Fisheries Management Plan, enhances required descriptions of Essential Fish Habitat for two key prey species, and provides benchmarks against which to assess future changes to the Arctic marine ecosystem that may result from new development in the Arctic and from anthropogenic climate change.

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Glider based real-time monitoring of marine mammals in the Arctic

Funding provided by North Pacific Research Board (project 1515)

Shipboard observations of marine mammal distribution and habitat are expensive and logistically challenging to collect in Arctic waters. Port facilities are minimal and access to appropriate vessels for spending extended periods of time at sea is extremely limited. Autonomous platforms like gliders provide the capability to collect both oceanographic and passive acoustic data for far longer periods of time (weeks to months) and at significantly reduced costs than traditional shipboard or aerial surveys. We have developed a system to record, detect, classify, and remotely report Arctic and sub-Arctic marine mammal calls in real time from Slocum ocean gliders based on the digital acoustic monitoring (DMON) instrument and the low-frequency detection and classification system (LFDCS). The system has been used several times in the northwest Atlantic Ocean and was successfully demonstrated for Arctic research during two pilot studies in the Chukchi Sea during September 2013 and 2014. Deployments to date have been short (1-3 weeks), but the capability exists for much longer missions. Our objective is to conduct an 8-10 week survey of the northeastern Chukchi Sea using a G2 Slocum glider to (1) examine the distribution, occurrence, and habitat of marine mammals using in-situ passive acoustic and oceanographic data collected by the glider, and (2) demonstrate the near real-time detection and reporting capability of the system. We hypothesize that some Arctic species associate with a front separating Bering Sea water and Alaska Coastal Current water to take advantage of aggregations of either pelagic or benthic prey. We

further hypothesize that marine mammal community composition will change predictably with the strong spatial variability in oceanographic properties found in this region. We anticipate that these predictions will improve efforts to (1) mitigate impacts on marine mammals by human activities and (2) forecast changes in species distributions caused by climate change.

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Northern Alaska Sea Ice Project Jukebox, Phase II

Funding provided by North Pacific Research Board (project 1521)

The project examines the complex interrelationship between people and their environment as it relates to nearshore and shorefast sea ice and humans having to continually adapt responses to changes in ice conditions. Also addressed is how climate change is affecting the ecosystems, which in turn affect the local people. This project tells the story of the changing Arctic through those who live within it daily.

Building upon the Northern Alaska Sea Ice Project Jukebox website (www.jukebox.uaf.edu/seaice) researchers can listen to recordings made in 1978, 2008, 2009, and 2013 with local experts in Barrow and other northern Alaska communities talking about their local traditional knowledge about and observations of changing sea ice. Conducting interviews in 2015 in Barrow will provide continuity in documentation of changing nearshore sea ice conditions and of "unusual" years. This expanding record is useful to researchers trying to understand the ice environment as well as social scientists studying human adaptation, decision making, and risk taking behavior. Conducting similar interviews in Kotzebue will begin documentation of traditional knowledge of nearshore and shorefast sea ice there. This will serve as both a comparative dataset for a location with vastly different ice conditions than Barrow, and as the start of another longitudinal research plan in that area.

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NOAA Office of Exploration and Research

In FY15, NOAA Office of Exploration and Research will be supporting exploration projects in the Chukchi Borderlands. Three two-year projects are presently considered for funding. The field work for these projects is expected to take place in the August-September 2016 time frame. For more information please contact John McDonough at john.mcdonough@noaa.gov, Jeremy Potter at jeremy.potter@noaa.gov or Nathalie Valette-Silver at Nathalie.Valette-Silver@noaa.gov.

Research Plan

Text in italics is for instruction only and should be deleted in the completed research plan. All information in sections A–H must be within the 5 page limit and in Times New Roman Font 11.

A. Project Title:

B. Category: *Identify the specific category (1-5) identified in the Arctic Program RFP to which you are responding. Categories include:*

1. Patterns in subsistence use and potential shifts in response to ecosystem change;
2. Species distribution and interaction: Physical, biological and ecological drivers and important thresholds/tipping points relevant to the distribution and life history of apex predators, species importance to subsistence, and species and species guilds essential to ecosystem function;
3. Oceanography and lower trophic level productivity: Influence of sea ice dynamics and advection on the phenology, magnitude and location of primary and secondary production, match-mismatch, benthic-pelagic coupling, and the influence of winter conditions;
4. Modeling;
5. Other areas of research that align with priorities 1-4 above.

