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# Southeast Alaska Coastal Monitoring (SECM) Survey Plan for 2015

by

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# Southeast Alaska Coastal Monitoring (SECM) Survey Plan for 2015

**Keywords:** juvenile salmon, ocean monitoring, ecology, Southeast Alaska

## ABSTRACT

This survey plan details the proposed sampling for the Southeast Coastal Monitoring (SECM) project in May, June, July, and August of 2015. A primary objective of this SECM research to study the habitat use and early marine ecology of juvenile (age-0) Pacific salmon (*Oncorhynchus* spp.) and associated epipelagic ichthyofauna in Southeast Alaska (SEAK) and in the Gulf of Alaska ecosystem. The SECM surveys have been continuous since 1997, and have provided long-term biological and oceanographic data sets associated with all five species of wild and hatchery salmon during a period of climate change. Ecosystem metrics from this SECM time series are currently used to develop pre-season forecast models for pink salmon (*O. gorbuscha*) harvest in SEAK and additionally contribute annual NOAA ecosystem consideration reports for Chinook salmon (*O. tshawytscha*), Sablefish (*Anoplopoma fimbria*), and zooplankton. The SECM project is currently supported by the Alaska Fisheries Science Center, Auke Bay Laboratories, along with supplemental funding from the Northern Fund of the Pacific Salmon Commission.

### *SECM sampling planned for 2015*

A primary objective of this SECM research to study the habitat use and early marine ecology of juvenile (age-0) Pacific salmon (*Oncorhynchus* spp.) and associated epipelagic ichthyofauna in Southeast Alaska (SEAK) and in the Gulf of Alaska (GOA) ecosystem. In 2015,

SECM research surveys are scheduled to continue at 13 core stations during four monthly intervals from late May to late August (Tables 1 and 2). These surveys will be conducted off government and chartered research vessels in the vicinities of Icy Strait and Icy Point (58° N, 135°W; 57° N, 134° W) to sample fish, zooplankton, nutrients, chlorophyll, and physical water properties using a surface trawl, plankton nets, and an oceanographic profiler (Figure 1). Continued monitoring in 2015 will extend the long-term biological and oceanographic SECM time series to 19 continuous years, covering recent periods of climate change, for all five species of both wild and hatchery Pacific salmon.

SECM researchers have collaborated with many agencies, institutions, and individuals over the project lifespan and have contributed numerous reports and publications to the scientific community (http://www.afsc.noaa.gov/ABL/EMA/EMA_SECM.htm; see selected publications section). Annual presentations on pre-season pink salmon forecasting have been given to the Purse Seine Task Force (http://www.afsc.noaa.gov/ABL/EMA/EMA_PSF.htm) since 2005, and both oral and poster presentations on topics on relevant salmon ecology topics have been delivered at professional meetings and seminars, such as both Alaska Chapter and National American Fisheries Society meetings, the Alaska Hatchery Managers Meeting, the Alaska Marine Science Symposium, the Pink and Chum Salmon Workshop, the North Pacific Anadromous Fish Commission (NPAFC) Meetings, the Salmon Ocean Ecology Meetings, the State of the Salmon international conference, and at the University of Alaska.

SECM data are reported annually in the NPAFC document series. These contributions are an important service to the fisheries research community and continue to provide data that will improve the understanding of salmon production and interactions in regional and basin-scale ecosystems. The increasing value of these time series has most recently become apparent in

stock assessments for pink salmon and Chinook salmon reported in NOAA Ecosystems Consideration Reports. For example, information on juvenile Chinook salmon ecology has been reported and applied to improve understanding of stocks in western Alaska, where the causes for disastrous run failures are unknown. Additionally, annual pink salmon harvest forecasts have been provided to the stakeholders of SEAK commercial fishery for over a decade, which has a tremendous economic benefit to the region that can reach $125 M annually.

***Historical SECM sampling 1997–2014***

Historically, some aspects of the SECM project have varied to accommodate new research objectives or process studies designed to examine specific questions. From 1997 to 2000, SECM research was directed at sampling juvenile salmon and their associated biophysical parameters in inshore, strait, and coastal habitats along a primary seaward migration corridor in the northern region of SEAK. Up to 24 stations spanning 250 km were sampled five times annually, from May to early October. These habitats extended geographically from inshore localities near large glacial rivers to 65 km offshore in the GOA. Fish were sampled during the daytime with a NORDIC 264 surface rope trawl from the National Oceanic and Atmospheric Administration (NOAA) Ship *John N. Cobb*. The biophysical data collected included vertical profile data on water temperature and salinity, surface nutrients and chlorophyll, zooplankton from vertical 20-m hauls and double oblique hauls deployed to 200 m depth, and onboard stomach analysis of potential predators of juvenile salmon. A laboratory process study of juvenile sablefish predation impact on juvenile salmon was initiated in response to unusual field observations in 1999. After four years of sampling, the inshore sampling stations and the Cross

Sound transect were eliminated because juvenile salmon trawl catches were consistently low in these habitats during the sampling months.

