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Southeast Alaska Coastal Monitoring (SECM) Cruise Plan for 2007

by

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Rationale for SECM research

The Southeast Alaska Coastal Monitoring (SECM) project in Alaska 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).

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: *monitor and observe* the land, sea, atmosphere..., *understand and describe* how natural systems work together..., *assess and predict* the changes in natural systems..., *engage, advise, and inform* individuals, partners, communities, and industries..., and *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 an important component of the NPAFC 2006–2010 Science Plan. This component recommends studies

directed at understanding: seasonal distribution and migration route/timing of juvenile salmon; hydrological characteristics, primary production, and prey resources in the habitats; trophic linkages, growth rates, and predation rates of juvenile salmon; and population size, survival rates and survival mechanisms of juvenile salmon. SECM research focuses on each of these elements 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 basin-scale studies to determine how plankton productivity and the carrying capacity for high-trophic level, pelagic carnivores in the North Pacific Ocean change in response to climate variations, and incorporates regional-scale ecosystem studies to 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 American and Asia on forage species manifested in the GOA food web, and 3) input from biological observations including food web perturbations of

commercially important fish under varying climatic conditions for developing models to forecast annual run strength.

Historical SECM sampling 1997–2006

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 diurnally 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.

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 will enable more accurate 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 consistently low juvenile salmon abundances had been documented for September; sampling time intervals were increased 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, concurrent inshore sampling was added in two periods using a second trawl gear type to examine inshore spatial distribution and to compare size-selectivity of the two trawl types for juvenile salmon. Sea lice infestation on juvenile salmon was also recorded. In 2004, the SECM sampling effort expanded inshore to support collaboration with a Taku Inlet Chum Salmon Study funded under the Southeast Sustainable Salmon Fund. This study is examining hatchery- and wild-stock interactions of juvenile chum salmon out migrating through the Taku River estuary. The Taku Inlet Chum Salmon Study sampled littoral habitats, while SECM sampling focused on coincident sampling in neritic habitats in the vicinity of Taku Inlet and seaward.

In 2005 and 2006, SECM sampled up to 13 core stations during four intervals from late May to late August, and extended sampling in June and July into Clarence Strait in the southern region of southeastern Alaska. Sampling in this new region provided additional information on juvenile salmon and associated biophysical parameters in both marine environments to broaden basic understanding of the trophic relationships and ecological interactions of wild and hatchery juvenile salmon and associated fishes. This expanded project, funded in part by the Northern Fund of the Pacific Salmon Commission (PSC), has four specific objectives: 1) forecasting pink salmon abundance in southeastern 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 southeastern Alaska, and 4)

evaluating regional concordance in relative abundance and growth of juvenile pink and chum salmon in northern and southern regions of southeastern Alaska.

Planned SECM sampling in 2007

In 2007, SECM research is scheduled to be conducted at four intervals from late May to late August at up to 13 core stations in the northern region (Figure 1, Tables 1 and 2), and at eight stations in the southern region in June and July (Figure 2). This sampling schedule is similar to what was done in 2005 and 2006. One additional component will involve an inter vessel calibration of CPUE with the NOAA ship John N. Cobb and the RV *Medeia* in July.

Table 1.—Localities and coordinates of stations scheduled for sampling monthly in marine waters of the northern region (22–26 May, 20 June–03 July, 09 July–01 August, 20–24 August) and in the southern region (20 June–03 July, 19 July–01 August) of southeastern Alaska in 2007.

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°23.505'N	131°55.492'W	3.2	346
Middle Clarence Strait	MCB	55°24.255'N	131°58.228'W	6.4	439
Middle Clarence Strait	MCC	55°25.061'N	132°01.194'W	6.4	412
Middle Clarence Strait	MCD	55°25.792'N	132°03.930'W	3.2	461
Lower Clarence Strait	LCA	55°06.927'N	131°56.787'W	3.2	315
Lower Clarence Strait	LCB	55°07.136'N	131°53.793'W	6.4	466
Lower Clarence Strait	LCC	55°07.321'N	131°51.088'W	6.4	459
Lower Clarence Strait	LCD	55°07.533'N	131°48.094'W	3.2	413

Table 2.—Southeast Alaska Coastal Monitoring (SECM) research cruises scheduled off southeastern Alaska, May–August 2007.