C. Rationale and justification: *Describe the rationale and justification for the proposed work and how it addresses ecosystem information needs identified as important by federal or state agencies or the scientific community. Explain how the proposed work will address the focus of the funding category under which the pre-proposal was submitted and how it will contribute to answering the overarching questions "How do physical, biological and ecological processes in the Chukchi Sea influence the distribution, life history and interactions of species or species guilds critical to subsistence and ecosystem function. How might those processes change in the next fifty years?"*

D. Hypotheses: *State testable hypotheses that the proposed research will address. Hypotheses should explore mechanistic processes in detail.*

E. Objectives: *Provide a numbered, annotated list of your project objectives. Objectives are the fundamental and measureable goals of your proposed work and will be used to evaluate progress and completion of the project. Project objectives must be achievable and specific.*

F. Expected outcomes and deliverables: *Describe the expected products of the proposed research and how they would contribute to improving ecosystem understanding or addressing resource management needs.*

G. Project design and conceptual approach: *Describe and justify the proposed a) geographic location and timing of data collection, b) types of information that will be collected (e.g., focal species, parameters measured), c) sampling methods and platform, and d) analytical techniques. Describe the conceptual or statistical model underlying your experimental work. Describe and justify the experimental design, methods and the analytical approach, including assumptions, sample size required (and power analysis where appropriate), model validation, and other relevant information needed to determine the utility and technical feasibility of accomplishing your research, analyzing the data, and achieving the expected outcomes.*

H. Linkages between field and modeling efforts: *Applicants who submit pre-proposals under categories 1-3 and 5 should describe how the proposed project would complement the types of modeling efforts solicited under funding category 4 (modeling). Proposals submitted under funding category 4 should articulate how the modeling project proposed would integrate with other types of modeling projects that might be funded as well as the types of projects solicited in the other funding categories.*

The following sections are also required, but are <u>not</u> be counted in the five-page limit.

<u>Tables and Figures</u>: *Insert up to five tables and five figures here.*

<u>Literature Cited</u>: *List all references in a format appropriate for a major journal such as Transactions of the American Fisheries Society or ICES Journal of Marine Science. (No word limit.)*

<u>Integration with existing projects and reliance on other sources of data</u>: *Describe how the proposed work would integrate with collaborating projects listed in the RFP appendix to address the hypotheses posed. Describe the extent to which the proposed research relies on data that will not be collected directly through the proposal (e.g., existing public data or data that might be collected by projects funded in other categories of this RFP). If you are aware of pre-proposals submitted in other funding categories and you have communicated with the lead PIs about how your respective work might be integrated, please describe that here. (No word limit.)*

<u>Project Management</u>: *Describe the organization and management of the project as well as the experience and qualifications of the principal and co-investigator(s). Individuals with full-time equivalent (FTE) positions must indicate standing time availability as authorized by their supervisor. Applicants must seek to avoid duplication of other research efforts; demonstrate how PIs/Co-PIs will coordinate and collaborate with other projects and leverage their proposals with support from other sources. If more than one investigator is involved, the applicant must clearly identify which one will be responsible for the overall work (the designated lead principal investigator), as well as the specific responsibilities of each PI/Co-PI involved in the project. (No word limit.)*

*If applicable, **permits** that may be required to conduct the project must be documented in this Program Management section. If available, permit applications or granted permit numbers should be provided. Permitting requirements are the responsibility of the applicants; NPRB will <u>not</u> financially support the permit application process.*

<u>Principal Investigators</u>*: A template is not required for **PI descriptions**. Please provide a one-page curriculum vitae (that includes current activities and publications relevant to the work proposed) for all Principal Investigators (PIs) and Co-Investigators (Co-PIs) associated with the proposal. PIs and Co-PIs are those who will receive funds. Collaborators are those who will participate in the project but will not request funds; a curriculum vitae is not required for collaborators.*

<u>Other Required Materials:</u>
*Please use the templates provided for **timelines and milestones** (MS Excel), **budget summary** (MS Excel), **budget narrative** (MS Word), and **logistics summary** (MS Word). These templates are included as attachments to the RFP and available at:*
http://www.nprb.org/arctic-program/request-for-proposals/templates/.

