

## **Southeast Alaska Coastal Monitoring (SECM) Survey Plan for 2011**

by

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## **Southeast Alaska Coastal Monitoring (SECM) Survey Plan for 2011**

### ***SECM sampling planned for 2011***

The Southeast Coastal Monitoring (SECM) project was initiated in 1997 by the Alaska Fisheries Science Center, Auke Bay Laboratories, to study the habitat use and early marine ecology of juvenile (age-0) Pacific salmon (*Oncorhynchus* spp.) and associated epipelagic ichthyofauna in Southeast Alaska. SECM surveys are conducted off government and chartered research vessels in the vicinity of Icy Strait (58° N, 135°W) and sample fish, zooplankton, nutrients/chlorophyll, and physical water properties using a surface trawl, plankton nets, and an oceanographic profiler. In 2011 SECM research surveys are scheduled to continue at 13 core stations in Icy Strait during four monthly intervals from late May to late August and also at four stations in the Gulf of Alaska (Figure 1, Tables 1 and 2). This 2011 SECM survey plan reflects what was accomplished at the inception of the project in 1997, and this additional survey year will extend the biophysical time series to 15 years.

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/MSI/msi\\_secm.htm](http://www.afsc.noaa.gov/ABL/MSI/msi_secm.htm), and see selected publications section). Annual presentations on pink salmon forecasting have been given to the Purse Seine Task Force, ([http://www.afsc.noaa.gov/ABL/MSI/msi\\_sae\\_psf.htm](http://www.afsc.noaa.gov/ABL/MSI/msi_sae_psf.htm)) since 2005, and both oral and poster presentations on topics in salmon ecology are made at professional meetings and seminars, such as the Pink and Chum Salmon Workshop, Salmon Ocean Ecology Meeting, American Fisheries Society Alaska Chapter and national meetings, Alaska Hatchery Managers Meeting, North Pacific Anadromous Fish Commission (NPAFC) Meeting, Alaska Marine

Science Symposium, State of the Salmon international conference, and at local schools and universities. A complete SECM data summary is reported annually to NPAFC in their document series lagged by one year. These contributions are an important service and continue to provide data that will improve understanding of the role of salmon in regional and basin scale ecosystems.

### ***Historical SECM sampling 1997–2010***

Historically, some aspects of the SECM project have been conducted differently to accommodate new research objectives or process studies. 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 Southeast Alaska. Up to 24 stations spanning 250 km were sampled five times annually, from May to October. These habitats extended geographically from inshore localities near large glacial rivers to 65 km offshore in the Gulf of Alaska. Fish were sampled during the daytime with a NORDIC 264 surface rope trawl from the 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 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.

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 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, sampling was curtailed in late September because juvenile salmon abundances had been consistently low, 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 this year, one on sea lice infestation on juvenile salmon at sea and another on juvenile chum salmon starvation energetics of trawl caught fish in the laboratory. Additionally, in 2003 and 2004, concurrent sampling with a second, smaller mesh, trawl was conducted in two intervals to examine spatial distribution and to compare size-selectivity of the two trawl types for juvenile salmon. Also in 2004, the SECM sampling effort returned to inshore habitat 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. In 2005-2007, sampling was also conducted in the southern region in Clarence Strait at eight stations in late June and late July. In 2008,

however, 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 problems 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.

In 2010, the northern region was sampled monthly from late May to late August with the charter vessel (FV *Northwest Explorer*). These surveys also included sampling at the Icy Point stations in July and August to complement the emerging GOA-IRP project. No inter-vessel calibration of CPUE was done in 2010; however, it is likely that the *Northwest Explorer* will be chartered again in 2011 if a second year contract option is exercised.

### ***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, and through a Pacific Salmon Commission endowment: the Northern Fund (NF); and NOAA's Pacific Coastal Salmon Recovery Fund that in Alaska is referred to as the Alaska Sustainable Salmon Fund (AKSSF). The SECM research project addresses several goals and

objectives identified by the National Oceanic and Atmospheric Administration (NOAA), the Science Plan of the Alaska Fisheries Science Center, NPAFC, and the North Pacific Research Board (NPRB) Gulf of Alaska Integrated Ecosystem Research Program (GOA-IERP).