Vessel cruise #	Period (days)	Research focus	Sampling conducted
<i>John N. Cobb</i> JC-07-09	22–26 May (5 days)	Oceanography Fish survey (trawl)	CTD, chlorophyll and nutrients, zooplankton, fish (some stations) All 13 core NSEAK stations
<i>John N. Cobb</i> JC-07-12	20 June–03 July (14 days)	Oceanography Fish survey (trawl) Regional comparisons	CTD, chlorophyll and nutrients, zooplankton, fish 9 core NSEAK stations and SSEAK
<i>John N. Cobb</i> JC-07-14	19 July–01 August (14 days)	Oceanography Fish survey (trawl) Regional comparisons	CTD, chlorophyll and nutrients, zooplankton, fish 9 core NSEK stations and SSEAK Intervessel calibration w/ <i>Medeia</i>
<i>John N. Cobb</i> JC-07-17	20–24 August (5 days)	Oceanography Fish survey (trawl)	CTD, chlorophyll and nutrients, zooplankton, fish 9 core NSEAK stations

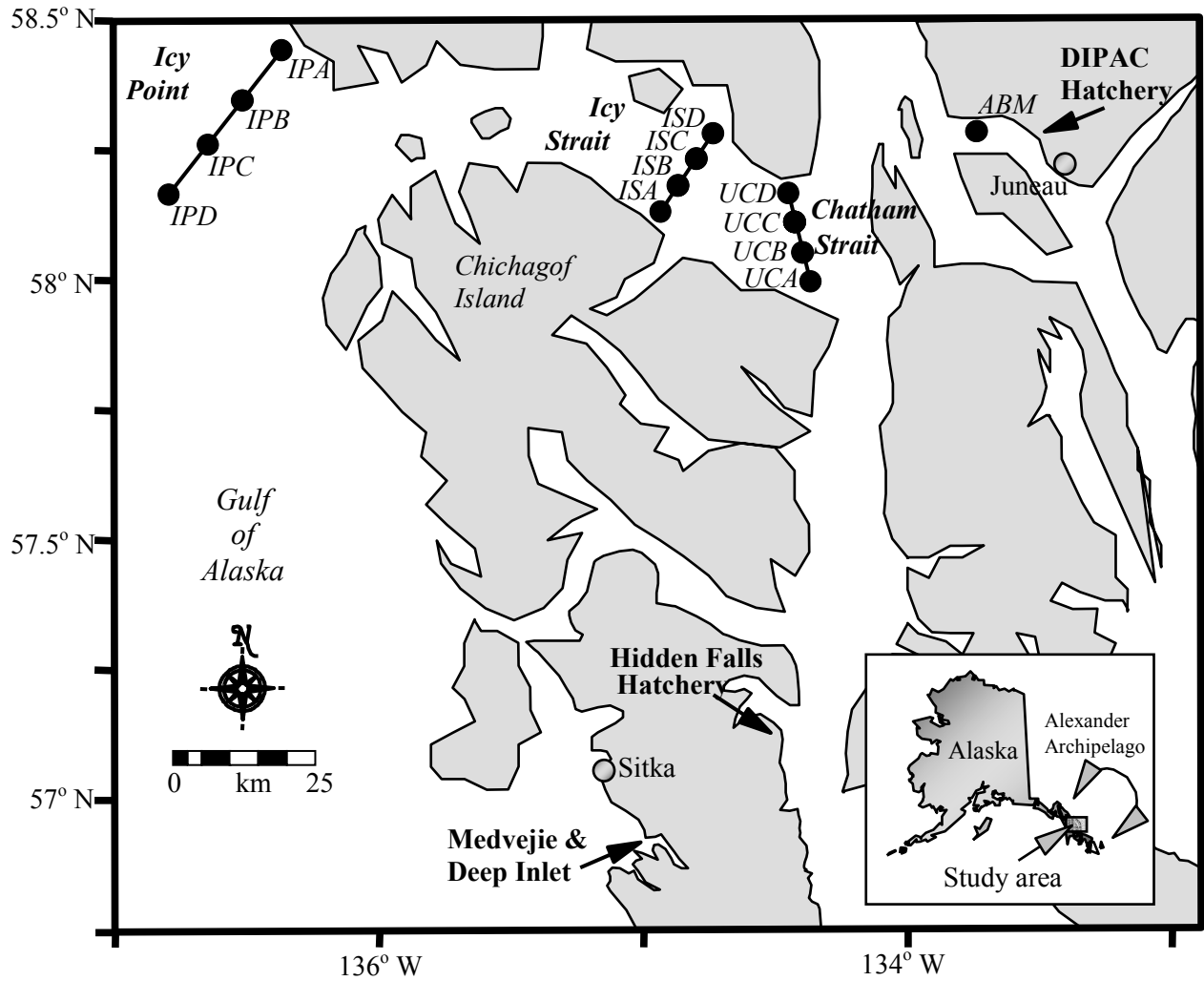


Figure 1.—Stations scheduled to be sampled monthly in marine waters of the northern region of southeastern Alaska, May, June, July, and August 2007. The stations in Icy Point are only scheduled to be sampled in May.