In 2001–2004, SECM researchers continued biophysical sampling at 13 core stations and directed more research effort into process studies. Two such studies initiated in 2001 included diel feeding periodicity and prey fields of juvenile pink, chum, and coho salmon, and onboard gastric evacuation rate experiments for juvenile pink and chum salmon. These process studies were designed to increase our understanding of trophic linkages and provide more specific input parameters for use in bioenergetics models to evaluate coastal marine carrying capacity and salmon habitat quality (growth potential). Beginning in 2002, the late September sampling was eliminated because juvenile salmon abundances had been consistently low for this monthly interval, and consequently, sampling time intervals were extended in earlier months to maximize the opportunities for obtaining data at offshore stations and to replicate trawling at the core stations. In 2003, sampling frequency at the 13 core stations was increased from four to six time intervals between mid-May and late August, to gain better temporal resolution of biophysical factors related to salmon growth and abundance. Two process studies were conducted in this year, one on sea lice infestation of juvenile salmon at sea and another on energetics of starved juvenile chum salmon brought into the laboratory from trawl catches during field surveys. Additionally, in 2003 and 2004, concurrent sampling with a second, smaller mesh, trawl was conducted in two time intervals to examine spatial distribution and to compare size-selectivity of two trawl types for juvenile salmon. Also in 2004, the SECM trawl sampling effort returned to one of the inshore habitats to collaborate with a Taku Inlet study on hatchery- and wild-stock interactions of juvenile chum salmon.

From 2005 to 2009, SECM research expanded to include a second sampling region in southern Southeast Alaska. The established sampling scheme of 13 core stations was maintained in the northern region from late May to late August, and eight stations in Clarence Strait were also sampled in late June and late July. The 2008 scheduled sampling in Clarence Strait was not accomplished because of a fatal vessel breakdown of the *John N. Cobb*. In 2009, sampling was resumed in the southern region; however, vessel charter contract logistics only allowed sampling to occur in July in this region. Future efforts are not planned for the southern region, but the four years of comparative sampling of juvenile salmon and associated biophysical parameters will be used to broaden basic understanding of the trophic relationships and ecological interactions of wild and hatchery juvenile salmon and associated fishes in different marine environments. In 2007, inter-vessel calibrations were conducted to compare catch-per-unit-effort (CPUE) for juvenile salmon between the *John N. Cobb* and the RV *Medeia*. Calibrations were also done between the *Medeia* and a charter vessel (FV *Steller*) in 2008 and between the *Medeia* and another charter vessel (FV *Chellissa*) in 2009.

From 2010 to 2014, the northern region of Southeast Alaska was sampled monthly from late May to late August with an ABL vessel (May only) and the charter vessel FV *Northwest Explorer*. These surveys included sampling at the Icy Point stations in June, July, and August to complement the Gulf of Alaska Integrated Ecosystem Research Program (GOA-IERP).

***Support and rationale for SECM research***

In addition to internal NOAA support, the SECM project has been partially supported over the years with funding through the Global Ocean Ecosystem Dynamics (GLOBEC) program, a Pacific Salmon Commission endowment (the Northern Fund, NF), and NOAA's

Pacific Coastal Salmon Recovery Fund (Alaska Sustainable Salmon Fund, AKSSF). The SECM research project addresses several goals and objectives identified by the NOAA Science Plan of the AFSC, the NPAFC, and the North Pacific Research Board (NPRB) (GOA-IERP).

The mission of NOAA's current next generation Strategic Plan involves three objectives: to understand and predict changes in climate, weather, oceans, and coasts; to share that knowledge and information with others; and to conserve and manage coastal and marine ecosystems and resources. NOAA's current vision is to have healthy ecosystems, communities, and economies that are resilient in the face of this change that is expected to impact fisheries production. SECM research emphasizes long-term monitoring of coastal marine habitats used by juvenile salmon and associated epipelagic fishes, to understand how environmental variation affects the sustainability of these marine resources in an ecological context. SECM research provides valuable time series data specific to salmon and other marine species to monitor long-term ecosystem changes and also provides salmon forecasting data to ensure that regional fisheries are sustained through an ecosystem approach to management. One of the focus areas for planning in NOAA's Annual Guidance Memorandum (FY 2012-2020) is to "Enhance research and modeling to advance NOAA's mission" and includes to "continually improve our environmental modeling capabilities, focusing on regional climate, high impact weather, and ecological forecasting". SECM research project has provided pre-season salmon forecasting information to regional stakeholders of Southeast Alaska fishing communities for the past eleven years, thus helping to sustain regional fisheries with science-based ecological forecasts.

