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Loss of Sea Ice (LOSI) Plan for FY15-FY19

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Alaska Fisheries Science Center Loss of Sea Ice (LOSI) Plan for FY15-FY19

by

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Introduction

Sea ice consistently covers the northern Bering Sea each year (Stabeno et al. 2012a), while ice extent and retreat timing vary annually in the southeastern Bering Sea (Stabeno et al. 2012b). As a result, conditions vary more in the southeastern Bering Sea, which is an ecotone marking the transition between the seasonally ice-covered northern Bering Sea and the largely ice-free Gulf of Alaska. The interaction of annual ice extent and the broad (500 km), nearly flat continental shelf makes the eastern Bering Sea spatially rich, with three cross-shelf domains (inner, middle, outer) in the southeastern Bering Sea (Coachman 1986); a distinct northern Bering Sea domain (Grebmeier et al. 2006, Sigler et al. 2011, Stabeno et al. 2012a); and a Pribilof domain (Stabeno et al. 2008).

Surveys for groundfish and crab focus on the southeastern Bering Sea because major fisheries occur there. However some cold-loving species such as yellowfin sole and snow crab extend their distribution into the northern Bering Sea but are not routinely surveyed there (Lauth 2010). Ice seal abundances previously were unmeasured until the Bering and Okhotsk seas were surveyed a few years ago.

NOAA funded Loss of Sea Ice (LOSI) research during FY10-FY11 and again starting FY14. The 2010-2011 funding was used to survey groundfish and crab in the northern Bering Sea in 2010 and to survey ice seals of the Bering and Okhotsk seas during 2012-2013. This document describes the AFSC plan for LOSI research for FY15-FY19.

This collaborative research by several AFSC Divisions will address objectives within NOAA's Arctic Vision and Strategy (NOAA 2011), and contribute to the implementation of NOAA's Arctic Action Plan (NOAA 2014) for pursuing responsible Arctic region stewardship and enhancing international partnerships. Surveys to assess the abundance of managed fish stocks and ice-associated seals and to collect oceanographic data are goals of the Arctic Action Plan for *Living Marine Resources Surveys and Assessments*. This research will meet these goals by *providing information on how species distribution and marine food webs are altered by climate and seasonal ice in the northern Bering Sea, and for ice seals, in the Chukchi Sea.*

Plan Summary

Northern Bering Sea bottom trawl survey

Northern Bering Sea shelf trawl surveys will start in 2017. These surveys will enumerate commercially important shelf species such as snow crab and yellowfin sole, which have distributions extending beyond the current area of the annual eastern Bering Sea shelf survey. The resulting survey effort will cover the entire eastern Bering Sea shelf and will be repeated biennially.

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

The northern Bering Sea BASIS survey will continue in 2015, 2016, and 2018. These surveys will enumerate late summer/early fall fish species such as juvenile salmon and juvenile pollock and will concurrently measure oceanographic conditions. When combined with the southeastern Bering Sea BASIS survey, the resulting survey effort will cover much of the eastern Bering Sea shelf.

Ice seal surveys

Chukchi Sea ice seal surveys will occur in 2015 and 2016. These surveys will enumerate ice seal species such as bearded and ringed seals and will extend the surveyed area from the Bering and Okhotsk seas, previously completed, to north of Bering Strait.

Northern Bering Sea modeler

Beginning in 2015, a research scientist will specialize in multispecies stock assessment models and Management Strategy Evaluations (MSEs) that incorporate climate projections and results from ecosystem models, in order to develop sustainable fishing strategies for the eastern Bering Sea under LOSI future scenarios.

Survey	2015	2016	2017	2018	2019
Bottom trawl survey			survey		survey
BASIS	survey	survey		survey	
Ice seal survey	survey	survey			

Plans after 2019

Northern Bering Sea bottom trawl surveys will continue biennially after 2019. The timing of future northern Bering Sea BASIS and ice seals surveys (after 2019) will be determined later.