NOAA currently has two strategic plans in place: the 2006–2011 NOAA Fisheries Strategic Plan and the Next Generation Strategic Plan. A primary goal of the 2006–2011 NOAA Fisheries Strategic Plan is to “Protect, Restore, and Manage the Use of Coastal and Ocean Resources through an Ecosystem Approach to Management”. SECM research addresses the five fundamental activities identified under this goal, which include: 1) *monitor and observe* the land, sea, atmosphere; 2) *understand and describe* how natural systems work together; 3) *assess and predict* the changes in natural systems; 4) *engage, advise, and inform* individuals, partners, communities, and industries; and 5) *manage* coastal and ocean resources. 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. NOAA’s Next Generation Strategic Plan identifies four long term goals, and two of these goals are specifically addressed by SECM research: “Healthy Oceans” and “Resilient Coast Communities and Economies”. For the former goal, “Marine fisheries, habitats, and biodiversity are sustained within healthily and productive ecosystems”, and for the latter goal, “Coastal and Great Lakes communities are environmentally and economically sustainable”. 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.

The Science Plan for the Alaska Fisheries Science Center 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 assess the role of habitats in supporting healthy marine ecosystems and populations of fish, crab, and marine mammals. The long-term time series of SECM observations is ideally suited to provide important datasets 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 “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 juveniles and biological monitoring of key salmon populations.

Several important components of the NPRB’s GOA-IERP project are addressed by SECM research. These GOA-IERP components include: 1) time series collections of biophysical processes that may provide insight into periodic large-scale regime shifts; 2) carrying capacity

and ecological implications of large numbers of hatchery salmon from North America and Asia manifested on forage species in the GOA food web; and 3) input from biological observations including food web shifts of commercially important fish under varying climatic conditions for developing models to forecast annual run strength.

The GLOBEC program focuses on both region and basin-scale studies: the region-scale ecosystem studies compare how variations in ocean climate affect species dominance and fish populations in the coastal margins of the Pacific Rim, whereas the basin-scale components address how plankton productivity and the carrying capacity for high-trophic level, pelagic piscivores in the North Pacific Ocean respond to climate variations. SECM research addresses the region-scale component of the GLOBEC program by: 1) collecting biological data on juvenile Pacific salmon and ecologically-related fish species from surface rope trawl samples; 2) monitoring physical and biological oceanographic indices at sampling stations in marine habitats; and 3) conducting process studies focusing on bioenergetics, prey fields, and trophic relationships of juvenile salmon and associated fishes.



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 2011. The only exception will be that the Icy Point stations will not be sampled in the month of 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	1300

Table 2.—Monthly Southeast Alaska Coastal Monitoring (SECM) project research surveys scheduled in marine waters of the northern region of Southeast Alaska in May, June, July, and August of 2011.

Vessel, survey #	On or about (days)	Research focus	Sampling conducted
<i>R/V Quest</i> QT-11-01	23-25 May (3 days)	Oceanography	CTD, chlorophyll and nutrients, zooplankton 9 core stations in Icy/Chatham Straits and Auke Bay
<i>F/V Northwest Explorer</i> NE-11-02	23 June–30 June (8 days)	Oceanography Fish survey (trawl)	CTD, chlorophyll and nutrients, zooplankton, fish 9 core stations and 4 stations in Icy Point
6 <i>F/V Northwest Explorer</i> NE-11-03	23 July–30 July (8 days)	Oceanography Fish survey (trawl)	CTD, chlorophyll and nutrients, zooplankton, fish 9 core stations and 4 stations in Icy Point
<i>F/V Northwest Explorer</i> NE-11-04	23–30 August (8 days)	Oceanography Fish survey (trawl)	CTD, chlorophyll and nutrients, zooplankton, fish 9 core stations and 4 stations in Icy Point

