

Annual Report for Period:04/2006 - 03/2007

Submitted on: 01/30/2007

Principal Investigator: Hunt, George L.

Award ID: 0518226

Organization: U of Washington

Title:

Planning Activities for Bering Ecosystem Studies (BEST)

Project Participants

Senior Personnel

Name: Hunt, George

Worked for more than 160 Hours: Yes

Contribution to Project:

Name: Hyrenbach, K David

Worked for more than 160 Hours: Yes

Contribution to Project:

Dr. Hyrenbach is working closely with me to coordinate all planning activities for BEST. He attends meetings in my stead, helps to develop agendas for workshops and leads discussions. He is also involved with the development of a website for BEST that will be hosted at the University of Washington.

Post-doc

Graduate Student

Undergraduate Student

Technician, Programmer

Other Participant

Research Experience for Undergraduates

Organizational Partners

Duke University Marine Laboratory

Dr. David Hyrenbach, a research scientist at the Duke University Marine Laboratory, has been working on the Project Planning Activity.

Other Collaborators or Contacts

Dr. David Hyrenbach has been collaborating on this project as a visiting scholar working at the University of Washington's School of Aquatic and Fishery Sciences (SAFS) in Seattle, Washington.

Activities and Findings

Research and Education Activities:

While the performance period of this second year report spans April 1, 2006 - March 31, 2007, BEST planning activities have been ongoing since 2002. Previous planning efforts, initiated under NSF proposal ARC-0226371 'Workshop to Assess Research Priorities in the Bering Sea', focused on the formulation of the BEST Science Plan. Starting in March 2005, NSF proposal ARC-0518226 'Planning Activities for

Bering Ecosystem Studies (BEST)' has supported ongoing planning efforts, including the establishment of the BEST Planning Office (BEST PO) housed at the University of Washington in Seattle (UW).

A) BEST Implementation:

We continued working towards effective implementation of BEST by helping to integrate the currently-funded projects into a cohesive research program by: (i) Contributing to the development of an integrated cruise plan for the 2007 field season; (ii) Stimulating the participation of other investigators in the 2007 cruise and the upcoming BEST AO (due March 15, 2007); and (iii) Coordinating BEST activities with the research and funding efforts of other agencies active in the Bering Sea. To this end, the BEST PO participated in four planning meetings during the last year.

During 17-19 July 2006, the 'Climate Change and the Bering Sea Ecosystem Meeting', organized by the BEST PO and ARCUS, was held at NOAA's Pacific Marine Environmental Laboratory (PMEL) in Seattle, Washington. Participants, including members of the BEST Science Steering Committee (SSC), the Bering Interagency Oversight Group (BIOG), the Bering Interagency Working Group (BIAWG), and other interested funding and research parties working in the Bering Sea, met to discuss research planning and coordination. The meeting provided an opportunity to share information on ongoing activities and research plans, to assess what areas of Bering Sea work had been funded, to identify research and funding gaps, and to organize resources to avoid duplication of efforts. Bill Wiseman (NSF Arctic Natural Sciences), Anna Kerttula (NSF Arctic Social Sciences) and George Hunt (BEST PO) presented information about the BEST funding and research plans. As part of this meeting, the BEST SSC and PO held a closed session to review NSF funding plans and future activities. Karen Pletnikoff and Jennifer Sepez, two new BEST SSC members, joined the group in an effort to integrate the natural science and the social science components of BEST.

During September 7 - 8, representatives of the BEST PO and the PIs from the five BEST projects funded by the NSF met at the Foundation's headquarters in Arlington, Virginia. This meeting, also attended by representatives of the BEST SSC, NSF program managers, and NOAA scientists involved in Bering Sea research, provided a forum to initiate planning for the 2007 BEST cruise, and for developing collaborations among the natural and social science components of BEST. The meeting participants discussed current and future BEST activities, reviewed the proposed goals and plans of each funded research project, and exchanged information about 2007 BEST cruise and NOAA's Bering Sea activities.