Budget

Category	2015	2016	2017	2018	2019
Bottom trawl survey	\$64,424	\$163,615	\$921,335	\$178,487	\$982,598
BASIS	\$259,663	\$242,966	\$0	\$310,822	\$0
Ice seal survey	\$624,000	\$535,520	\$19,456	\$181,920	\$0
Modeling	\$131,315	\$137,781	\$139,262	\$146,225	\$159,164
Administrative tax	\$120,000	\$120,000	\$120,000	\$120,000	\$120,000
Total	\$1,199,402	\$1,199,881	\$1,200,053	\$937,454	\$1,261,762

Project Title

Northern Bering Sea Bottom Trawl Survey

Goals

This survey will provide long-term monitoring of bottom fishes, crabs, and other demersal macrofauna in the northern Bering Sea (NBS) 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.

Survey

The sampling design and standard sampling methods will be the same used for the 2010 NBS bottom trawl survey (Lauth 2010). The EBS shelf systematic sampling grid (20 × 20 nmi) was extended northward to the Bering Strait and includes 143 additional bottom trawl sampling stations. The NBS survey requires 45 charter vessel days starting and ending in Dutch Harbor, AK, with a mid-cruise change of scientific personnel in Nome, AK. The first NBS survey will be conducted in 2017 and a biennial survey schedule will continue during odd-numbered years.

Budget

Category	2015	2016	2017	2018	2019
Contract (Charter)			\$636,787		\$675,567
Contract (Labor)			\$23,357		\$24,779
Labor (2)	\$56,184	\$117,987	\$123,887	\$130,081	\$136,585
Equipment		\$29,175		\$30,952	
Supplies		\$7,965		\$8,450	
Shipping			\$16,391		\$17,389
Travel (Outreach)	\$8,240	\$8,487	\$8,742	\$9,004	\$9,274
Travel (Survey)			\$32,782		\$34,778
Overtime			\$79,390		\$84,225
Total	\$64,424	\$163,615	\$921,335	\$178,487	\$982,598

Budget Narrative

A 2014 cost basis was used for estimating out year budgets by multiplying at a 5% annual rate of increase for permanent labor costs and a 3% annual rate of increase for everything else. The

2014 cost basis for a vessel charter was 45 days at \$9,800 per day plus daily fuel consumption of 900 gallons at \$3.50 per gallon. Projected charter costs are \$637,000 for 2017 and \$676,000 for 2019. The labor contract is to fill one position on the 45-day survey in 2017 and again in 2019 through an existing contract for fishery observers. The 2014 cost basis for an observer contract is \$475 per day. Equipment costs are for annual maintenance, wear-and-tear, and replacement of survey equipment such as trawl nets, acoustic mensuration system, computers, electronic scales, etc., that have an annual cycle or limited life. Supplies include expendable survey items such as chemicals, storage materials, protective equipment, etc. Survey costs for equipment and supplies are incurred the year prior to surveys for better survey planning and preparation. Shipping cost in 2017 and 2019 is for a 40-foot container with survey equipment and a flatbed with trawl nets and doors one-way from Dutch Harbor to Seattle. Travel for outreach is to discuss survey plans with selected NBS coastal communities and for staff to attend the annual Alaska Marine Science Symposium. Survey travel is for roundtrip travel to Dutch Harbor by six AFSC staff to participate on each of two survey legs. Overtime is for six AFSC staff participating for 3.2 pay periods (45 days) for 88 hours per pay period with a 2014 cost basis of \$43/hr including benefits. Labor is for two permanent fisheries biologists (ZP-2 level) that are required to adequately support the expanded survey program. The 2014 cost basis for each of these positions is \$41,804 plus an additional 28% for benefits (\$53,509). It is anticipated that the two positions will be hired in the second half of 2015, so only half of the labor costs are applied. The available LOSI funds are insufficient to fully cover the 2019 survey and \$62,000 of additional AFSC funds will be necessary to complete this survey.

Project Title

Northern Bering Sea - BASIS

Goals

This survey will provide long-term monitoring of late summer/early fall fish species such as juvenile pollock and Pacific salmon and will concurrently measure oceanographic conditions. The ultimate goal is a long time-series of standardized data collections that will provide scientific information for determining how climate change is affecting population trends and community structure. When combined with southeastern Bering Sea BASIS, the resulting survey effort will cover much of the eastern Bering Sea shelf.