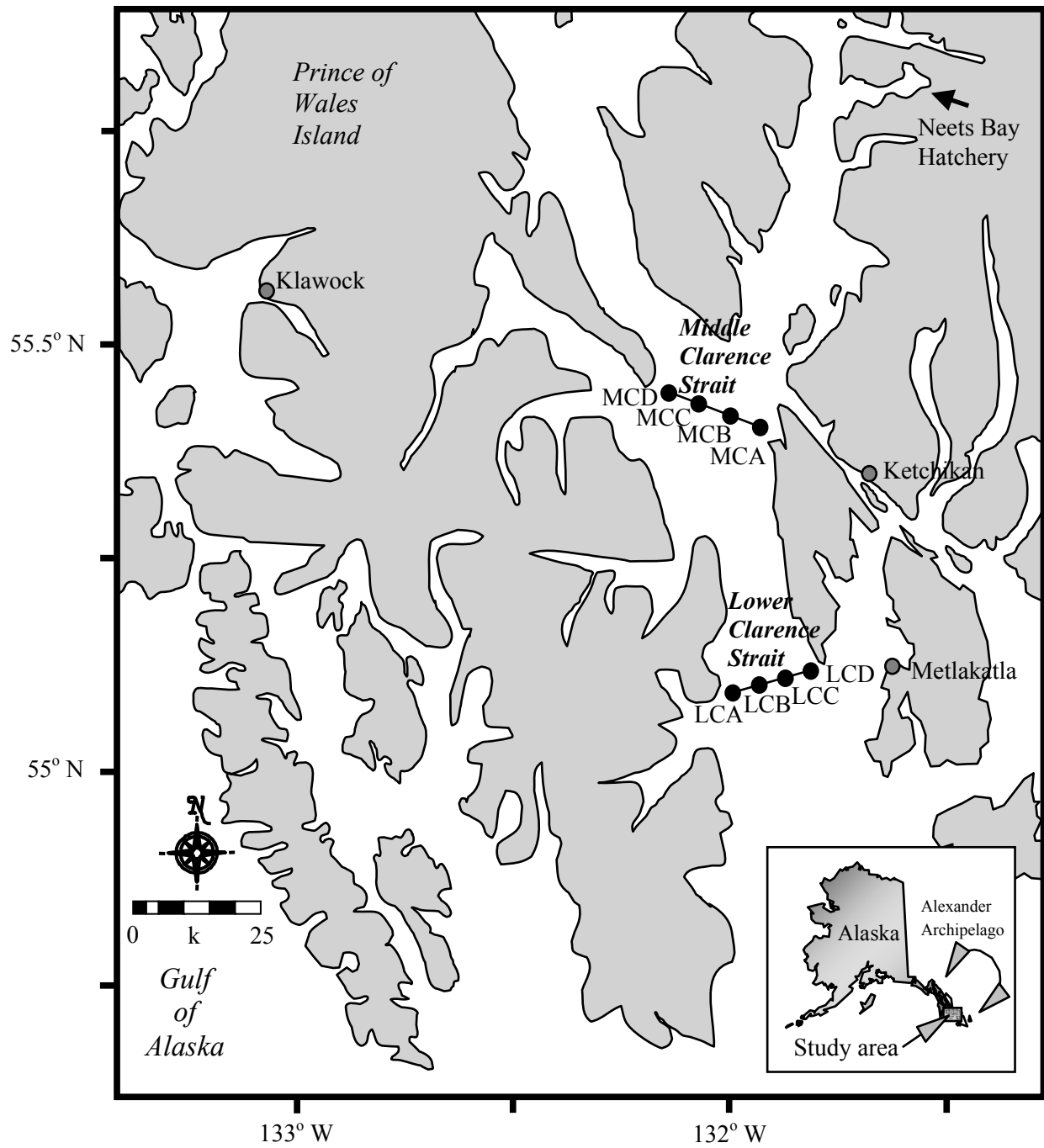


Figure 2.—Stations scheduled to be sampled monthly in marine waters of the northern region of southeastern Alaska, June and July 2007.

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