On December 4, 2006, the BEST PO organized a 'Cruise Planning Meeting', held at the University of Washington in Seattle, Washington. This meeting, led by the cruise Chief Scientist, Ray Sambrotto, was attended by the BEST PO, investigators from the funded projects, and representatives from the USCGC Healy. The one-day planning meeting, which focused on cruise planning activities, was followed by a December 5 visit to the USCG Seattle facility and the USCGC Healy in the dry dock.

The BEST PO has also organized a town hall meeting, scheduled for February 7, 2007, during the American Society of Limnology and Oceanography (ASLO) conference in Santa Fe, New Mexico. In anticipation of the deadline of the second BEST competition, due March 15, 2007, the 'Bering Ecosystem Study (BEST) Research and Funding Plans' town hall will provide the scientific community with information on the BEST program research and funding activities. Brief introductory presentations on recent changes in the Bering Sea and on the scope of the funded proposals will be followed by an open question / answer session. A representative of the Arctic Section of the Office of Polar Programs has been invited to attend and provide background on NSF's expectations for responses to the BEST AO.

In addition to participating in meetings and workshops, the BEST PO has worked with researchers from the Pacific Marine Environmental Laboratory (PMEL) and NOAA's Alaska Fisheries Science Center to develop a service proposal for sampling of hydrography, nutrients, and zooplankton during the 2007 BEST cruise. This proposal, developed by Hunt in collaboration with Drs. Stabeno, Napp and Mordy, was submitted in January 2007. The BEST PO also assisted researchers from the USFWS (Drs. Kuletz and Irons) to develop a proposal to the North Pacific Research Board (NPRB) to fund at-sea surveys of marine bird distribution and abundance in the Bering Sea shelf. This funding will result in marine bird surveys during several of the BEST cruises, starting in the 2007 field season. The establishment of this seabirds-at-sea-survey program resulted, in part, from our outreach efforts to seabird researchers during the last two years, including a one-day workshop with seabird researchers working in the Bering Sea held at the University of Washington (November 2005), and participation in the 'Seabirds as Ecosystem Indicators' workshop held at the Pacific Seabird Group (PSG) annual conference (February 2006).

B) Inter-agency Collaboration:

To ensure that the available resources are used in the most effective way possible, the BEST PO has worked with national and international research and funding organizations to coordinate BEST activities with other research programs working in the Bering Sea, the North Pacific, and other sub-Arctic Seas. These collaborative efforts have addressed three partners: (i) Synergistic activities of BEST within the framework of the Study of Environmental Arctic Change (SEARCH) program; (ii) Domestic and international research and funding organizations working in

the Bering Sea; and (iii) Contributions of BEST to the international ESSAS (Ecosystem Studies of Sub-Arctic Seas) program.

(a) To ensure BEST maintains a connection with the SEARCH program, Hunt, a member of the SEARCH SSC, attended a meeting (November 29 - December 1, 2006) held in Arlington Virginia, to discuss synergies between BEST and SEARCH. These collaborative efforts are reinforced by the programmatic synergies between BEST and the research activities planned for the International Polar Year (IPY). This meeting also allowed Hunt to meet with the NSF program managers, to discuss BEST funding projections and the logistics of the upcoming field program.

(b) Inter-agency activities with domestic partners have included the following agencies and organizations: the North Pacific Research Board (NPRB), the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Fish and Wildlife Service (USFWS).

We participated in two workshops to develop and integrate ecological indicators for the North Pacific and the Bering Sea. The first one was held on January 25, 2006 during the Alaska Marine Science Symposium in Anchorage, Alaska. The second one took place on June 1-3, 2006 in Seattle, Washington. Hunt and Hyrenbach participated in the open scoping meeting held in January, and Hunt was invited to the closed workshop in June. These workshops led to a series of recommendations for the identification of ecological indicators for the Bering Sea, which have been published as PICES scientific report No. 33 ('Report of the PICES / NPRB Workshop on Integration of Ecological Indicators of the North Pacific with Emphasis on the Bering Sea') available online at the PICES web-site: http://www.pices.int/publications/scientific_reports/Report33/Rep_33_default.aspx.