The AFSC Science Plan addresses three main research themes: (1) Monitor and assess fish, crab, and marine mammal populations, fisheries, marine ecosystems, and associated communities that rely on these resources; (2) Understand and forecast effects of climate change

on marine resources; and (3) Describe and evaluate the role of habitats in supporting healthy marine ecosystems and populations of fish, crab, and marine mammals. The SECM long-term time series dataset is ideally suited to provide information addressing each of these themes.

The NPAFC 2011–2015 Science Plan identifies the study of juvenile anadromous salmon stocks in ocean ecosystems as an important component. This Science Plan has a primary goal to explain and forecast the annual variation in Pacific salmon production, an overarching theme of "Forecast of Pacific salmon production in the ocean ecosystems under changing climate", and five primary research topics: 1) Migration and survival mechanisms of juvenile salmon in the ocean ecosystems; 2) Climate impacts on Pacific salmon production in the Bering Sea (BASIS) and adjacent waters; 3) Winter survival of Pacific salmon in the North Pacific ocean ecosystems; 4) Biological monitoring of key salmon populations; and 5) Development and applications of stock identification methods and models for management of Pacific salmon. SECM research is aligned with both the goal and themes of the NPAFC Science Plan, and specifically addresses research topics 1 and 4 related to the understanding of migration and survival mechanisms of salmon juveniles and biological monitoring of key salmon populations.

Table 1.—Localities and coordinates of stations scheduled for monthly sampling by the Southeast Alaska Coastal Monitoring (SECM) project in marine waters of the northern region of Southeast Alaska in May, June, July, and August of 2015. No sampling is scheduled at the Icy Point stations in May.

| Locality | Station | Latitude | Longitude | Offshore distance (km) | Bottom depth (m) |
|---|---|---|---|---|---|
| Auke Bay Monitor | ABM | 58°22.00'N | 134°40.00'W | 1.5 | 60 |
| Upper Chatham Strait | UCA | 58°04.57'N | 135°00.08'W | 3.2 | 400 |
| Upper Chatham Strait | UCB | 58°06.22'N | 135°00.91'W | 6.4 | 100 |
| Upper Chatham Strait | UCC | 58°07.95'N | 135°04.00'W | 6.4 | 100 |
| Upper Chatham Strait | UCD | 58°09.64'N | 135°02.52'W | 3.2 | 200 |
| Icy Strait | ISA | 58°13.25'N | 135°31.76'W | 3.2 | 128 |
| Icy Strait | ISB | 58°14.22'N | 135°29.26'W | 6.4 | 200 |
| Icy Strait | ISC | 58°15.28'N | 135°26.65'W | 6.4 | 200 |
| Icy Strait | ISD | 58°16.38'N | 135°23.98'W | 3.2 | 234 |
| Icy Point | IPA | 58°20.12'N | 137°07.16'W | 6.9 | 160 |
| Icy Point | IPB | 58°12.71'N | 137°16.96'W | 23.4 | 130 |
| Icy Point | IPC | 58°05.28'N | 137°26.75'W | 40.2 | 150 |
| Icy Point | IPD | 57°53.50'N | 137°42.60'W | 65.0 | 1,300 |

Table 2.—Monthly Southeast Alaska Coastal Monitoring (SECM) project research surveys and vessels (laboratory and chartered) scheduled in marine waters of the northern region of Southeast Alaska in May, June, July, and August of 2015.

| Vessel, survey # | On or about (days) | Research focus | Sampling conducted |
|---|---|---|---|
| *RV Sashin*<br>SA–15–01 | 20-22 May<br>(3 days) | Oceanography | CTD, chlorophyll and nutrients, zooplankton<br>9 core stations in Icy/Chatham Straits and Auke Bay |
| *FV Northwest Explorer*<br>NW-15-02 | 27 June–04 July<br>(8 days) | Oceanography<br>Fish survey (trawl) | CTD, chlorophyll and nutrients, zooplankton, fish<br>9 core stations and 4 stations in Icy Point |
| *FV Northwest Explorer*<br>NW–15–03 | 27 July–03 August<br>(8 days) | Oceanography<br>Fish survey (trawl) | CTD, chlorophyll and nutrients, zooplankton, fish<br>9 core stations and 4 stations in Icy Point |
| *FV Northwest Explorer*<br>NW–15–04 | 27 August–03 Sept.<br>(8 days) | Oceanography<br>Fish survey (trawl) | CTD, chlorophyll and nutrients, zooplankton, fish<br>9 core stations and 4 stations in Icy Point |

