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Southeast Alaska Coastal Monitoring (SECM) Survey Plan for 2009

by

Joseph A. Orsi, Molly V. Sturdevant, Emily A. Fergusson,
Alex C. Wertheimer, Bruce L. Wing, and William R. Heard

Auke Bay Laboratories
Alaska Fisheries Science Center, NMFS,
NOAA Fisheries, U.S. Department of Commerce,
Ted Stevens Marine Research Institute
17109 Point Lena Loop Road
Juneau, AK 99801 USA

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Southeast Alaska Coastal Monitoring (SECM) Survey Plan for 2009

Rationale for SECM research

The Southeast Alaska Coastal Monitoring (SECM) project was initiated in 1997 by the Auke Bay Laboratory, National Marine Fisheries Service, to study the habitat use and early marine ecology of juvenile (age-0) Pacific salmon (*Oncorhynchus* spp.) and associated epipelagic ichthyofauna. This research has been conducted to meet several needs identified in the National Oceanic and Atmospheric Administration (NOAA) Fisheries 2006–2011 Strategic Plan, the North Pacific Anadromous Fisheries Commission (NPAFC) 2006–2010 Science Plan, the Gulf of Alaska Global Ocean Ecosystem Dynamics (GLOBEC) Program, and the North Pacific Research Board (NPRB) Gulf of Alaska Integrated Ecosystem Research Program (GOA-IERP). Research support has been received through funding from GLOBEC and two endowments through the Pacific Salmon Commission, the Northern Fund (NF) and the Alaska Sustainable Salmon Fund (AKSSF).

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.

The study of juvenile anadromous stocks of salmon in ocean ecosystems is also an important component of the NPAFC 2006–2010 Science Plan. This component of the Science Plan recommends studies directed at understanding: 1) seasonal distribution and migration route/timing of juvenile salmon; 2) hydrological characteristics, primary production, and prey resources in the habitats utilized; 3) trophic linkages, growth rates, and predation rates of juvenile salmon; and 4) population size, survival rates and survival mechanisms of juvenile salmon. SECM research focuses on each of element of this component. In particular, SECM examines the relationships among habitat use, marine growth, hatchery and wild stock interactions, year-class strength, and ocean carrying capacity of key juvenile salmon stocks in the Eastern Pacific rim.

Research under the GLOBEC program incorporates both basin-scale and regional-scale studies. 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, while the regional-scale ecosystem studies compare how variations in ocean climate affect species dominance and fish populations in the coastal margins of the Pacific Rim. SECM research addresses the regional-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.

SECM research also addresses several important components of NPRB's GOA-IERP, including: 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.

Historical SECM sampling 1997–2008

Historically, SECM monitoring has been conducted in different phases to incorporate changes in the research focus. 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 to be used with bioenergetic models to evaluate coastal marine carrying capacity and salmon habitat quality (growth potential). Beginning in 2002, sampling was curtailed after late August because low juvenile salmon abundances had been consistently documented for September; 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. 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 2003, sea lice infestation on juvenile salmon was recorded and a laboratory process study on juvenile chum salmon starvation energetics was conducted. In 2004, the SECM sampling effort returned to inshore habitat to collaborate with a Taku Inlet chum salmon study funded under the AKSSF. This study examined hatchery- and wild-stock interactions of juvenile chum salmon in littoral habitats during out-migration through the Taku River estuary, while SECM sampled concurrently in neritic habitats in the vicinity of Taku Inlet and seaward.

From 2005 to 2008, SECM research expanded to include a second sampling region in southern Southeast Alaska. Continuing the established sampling schemes in the northern region, up to 13 core stations were sampled during four monthly intervals 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. Future efforts are intended to again include the southern region, where the three years of comparative sampling provided information on juvenile salmon and associated biophysical parameters between regions to broaden basic understanding of the trophic relationships and ecological interactions of wild and hatchery juvenile salmon and associated fishes in different marine environments. This expanded project, funded in part by the PSC Northern Fund, has four specific objectives: 1) forecasting pink salmon abundance in Southeast Alaska from juvenile salmon catches and associated biophysical parameters, 2) estimating daily prey consumption rates of juvenile pink salmon with a bioenergetics model to determine the proportion of zooplankton standing crop consumed, 3) comparing total prey consumption of juvenile pink salmon to total prey consumption of wild and hatchery juvenile chum salmon in northern and southern regions of Southeast Alaska, and 4) evaluating regional concordance in relative abundance and growth of juvenile pink and chum salmon in the northern and southern regions of Southeast Alaska. While no new process studies were undertaken during these years, inter-vessel calibrations between the NOAA vessel *John N. Cobb* and the RV *Medeia* in 2007, and between the *Medeia* and a charter vessel (FV *Steller*) in 2008, were conducted to compare catch-per-unit-effort (CPUE) for juvenile salmon.