(c) The BEST PO has also worked to reinforce its links with international research programs. Best is the major U.S. contribution to the Ecosystem Studies of Sub-Arctic Seas (ESSAS) program, and was given observer status by the North Pacific Marine Science Organization (PICES). Thus, developing programmatic synergies with these research programs has been a major priority of the BEST PO during 2006. As a member of the ESSAS SSC, Hunt has been involved in discussions to integrate the BEST and ESSAS research programs. During the last year, BEST PO representatives attended an ESSAS workshop held in St. Petersburg, Russia (June, 2006) and the PICES annual meeting in Yokohama, Japan (October, 2006). These efforts are critical for developing strong partnerships amongst BEST and ESSAS and PICES, which will provide a firm foundation for future collaborations and comparative studies.

Between June 12-14, 2006, Hunt attended a PICES / ESSAS workshop to develop comparative studies of the sub-Arctic Seas in St. Petersburg, Russia. During this workshop, Hunt made a presentation stressing the importance of inter-regional comparisons and international collaboration for gaining a mechanistic understanding of the ecosystem effects of the loss of sea-ice and ocean warming. This meeting also provided an opportunity to set the foundation for a strong BEST representation at the ESSAS workshop planned for June 2007 in Hakodate, Japan. This meeting has four objectives: (i) A two day workshop on 'The Role of Seasonal Sea Ice Cover in Marine Ecosystems' that will focus on the mechanisms whereby seasonal sea-ice cover influences the timing, amount and fate of spring primary production; (ii) A one day workshop on the 'Evaluation of Future ESSAS Climate Scenarios' that will focus on evaluating which of the IPCC models provides the most accurate forecasts of climate variables in each of the ESSAS regions; and (iii) A half day organizing meeting for the ESSAS Working Group on Modeling Ecosystem Response, which has been charged with determining the best way to use modeling approaches to compare climate effects on different sub-Arctic seas. As one of the organizers of this workshop, Hunt is working to ensure BEST becomes a full partner in ESSAS research activities.

It is envisioned that BEST representatives will attend the sea-ice workshop to highlight ongoing and future research efforts in the Bering Sea. Given the timing of the BEST field work and the emphasis of this workshop, it was felt that BEST P.I. Jinlun Zhang and BEST SSC member Rolf Gradinger should be invited and supported to attend the sea ice workshop. Additionally, it was felt that Zhang would find useful the ESSAS workshop on the evaluation of future ESSAS climate scenarios. It was also recommended that Kenny Rose, a member of the BEST SSC, be nominated as a co-chair of the ESSAS Working Group on Modeling Ecosystem Response, and that he be supported to attend the Hakodate meetings. Establishing links with other researchers involved in sea-ice and ecosystem modeling studies in other ESSAS regions early on is critical to facilitate the seamless integration of BEST research and results into the ESSAS frame-work.

Hunt also attended the annual PICES meeting, held in Yokohama, Japan (October 13 - 22, 2006), where he made a presentation to the PICES Governing Council on the BEST program and the value to both organizations of collaborations between PICES and BEST. Hunt also had the opportunity to meet with the PICES Committees on Biological Oceanography, Physical Oceanography and Fisheries, in preparation for the June 2007 ESSAS workshop in Hakodate. Broad-based support from the PICES Governing Council and Committees was forthcoming. In addition, PICES will help support the attendance of scientists at the Hakodate workshops. There is need to develop stronger ties and integration between BEST researchers and those in the international community, as many of the investigators are working on similar climate-related problems in the Atlantic and Pacific oceans have much experience to offer the BEST research community.