Using the template below, replace column B with information pertaining to the research objectives described in your proposal. Black out the dates that are not relevent to your proposal. Please provide as much detail as possible, noting the entire time period activities will take place, not just the completion date. Add sections for additional objectives or deliverables and add lines for additional actvities/tasks as necessary.

Proposal Short Title

Project Start Date – Project End Date

	individual responsible for completion	FY16	FY17				FY18				FY19				FY20				FY21			
		July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept
Objective #1																						
Data collection/field work																						
Data/sample processing																						
Analysis																						
additional lines as needed																						
Objective #2																						
Data collection/field work																						
Data/sample processing																						
Analysis																						
additional lines as needed																						
Objective #3																						
Data collection/field work																						
Data/sample processing																						
Analysis																						
additional lines as needed																						
Other																						
Progress report			x		x		x		x		x		x		x		x		x		x	
AMSS presentation				x				x				x				x				x		
PI meeting				x				x				x				x				x		
Logistics planning meeting			x				x															
Publication submission																						
Final report (due within 60 days of project end date)																						
Metadata and data submission (due within 60 days of project end date)																						
additional lines as needed																						

Arctic Program Logistics Summary

(No page limit) Text in Italics is for instructions only and should be deleted.

Project Title:

Lead PI:

Logistical Needs: *Provide a detailed accounting of your needs with respect to logistical support. Include all of the following: type of vessel and sampling capability required (e.g., fishing capability for bottom trawling), number of days of ship time (ideal and minimum required), month and year of sampling, number of berths required, special needs with respect to lab space or availability of space for large pieces of equipment, and notes regarding your ability to be flexible on any of these. If your sampling cannot be conducted in darkness please note that here. If you propose to follow a sampling plan that is time-sensitive and that will make deviation to accommodate the activities of other investigators difficult, please explain your constraints here and include a brief justification.*

Leverage of In-Kind Support for Logistics: *Describe in detail any in-kind logistical support that the proposed work will leverage. If this includes vessel time, please explain if the vessel to be contracted has been identified, and if choice of vessel is flexible. Please explain if the project leverages money that can be used to contribute to chartering any vessel or if vessel selection must occur through a process imposed by another funding entity. If known, describe the type of vessel and its capabilities. Account for the number of berths needed by your project and identify the number of berths that would be available to other investigators. Describe the length and proposed timing of all cruises and explain your level of flexibility in timing to accommodate collaborators from other projects funded through this program. Estimate any deck space available for vans and note any lab space available to collaborators from other projects. Identify whether or not the vessel can accommodate radiation experiments, if known. Provide details about any equipment that will be provided either by the contracted vessel or by your project, including frequencies of acoustic echosounders, sampling gear, maximum load limit of winches, etc. If you plan to bring technicians, please include that information, as well as a brief explanation of their capabilities. If the vessel that you plan to use requires that participants complete safety training, please explain that here, including cost per person and whether or not the funds for such training can be provided in-kind.*

Arctic Program Budget Narrative – Organization A

Complete a separate budget narrative for each organization. Below is an example of how the budget narrative should be structured and corresponds to the Budget Summary template on the NPRB website. The italicized text is provided as guidance and should be removed in the budget narrative you submit.

The details of the Budget Narrative must match exactly to the numbers entered in the Budget Summary (Excel template) for each organization involved in the project. Guidance is provided below demonstrating the connection between the budget narrative and the budget summary spreadsheet. You are welcome to include additional supporting spreadsheets as an attachment.

Project Title:

Total Amount requested by Organization A for this project is: $###, ###
(cell H27 on "org 1" page in budget summary)

1. Personnel/Salaries:

Provide a description of the amount of time in each year of the proposed project that each individual from the organization will dedicate to this work. You can also include a brief description of the individual's responsibilities. ***Note that years are defined by NPRB's fiscal year Oct. 1 – Sep. 30.*** *Year 1 represents the period from the start date of your award (likely on or around July 1, 2016) to Sep. 30, 2016.*

2. Personnel/Fringe Benefits:

Indicate the fringe rate that applies to all individuals identified in 1. Personnel/Salaries

Personnel Expense Details:

In the table below, detail the personnel expenses described above. Add more rows as necessary.

Year	Title/Name	Time devoted to project	Annual rate	Personnel cost	Fringe rate	Fringe cost
FY16						
FY16						
FY16 Totals				(*cell B18 in budget summary)*		*(cell B19 in budget summary)*
FY17						
FY17						
FY17 Totals				(*cell C18 in budget summary)*		*(cell C19 in budget summary)*

3. Travel:

For each year of the project, indicate domestic and foreign travel separately; indicate the purpose of the travel and, as appropriate, detail airfare, taxi, accommodations, per diem, etc. expenses.