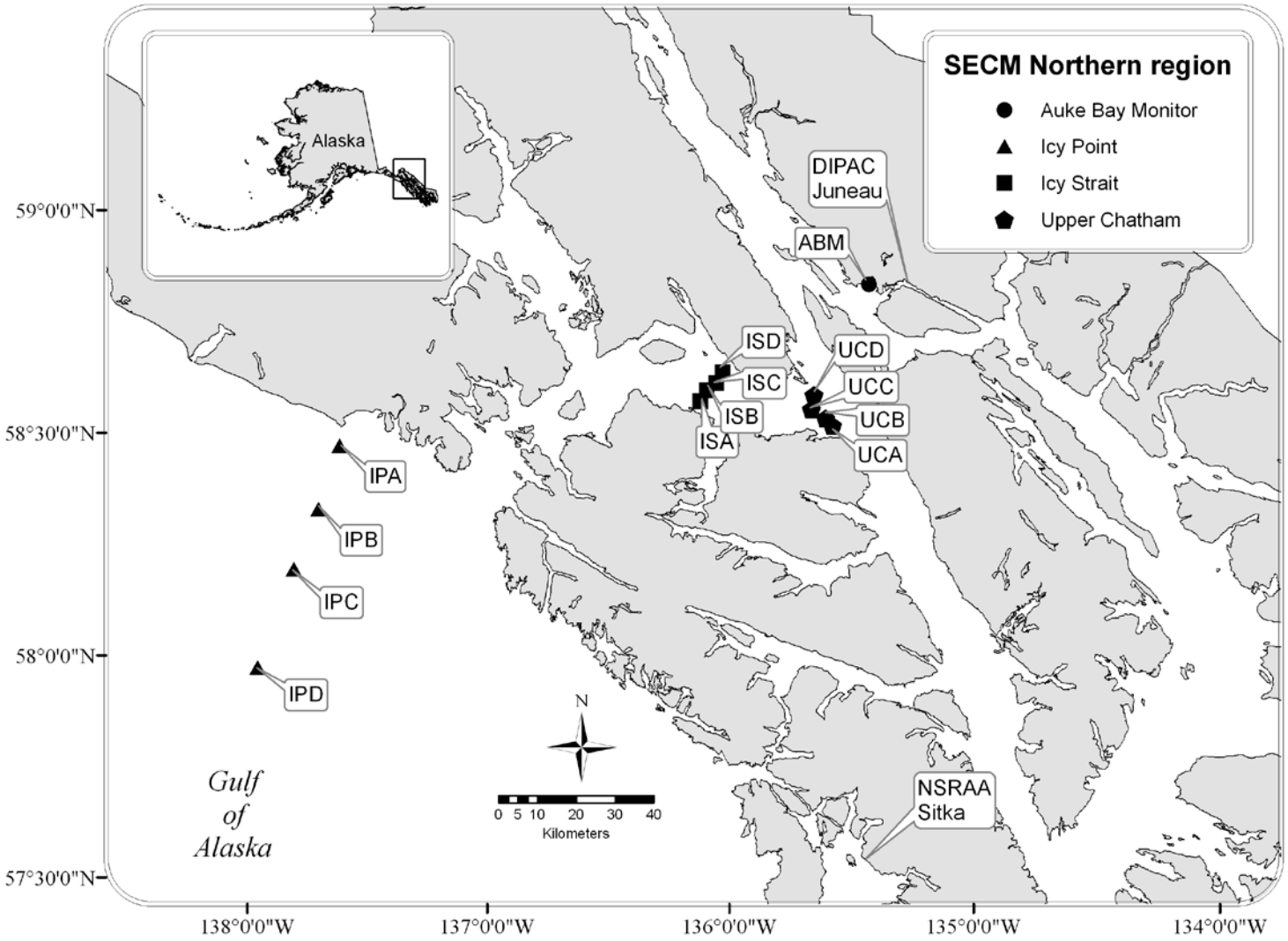


Figure 1.—Stations scheduled for monthly sampling by the Southeast Alaska Coastal Monitoring (SECM) project in marine waters of the northern region of Southeast Alaska in May (no Icy Point stations[IPA, IPB, IPC, IPD]), June, July, and August of 2015.

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