Between March 5- 9, 2007, Hunt will participate in the Marine Ecosystems of NORWAY and the U.S. (MENU) Workshop in Bergen, Norway. The MENU program is based on a Memorandum of Understanding between the National Marine Fisheries Service (NMFS) and the Institute of

Marine Research in Norway. In March 2006, a US-Norway bilateral workshop, hosted by the NEFSC and held in Woods Hole, resulted in a MENU proposal for ecosystem comparisons between the two countries. This proposal was submitted by partners of the Norwegian Institute of Marine Research to the Norwegian Research Council shortly after the Woods Hole workshop. A proposal to hold a theme session at the next ICES annual meeting on this topic was also submitted.

Both proposals were accepted, and the plan is for a workshop in Bergen followed by a special theme session at the 2007 ICES Annual Science Conference in Helsinki, where much of the work that will result from the MENU workshop will be presented. The focus of this research will be to undertake comparisons of the marine ecosystems of the Bering Sea, the Georges Bank Region, the Norwegian Sea and the Barents Sea. It is expected that Hunt will attend these workshops, where he will address aspects of the changing marine ecosystems of the eastern Bering Sea.

Findings:

N/A

Training and Development:

N/A

Outreach Activities:

During the last year, the BEST PO has engaged in outreach activities through three main avenues: (i) Presenting BEST goals and priorities to the broader scientific community at meetings and public lectures; (ii) Developing a publicly-available BEST web-site; and (iii) Establishing partnerships for developing outreach and educational products.

A) Presentations:

During the last year (April 1, 2006 û March 31, 2007) we have contributed eleven oral and four poster presentations on the BEST program and the changing marine ecosystems of the Bering Sea:

- Oral Presentations at Scientific Meetings:

Hunt, G.L., Jr. The Bering Sea Ecosystem Study (BEST) Program. Presentation to the PICES Governing Council. Annual PICES meeting, Yokohama, Japan. October 13-22, 2006

Hunt, G.L., Jr. Presentation to the CFAME task team, and informal presentations to the PICES Committees on Biological Oceanography, Physical Oceanography, and Fisheries. Annual PICES meeting, Yokohama, Japan. October 13-22, 2006

Hunt, G.L., Jr. Ecosystem Variation in the Southeastern Bering Sea. Alaska Forum on the Environment. Anchorage, AK. February 12-16, 2007

Hunt, G.L., Jr. Variability in the marine ecosystem of the southeastern Bering Sea. Marine Ecosystems of NORWAY and the U.S. (MENU) Workshop. Bergen, Norway. March 5-9, 2007

- Presentations at BEST and ESSAS Workshops and Meetings:

Hunt, G.L., Jr. Bering Sea Ecosystem Study. ESSAS SSC Annual Meeting. St. Petersburg, Russia. Jun 12-16, 2006

Hunt, G.L., Jr. Agencies Conducting Research in the Bering Sea. BEST SSC Meeting. Seattle, WA. July 17-20, 2006.

Hunt, G.L., Jr. A brief history of BEST and an introduction to other Bering Sea research efforts. BEST P.I. Meeting. NSF headquarters. Arlington, VA. September 7-8, 2006

- Poster Presentations at Scientific Meetings:

Hunt, G.L., Jr., & Hyrenbach, K.D. Bering Ecosystem Study (BEST): A new program for the eastern Bering Sea. PICES Annual Meeting. Yokohama, Japan. October 13-22, 2006

Hunt, G.L., Jr., & Hyrenbach, K.D. The Bering Sea Ecosystem Study (BEST). Alaska Marine Science Symposium. Anchorage, AK. January 21-24, 2007

Hunt, G.L., Jr., & Hyrenbach, K.D. The Bering Sea Ecosystem Study (BEST): A new NSF program for studying climate change and marine ecosystem function in the eastern Bering Sea. Aquatic Sciences Meeting. Santa FÚ, NM. February 4-7, 2007

Hyrenbach, K.D., & Hunt, G.L., Jr. The Bering Sea Ecosystem Study (BEST). Gordon Research Conference on Polar Marine Science. Ventura, CA. March 22-25, 2007

