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Southeast Alaska Coastal Monitoring (SECM) Survey Plan for 2012

by

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Southeast Alaska Coastal Monitoring (SECM) Survey Plan for 2012

SECM sampling planned for 2012

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 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. In 2012, SECM research surveys are scheduled to continue at 13 core stations during four monthly intervals from late May to late August (Figure 1, Tables 1 and 2). This 2012 SECM survey plan reflects accomplishments since the inception of the project in 1997, and outlines how this additional survey year will extend the biophysical time series to 16 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; see also 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) 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 summary of SECM data for the prior year is reported annually to NPAFC in its document series. These contributions are an important service to the fisheries community and continue to provide data that will improve understanding of the role of salmon in regional and basin-scale ecosystems.

Historical SECM sampling 1997–2011

Historically, some aspects of the SECM project have varied to accommodate new research objectives or process studies 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 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 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.

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 (monthly?) 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 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 and 2011, 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 June, July, and August to complement the emerging GOA-IRP project.

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 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 NOAA Science Plan of the Alaska Fisheries Science Center, the NPAFC, and

the North Pacific Research Board (NPRB) Gulf of Alaska Integrated Ecosystem Research Program (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 change. 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.

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 evaluate 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 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 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 U.S. GLOBEC Northeast Pacific program focuses on studying "the effects of past and present climate variability on the population ecology and population dynamics of marine biota and living marine resources, and to use this information as a proxy for how the ecosystems of the eastern North Pacific may respond to future global climate change," and also "…the biophysical mechanisms through which zooplankton and salmon populations respond to physical forcing and biological interactions in the coastal regions…." 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 2012. No sampling is scheduled at the Icy Point station 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	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 2012.

Vessel, survey #	On or about (days)	Research focus	Sampling conducted
F/V Charter Vessel CV–12–01	23-25 May (3 days)	Oceanography	CTD, chlorophyll and nutrients, zooplankton 9 core stations in Icy/Chatham Straits and Auke Bay
R/V Charter Vessel CV–12–02	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
R/V Charter Vessel CV–12–03	25 July–01 August (8 days)	Oceanography Fish survey (trawl)	CTD, chlorophyll and nutrients, zooplankton, fish 9 core stations and 4 stations in Icy Point
R/V Charter Vessel CV–12–04	29 August–04 Sept. (8 days)	Oceanography Fish survey (trawl)	CTD, chlorophyll and nutrients, zooplankton, fish 9 core stations and 4 stations in Icy Point

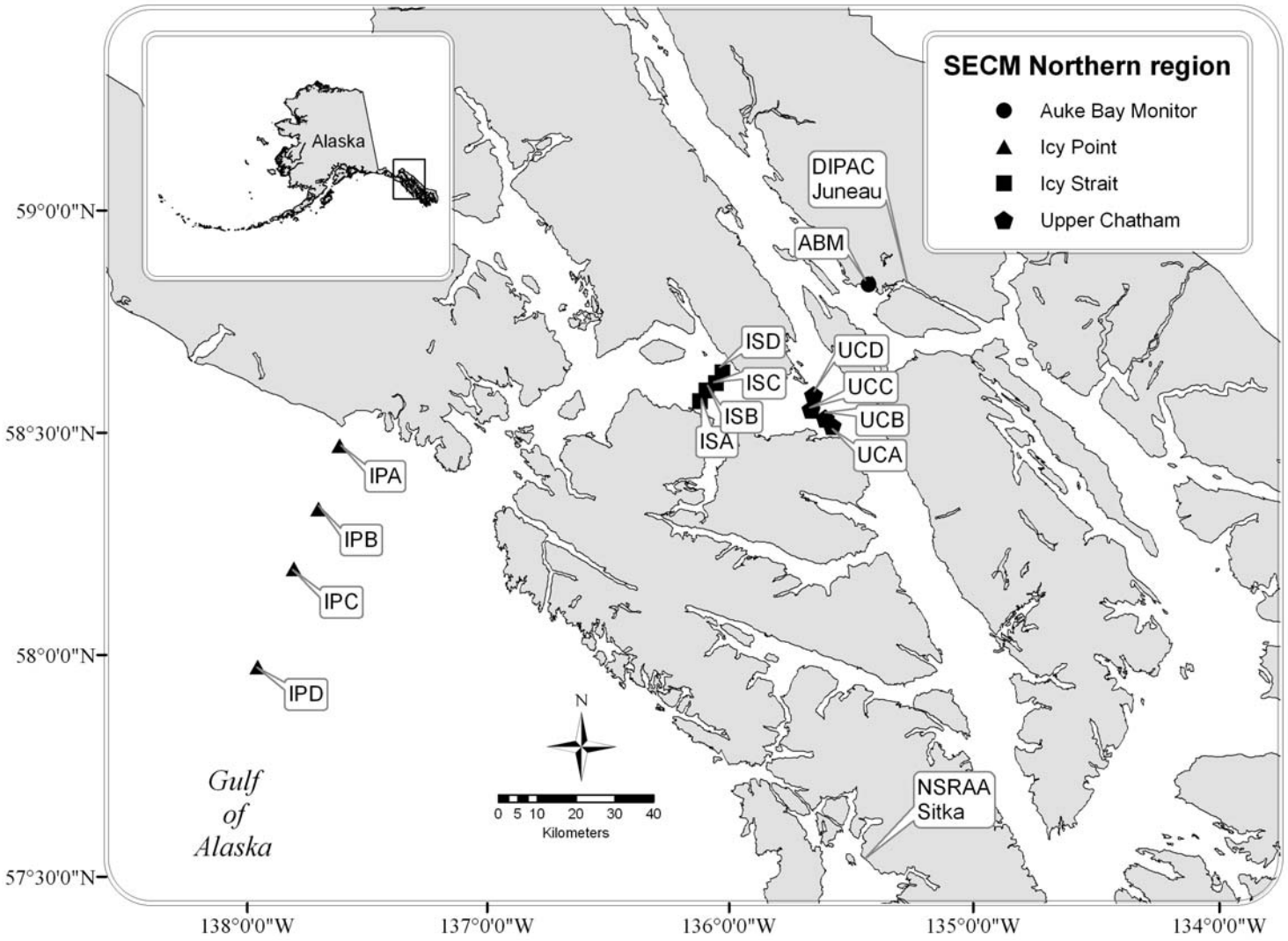

Figure 1.—Stations scheduled for monthly sampling by the Southeast Alaska Coastal Monitoring (SECM) project in marine waters of the northern region of Southeast Alaska in May, June, July, and August of 2012.

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