Year 1:

Total travel request in FY16 **$####**
(cell B20 in budget summary)

Year 2:

Total travel request in FY17 **$####**
(cell C20 in budget summary)

Arctic Program: Budget Narrative

4. Equipment:

For each year of the project, detail the funding requested to purchase equipment to fulfill the project scope of work.
(cells on line 21 of budget summary)

Year 1:

Total equipment funds request in FY16 $####
(cell B21 in budget summary)

Year 2:

Total equipment funds request in FY17 $####
(cell C21 in budget summary)

5. Supplies:

For each year of the project, detail the funding requested to purchase supplies.

Year 1:

Total supplies funds request in FY16 $####
(cell B22 in budget summary)

Year 2:

Total supplies funds request in FY17 $####
(cell C22 in budget summary)

6. Contractual/Consultants:

All contracts must be specified here, including names of contractors if known. If the project is approved, the contractual documents will state that no work may be subcontracted without written consent of NPRB. Please note that collaborations with other organizations that would traditionally be included as a subaward should not be included here; these organizations should request direct funding from NPRB in a separate budget narrative as part of the overall project budget.

Total Contractual funds requested is $### in FY16 and $#### in FY17
(cells B23 and C23 in budget summary)

7. Other:

For each year of the project, specify any other costs for which funds are being requested.

Total other funds requested is $### in FY16

8. Indirect Costs:

Indicate the indirect rate for the organization and to which budget line items the indirect rate applies. The total dollar amount of the indirect costs proposed must not exceed the indirect cost rate negotiated and approved by a cognizant federal agency prior to the proposed effective date of the award, or 100% of the total proposed direct cost amount in the application, whichever is less. If applicable, a copy of the current, approved indirect-cost agreement with the federal government must be included. Note that the indirect rate indicated at the time of proposal submission is the indirect rate that will apply through the duration of the project should the proposal receive funding.

Total indirect funds requested is $##,### in FY16 and $##,### in FY17
(cells B26 and C26 in budget summary)

Other Support/In kind Contributions for Organization A:

(*Include federal and non-federal funding. Summarize outside support divided by cost categories above.*)

Total Other Support provided by Organization A for this project is: $##,### *(cell I27 in budget summary)*
For each budget line item category, describe funding provided as other support (in-kind).

ARCTIC PROGRAM: BUDGET SUMMARY FORM - MULTIPLE ORGANIZATIONS

PROJECT TITLE: Enter short project title

PRINCIPAL INVESTIGATOR(S): PI names from 1st organization - organization affiliation; PI names from 2nd organization - organization affiliation; PI names from 3rd organization - organization affiliation; PI names from 4th organization - organization affiliation

FUNDING SOURCE	FY16 start date through 9/30	FY17 10/1 through 9/30	FY18 10/1 through 9/30	FY19 10/1 through 9/30	FY20 10/1 through 9/30	FY21 10/1 through 9/30	TOTAL
NPRB Funding	0	0	0	0	0	0	0
Other Support							0
TOTAL	0	0	0	0	0	0	0

Annual cost category breakdown for Other Support should be detailed in the budget narrative.

Cost Categories	NPRB FY16 start date through 9/30	NPRB FY17 10/1 - 9/30	NPRB FY18 10/1 - 9/30	NPRB FY19 10/1 - 9/30	NPRB FY20 10/1 - 9/30	NPRB FY21 10/1 - 9/30	NPRB TOTAL	Other Support TOTAL (all years)
1. Personnel Salaries	0	0	0	0	0	0	0	0
2. Personnel Fringe Benefits	0	0	0	0	0	0	0	0
3. Travel (include 1 trip to AMSS meeting in Anchorage each year plus for the year following project conclusion)	0	0	0	0	0	0	0	0
4. Equipment	0	0	0	0	0	0	0	0
5. Supplies	0	0	0	0	0	0	0	0
6. Contractual/Consultants	0	0	0	0	0	0	0	0
7. Other	0	0	0	0	0	0	0	0
Total Direct Costs	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Indirect Costs	0	0	0	0	0	0	0	0
TOTAL PROJECT COSTS	**0**	**0**	**0**	**0**	0	0	**0**	**0**