- Public Lectures:

Hyrenbach, K.D., & Zhang, J. The Bering Sea Ecosystem Study (BEST). Seminar at the Rural College of Alaska û Kuskokwin Campus. Bethel, AK. January 19, 2007

Hyrenbach, K.D., & Zhang, J. The Bering Sea Ecosystem Study (BEST). Presentation to the Calista Elders Council. Bethel, AK. January 19, 2007

Hunt, G.L., Jr. Change in the Bering Sea and the Bering Ecosystem Study (BEST). Presentation at the BEST Town Hall, Aquatic Sciences Meeting. Santa FÚ, NM. February 4 û 7, 2007

Hyrenbach K.D., Hunt, G.L., Zhang, J. Loss of Sea-ice and Ecosystem Changes in the Bering Sea. Pacific Science Center Polar Week, March 8 û 11, 2007

B) BEST Project Web-site:

We continue to maintain a publicly-available web-site, including background and outreach information on the BEST project and the marine ecosystems of the Bering Sea, housed at the University of Washington's School of Aquatic and Fishery Sciences (SAFS). We are currently working with Alison York at ARCUS to integrate the content of the two existing BEST web-sites. The PO site at the University of Washington (<http://fish.washington.edu/best>) will provide information on current and future activities, including presentations, workshops, and field projects. The site maintained by ARCUS (<http://arcus.org/bering>) will serve as a repository for background information and archived products from completed workshops and meetings.

C) Outreach Activities:

As the clearing-house for BEST project information and outreach materials, the BEST PO is collaborating with partners in the social and the natural science components of BEST to develop outreach materials for the public at large.

Working with Drs. Anne Riordan and Jinlun Zhang, Hyrenbach traveled to Bethel to attend a meeting of the Calista Elders Council on January 18-20, 2007. Hyrenbach and Zhang made a presentation of the BEST project to the council members and participated in an exchange of ideas and experiences concerning global warming and the loss of sea-ice in the Bering Sea. This effort brought together researchers involved in the natural science (P.I.s: Zhang and Woodgate) and the social science (P.I.s: John and Riordan) dimensions of BEST around the issue of sea-ice dynamics and loss, and provided an extraordinary opportunity for community outreach. Zhang and Hyrenbach also made a presentation at the rural college of Alaska's Bethel campus, which was made possible through the support of Mary Pete, a member of the BEST SSC. The BEST PO will work to facilitate future interactions between BEST researchers and the Calista Elders Council, as a way to facilitate local outreach efforts and the integration of the natural and the social science dimensions of the BEST project.

The great interest in BEST research and activities during the visit to Bethel underscores the need and opportunities for additional outreach activities. To this end, the BEST PO is working on a variety of outreach and educational products in support of the BEST field activities. In collaboration with NOAA's PMEL, we are preparing outreach materials as part of the 2007 BEST cruise, including a presentation to school children in the Pribilof Islands and a publicly-available cruise web-site. The BEST PO is also coordinating the inclusion of teachers and representatives from local communities on the cruise, in collaboration with NSF's PolarTrec program, NOAA's teacher at sea initiative, and local communities. The BEST SSC (Karen Pletnikoff) and the Calista Elders Council (Mark John and Anne Riordan) are playing a vital role as BEST liaisons in local communities to facilitate these outreach efforts.

The BEST PO has been invited to participate in a series of outreach and educational events, under the auspices of the Pacific Science Center and the UW's Applied Physics Laboratory's 'Polar Week'. This event, scheduled for March 8 û 11, 2007 at Seattle's Pacific Science Center, attracts hundreds of school children and visitors from the public at large. We intend to make this an annual outreach event, which will also involve the PIs funded by the BEST program.