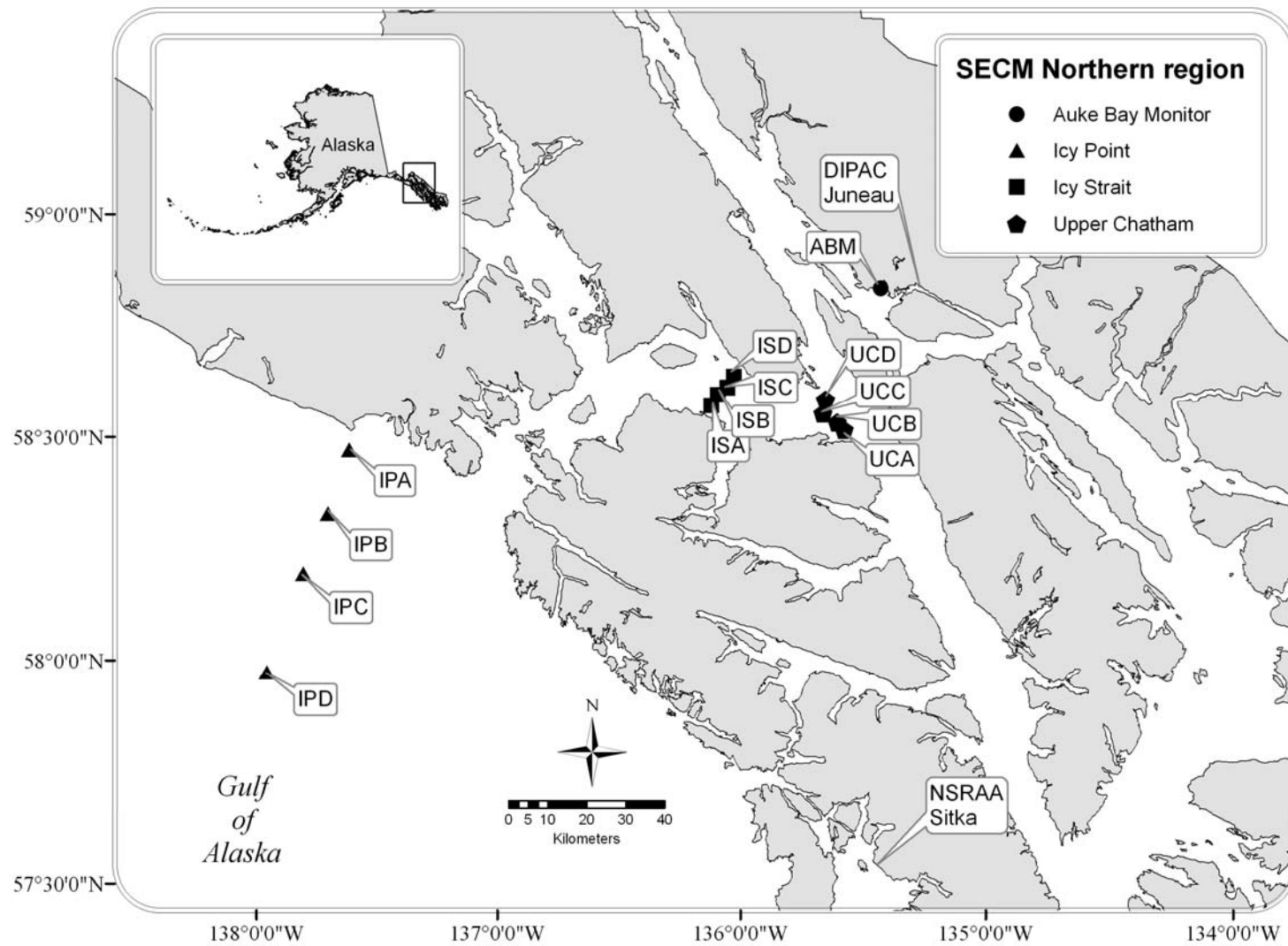


Figure 1.—Stations scheduled for monthly sampling by the Southeast Alaska Coastal Monitoring (SECM) project in marine waters of the northern region of Southeast Alaska in May, June, July, and August of 2011.

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