Planned SECM sampling in 2009

In 2009, SECM research is scheduled to be conducted in the northern region at up to 13 core stations during four intervals from late May to late August (Figure 1, Tables 1 and 2), and in the southern region at eight stations in late June and late July (Figure 1). This sampling schedule is similar to what was done in 2005, 2006, and 2007. One additional component in July will involve another inter-vessel calibration of CPUE with the RV *Medeia.* The charter vessel to be compared with the RV *Medeia* for this operation remains to be determined. Charter vessels will be used to replace the historical services of the NOAA ship *John N. Cobb,* decommissioned in 2008, until a permanent replacement vessel is available. Thus, the vessel calibration effort is necessary to maintain the comparability between historical and future data collections and to account for differences in CPUE between vessels.

SECM has collaborated with many agencies, institutions, and individuals over its lifespan and has contributed numerous reports and publications to the scientific community (http://www.afsc.noaa.gov/ABL/MSI/msi_secm.htm, see also section on selected publications). Annual presentations on pink salmon forecasting are made to the Purse Seine Task Force, (http://www.afsc.noaa.gov/ABL/MSI/msi_sae_psf.htm) and both oral and poster presentations on topics in salmon ecology are made at professional meetings and seminars, including the Pink and Chum Salmon Workshop, Salmon Ocean Ecology meeting, American Fisheries Society, Hatchery Managers Meeting, NPAFC, Alaska Marine Science Symposium, and local schools and universities. A complete data summary is reported annually to the North Pacific Anadromous Fish Commission as an NPAFC document (lagged one year). These contributions are an important service and continue to provide data that will improve understanding the role of salmon in local and regional ecological processes.

Table 1.—Localities and coordinates of stations in Southeast Alaska scheduled for monthly sampling in marine waters of the northern region (22–26 May, 20 June–03 July, 19 July–01 August, 20–24 August) and the southern region (20 June–03 July, 19 July–01 August) in 2009.

Locality	Station	Latitude	Longitude	Offshore distance (km)	Bottom depth (m)
		Northern region			
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
		Southern region			
Middle Clarence Strait	MCA	55°23.51'N	131°55.49'W	3.2	346
Middle Clarence Strait	MCB	55°24.26'N	131°58.23'W	6.4	439
Middle Clarence Strait	MCC	55°25.06'N	132°01.19'W	6.4	412
Middle Clarence Strait	MCD	55°25.79'N	132°03.93'W	3.2	461
Lower Clarence Strait	LCA	55°06.93'N	131°56.79'W	3.2	315
Lower Clarence Strait	LCB	55°07.14'N	131°53.79'W	6.4	466
Lower Clarence Strait	LCC	55°07.32'N	131°51.09'W	6.4	459
Lower Clarence Strait	LCD	55°07.53'N	131°48.09'W	3.2	413

Table 2.—Southeast Alaska Coastal Monitoring (SECM) research surveys scheduled in Southeast Alaska, May–August 2009.

Vessel survey #	Period (days)	Research focus	Sampling conducted
Charter vessel CV–09–01	22–26 May (5 days)	Oceanography	CTD, chlorophyll and nutrients, zooplankton All 13 core NSEAK stations
Charter vessel CV–09–02	20 June–03 July (14 days)	Oceanography Fish survey (trawl) Regional comparisons	CTD, chlorophyll and nutrients, zooplankton, fish 9 core NSEAK stations and 8 core SSEAK stations
Charter vessel CV–09–03	19 July–01 August (14 days)	Oceanography Fish survey (trawl) Regional comparisons	CTD, chlorophyll and nutrients, zooplankton, fish 9 core NSEAK stations and 8 core SSEAK stations Inter-vessel calibration with *Medeia*
Medeia CV–09–03	26 July–01 August (7 days)	Fish survey (trawl)	Inter-vessel calibration with *charter vessel*
Charter vessel CV–09–04	20–24 August (5 days)	Oceanography Fish survey (trawl)	CTD, chlorophyll and nutrients, zooplankton, fish 9 core NSEAK stations