Journal Publications

Hunt, G.L., Jr. & Drinkwater, K., "ESSAS (Ecosystem Studies of Sub-Arctic Seas) Science Steering Committee meets in St. Petersburg, Russia.", GLOBEC Newsletter (http://web.pml.ac.uk/globec/products/newsletter/news12_2.pdf), p. 3, vol. 12(2), (2006). Published

Drinkwater, K. & Hunt, G.L., Jr., "Update of the Ecosystem Studies of Sub-Arctic Seas (GLOBEC-ESSAS) regional programme.", GLOBEC International Newsletter (http://web.pml.ac.uk/globec/products/newsletter/news12_1.pdf), p. 51, vol. 12(1), (2006). Published

Books or Other One-time Publications

North Pacific Marine Science Organization (PICES), "Report of the PICES / NPRB Workshop on Integration of Ecological Indicators of the North Pacific with Emphasis on the Bering Sea.", (2006). PICES Scientific Report, Published

Editor(s): North Pacific Marine Science Organization (PICES)

Collection: PICES Scientific Report No. 33

Bibliography: http://www.pices.int/publications/scientific_reports/Report33/Rep_33_default.aspx

Web/Internet Site

URL(s):

<http://fish.washington.edu/best>

Description:

We have developed a BEST project web-site, housed at the University of Washington's School of Aquatic and Fishery Sciences (SAFS). This web-site, which includes background and outreach information on our project and the marine ecosystems of the Bering Sea, became publicly available on September 18, 2006:

We have monitored activity at the web-site automatically, by compiling information on the number and nature of visits by web-site users. As of January 17, 2007, four months since the BEST web-site became public, these are the cumulative usage statistics:

376 Page Loads - The number of times the site has been visited.

142 Unique Visitors - Based purely on an electronic cookie. This is the total of the returning visitors and first time visitors - all the visitors to the site.

98 First Time Visitors - Based purely on a electronic cookie. If visitors do not have a record from a previous visit, this is considered the first time they visit the site.

44 Returning Visitors - Based purely on an electronic cookie. If users return to the site, at least an hour or more after a previous visit, they are considered returning visitors.

We can also monitor some geographic and keyword information from web-site visitors:

Origin of visitors (percentages of 100%): Nation of the visitors based on I.P. addresses

88.89% United States

4.04% Japan

2.02% Canada
 2.02% Australia
 1.01% China
 1.01% Peru
 1.01% Unknown

Keywords used by visitors to the BEST web-site (percentages of 100%)

58.33% nsf best
 16.67% nsf best program
 8.33% fish.washington.edu/best
 8.33% www.fish.washington.edu/best
 8.33% best planning

Other Specific Products

Contributions

Contributions within Discipline:

The various workshops on Bering Sea climate change and indicators, organized through PICES, ESSAS, NPRB and NOAA have raised the interest of the scientific community in the changes taking place in the Bering Sea ecosystem, and have helped to publicize the ongoing and future research efforts of BEST. The meeting with the Calista Elders Council (January 2007), the BEST presentation at the Alaska Forum on the Environment (February 2007), and the BEST town hall meeting at the ASLO conference (February 2007), will disseminate information about the changing Bering Sea ecosystem and the BEST project to the natural / social science research communities and to the local peoples of Alaska. These and other ongoing BEST PO outreach and educational activities planned for before / during / after the first BEST cruise (April to May 2007) will continue to disseminate this information to the public at large, raising the general awareness of the plight of the Bering Sea ecosystem and communities in the U.S. and abroad.

Contributions to Other Disciplines:

Contributions to Human Resource Development:

Contributions to Resources for Research and Education:

Contributions Beyond Science and Engineering:

Special Requirements

Special reporting requirements: None

Change in Objectives or Scope: None

Unobligated funds: \$ 0.00

Animal, Human Subjects, Biohazards: None

Categories for which nothing is reported:

Any Product

Contributions: To Any Other Disciplines

Contributions: To Any Human Resource Development

Contributions: To Any Resources for Research and Education

Contributions: To Any Beyond Science and Engineering