Survey

The survey component of this research includes a 25-day late summer/early fall fish and oceanographic survey north of 60 °N to the Bering Strait, usually on a biennial (even-numbered years) schedule. The current survey design includes 55 to 60 stations which covers a grid to sample fish and determine physical and biological oceanographic conditions in the pelagic environment of the survey area. The survey will begin and end in Dutch Harbor, AK; a leg change in Nome, AK, will occur halfway through the survey. Northern Bering Sea BASIS surveys will continue in 2015, 2016, and 2018. The timing of future northern Bering Sea BASIS and ice seals surveys (after 2019) will be determined later.

Budget

Category	2015	2016	2017	2018	2019
Contract (Charter)	\$46,731	\$52,133		\$104,885	
Labor & benefits	\$19,932	\$83,713		\$ 92,293	
Contract (Ocean. Sample processing)	\$17,500	\$18,025		\$19,123	
Grant (Biol. Sample processing)	\$20,000	\$20,600		\$21,854	
Contract (Labor)	\$89,000				
Equipment	\$10,000	\$ 10,300		\$10,927	
Supplies	\$13,000	\$ 13,390		\$14,205	
Shipping	\$10,000	\$ 10,300		\$10,927	
Travel	\$17,500	\$ 18,025		\$19,123	
Overtime	\$16,000	\$ 16,480		\$17,484	
Total	\$259,663	\$242,966	\$0	\$310,822	\$0

Budget Narrative

The 2014 cost basis for a vessel charter was 25 days at \$9,800 per day plus a daily fuel consumption of 900 gallons at \$3.50 per gallon. Projected charter costs are \$338,000 for 2016 (funds in 2015 of \$167,000 will be carried over in the vessel contract to 2016) and \$359,000 for 2018. Available LOSI funds are insufficient to fully cover the 2015 and 2016 surveys and additional AFSC funds will be necessary. This vessel contract will be shared with the AFSC's Resource Assessment and Conservation Engineering (RACE) Division's survey contracts for financial and administrative savings. Labor costs include a permanent fisheries biologist (ZP-2 level) to manage, analyze, and report bio-energetic data collected on surveys. Cost basis for this position in 2014 was \$59,321 plus 28% for benefits (\$75,930). Budgets for out-years were estimated by multiplying at a 5% annual rate of increase for permanent labor costs and a 3% annual rate of increase for everything else. This fisheries biologist position will start in the fourth quarter of FY15. This position will be fully covered by LOSI funds in BASIS survey years and not covered in non-BASIS years (the remainder will be covered by the Alaska Fisheries Science Center's Auke Bay Laboratories (ABL)). The scientist will be assigned to the Recruitment Energetics and Coastal Assessment (RECA) program at ABL and will assist in logistics and staffing of Bering Sea surveys. Contract (process) includes processing of physical (conductivity-temperature-depth (CTD)) data at NOAA's Pacific Marine Environmental Laboratory (PMEL)); grant (process) includes processing of biological (zooplankton at Poland) oceanographic samples. Contract (labor) includes on-board diet analysis (\$10,000) and bio-energetic sample processing in the lab (\$79,000). Supplies include expendables at-sea and in the lab. Equipment includes maintenance of fish and oceanographic gear as well as replacement costs for equipment failure. Shipping costs (container and air cargo round trip from Juneau to Dutch Harbor, AK) are shared with the southern Bering Sea survey that occurs on a biennial (even year) basis. Travel and overtime includes AFSC staff (four for each leg) participation on the survey with round-trip tickets from Juneau to Dutch Harbor and Nome.

Project Title

Seals of the Bering and Chukchi Seas

Goals

Surveys to produce the first reliable estimates of abundance and assess the population trends of ice-associated seals are an important element of NOAA's Arctic Action Plan for *Living Marine Resources Surveys and Assessments*. This project also addresses ecosystem assessment objectives identified in the AFSC's Loss of Sea Ice (LOSI) program. The result of LOSI support for seal surveys, beginning with the Bering-Okhotsk Seal Surveys (BOSS) conducted in 2012-2013, will be comprehensive baseline abundance estimates and initiation of long-term trend monitoring for the four ice-associated seal species found in Alaska waters.