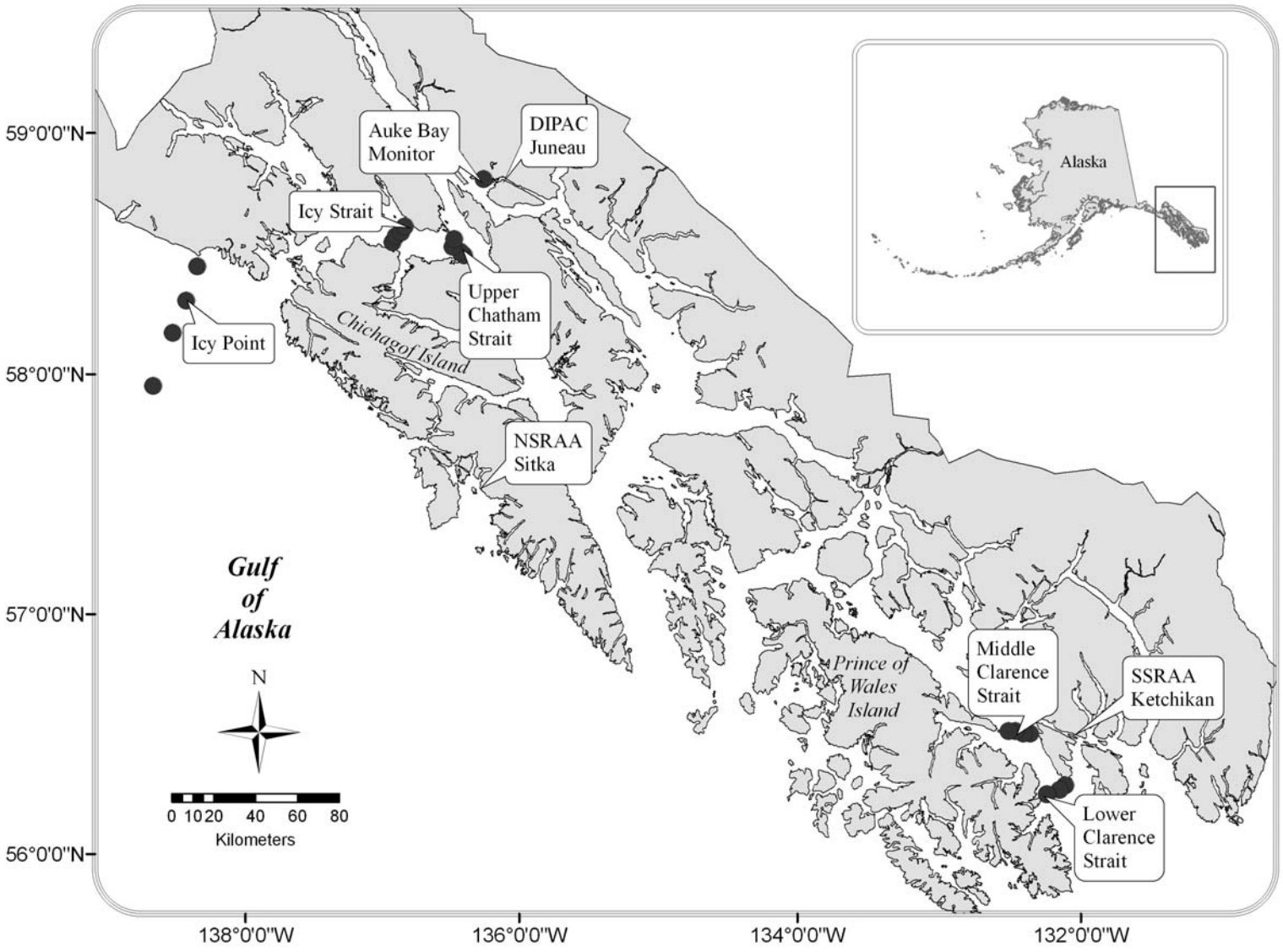

Figure 1.—Stations scheduled to be sampled monthly in marine waters of the northern and southern regions of Southeast Alaska, May–August, 2009.

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