Survey

The aerial survey component of this research includes late-spring field efforts in the Chukchi Sea. The Chukchi Sea surveys require a collaborative effort with the Russian Federation to ensure adequate coverage of the important, and previously unsurveyed, habitat in the western Chukchi Sea. The surveys will be timed to occur before the seasonal pulse of northward migration of bearded and ringed seals from the Bering Sea and after the majority of snow cover has melted away so that ringed seals are exposed on the ice (i.e., the 'basking' period). Adequate coverage for achieving statistical precision of abundance estimates ($CV < 0.2$) in the U.S. waters of the study regions requires about 200 hours of NOAA and commercial charter aircraft, operating out of Nome, Kotzebue, and Barrow, AK. The Chukchi Sea survey will be conducted in 2016 with funding commencing in FY15. The timing of future northern Bering Sea BASIS and ice seals surveys (after 2019) will be determined later.

Data Processing and Analysis

These surveys, which rely on remote-sensing instruments to detect and identify seals, generate large volumes of thermal and color imagery. Although substantial parts of the image processing has been automated, detecting seals in thermal video and matching the detections to high-resolution color photos for identification of species and age-class requires a full-time, year-round effort by an image processing technician (contractor labor). Project leadership and additional image processing will be supported by existing operations, research and facilities (ORF) funding to the AFSC's National Marine Mammal Laboratory (NMML), Polar Ecosystems Program. Statistical modeling to produce abundance, spatial distribution, and trend estimates will also be done under existing ORF salary support for statisticians in the Polar Ecosystems Program.

Budget

Category	2015	2016	2017	2018	2019
Contract Russian Chukchi	\$525,000				
Aircraft charter		\$260,000			
NOAA AOC aircraft		\$115,000			
Contract labor for image analysis	\$90,000	\$92,250	\$9,556	\$181,920	
Travel	\$9,000	\$31,650	\$9,900		
Premium pay		\$22,320			
Shipping		\$1,800			
Supplies		\$12,500			
Total	\$624,000	\$535,520	\$19,456	\$181,920	

Budget Narrative

2015: Contract for 2016 Russian survey of western Chukchi Sea; contract labor for image analysis (ongoing from Bering Sea surveys); travel for two scientists to Russia for workshop on survey design and analysis.

2016: Aircraft charter costs for surveys of eastern Chukchi Sea; contract labor for image analysis; travel and premium pay for three scientists, 28 days; shipping of survey equipment; survey supplies (mostly storage media for large volumes of imagery). Budgets for out-years were estimated by multiplying at a 5% annual rate of increase.

2017: Contract labor for image analysis; travel for two scientists to Russia for workshop on survey analysis. The amount of funds for contract labor in 2017 is reduced because of insufficient funds in the annual LOSI budget; however, this amount is available in 2018.

2018: Contract labor for image analysis.

Project Title

Northern Bering Sea - Modeling

Goals

Develop sustainable fishing strategies for the Bering Sea and northern Bering Sea regions under LOSI future scenarios.

Modeling

The modeling component will support a research scientist specializing in multispecies stock assessment models and Management Strategy Evaluations (MSEs) that incorporate climate projections and results from ecosystem models, in order to develop sustainable fishing strategies for the Bering Sea and northern Bering Sea regions under LOSI future scenarios. The modeler will serve to connect the other three studies into a larger research effort on the economic and ecological effects of loss of sea ice. An emphasis of the modeling will be on ecosystem-level energetics, growth, and production of fish and shellfish to apply to simulated management alternatives, in coordination with AFSC stock assessment and NMFS regulatory responsibilities.

Budget

Category	2015	2016	2017	2018	2019
Labor & benefits	\$121,315	\$127,381	\$133,750	\$140,437	\$147,459
Equipment	\$5,000	\$5,150			\$5,628
Travel	\$5,000	\$5,250	\$5,513	\$5,788	\$6,078
Total	\$ 131,315	\$ 137,781	\$ 139,262	\$146,225	\$ 159,164

Budget Narrative

The funding is for a single permanent scientist (ZP-3 or ZP-4 level), to act as a modeling expert for the Bering region for multispecies and ecosystem modeling. Cost basis for this position in 2015 was \$90,264 (ZP-4) plus 28% for benefits (\$115,537). The position will start first quarter of 2015. Equipment costs cover the purchase of a required high-end modeling desktop every 3 years. An annual \$5,000 in travel funds is specified for staff travel to relevant meetings, workshops and conferences. Budgets for out-years were estimated by multiplying at a 5% annual rate of increase.

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