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Southeast Alaska Coastal Monitoring (SECM) Cruise Plan for 2005

by

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Southeast Alaska Coastal Monitoring (SECM) Cruise Plan for 2005

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.). This research is conducted to meet several needs identified in the National Oceanic and Atmospheric Administration (NOAA) Fisheries Strategic Plan, the North Pacific Anadromous Fisheries Commission (NPAFC) 2001–2005 Science Plan, and the Gulf of Alaska Global Ocean Ecosystem Dynamics (GLOBEC) Program.

The three primary components of the NOAA Fisheries Strategic Plan are to 1) rebuild and maintain sustainable fisheries, 2) promote the recovery of protected species, and 3) protect and maintain the health of coastal marine habitats. Our SECM research addresses the first component by emphasizing long-term ecological monitoring of coastal marine habitats used by juvenile salmon and associated epipelagic fishes, and by researching how environmental variation affects the sustainability of these resources. The second component is addressed by seasonal sampling, which documented the earliest occurrence off the Alaska coast of stream-type juvenile chinook salmon stocks from the Columbia River Basin, including protected stocks. The third component is addressed by spatial and temporal sampling, which describes the essential marine habitat utilized by juvenile salmon and associated fishes as they migrate seaward to the Gulf of Alaska, and by documenting the occurrence of these fishes in relation to biophysical factors.

The NPAFC 2001–2005 Science Plan identifies “juvenile salmon research” as one of three major focuses of cooperative NPAFC science activities. Research issues within this juvenile salmon component include 1) seasonal distribution and migration, 2) population size and survival estimates, 3) trophic linkages and growth changes, and 4) primary production and food resources. The SECM research is closely aligned with these issues. The NPAFC Science Plan identifies a need for long-term ecological monitoring projects such as SECM that study key juvenile salmon stocks in several regions of the North Pacific Rim encompassing a variety of environmental conditions, in order to understand the relationships among habitat use, marine growth, hatchery and wild stock interactions, year-class strength, and ocean carrying capacity.

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. The SECM research addresses the regional-scale component of the GLOBEC program by 1) collecting biological data on juvenile Pacific salmon (*Oncorhynchus* spp.) 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.

Historical SECM sampling 1997-2004

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). 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 will examine hatchery- and wild-stock interactions of juvenile chum salmon in 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.

Planned SECM sampling for 2005 and future research direction

In 2005, SECM research is scheduled at four intervals from late May to late August to sample the 13 core stations (Figure 1, Tables 1 and 2); additional sampling in June and July will be directed at the southern region of southeastern Alaska (Figure 2). This additional sampling will allow us to collect information on juvenile salmon and associated biophysical parameters in the marine environments of both the southern and northern regions to increase understanding of the trophic relationships and ecological interactions of wild and hatchery juvenile salmon and associated fishes. The project has four specific objectives: 1) evaluating regional concordance in relative abundance and growth of juvenile pink and chum salmon in northern and southern regions of southeastern Alaska, 2) estimating daily prey consumption rates of juvenile pink salmon with a bioenergetic model to determine 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) forecasting pink salmon abundance in southeastern Alaska from juvenile salmon catches and associated biophysical parameters.

This year, 2005, is the last year of the current NPAFC five-year Science Plan. One major goal of this plan was a cooperative research focus on the early marine ecology of juvenile salmon by member countries. NOAA Fisheries strongly recommends that the NPAFC continues to stress a research focus on marine ecology of juvenile salmon by all parties. It is further recommended that a more formalized plan for this continuing research be considered whereby all parties would use standardized metrics, insofar as possible, in ecosystem studies on juvenile salmon and associated fishes, together with sampling of biophysical parameters in differing early marine habitats. Such a plan could be patterned after the basin-scale BASIS (Bering-Aleutian Salmon International Survey) study. While the BASIS program considers both juvenile, immature, and maturing life stages of salmon along with other fishes, expanding a BASIS-like program under NPAFC auspices to other North Pacific regions could be limited to ecosystem studies of only juvenile (age-0) salmon. Much of this type of research, similar to the current SECM Cruise Plan, is already underway by various member parties. A more formalized plan focused on juvenile salmon would serve to strengthen international collaboration and cooperation in this area, and would increase our knowledge and understanding of the role salmon play in ecosystems during early marine life stages.

Table 1.—Localities and coordinates of stations scheduled for sampling monthly in marine waters of the northern region of southeastern Alaska, 22–26 May, 20 June–03 July, 20 July–01 August, 23–29 August 2005, and in the southern region of southeastern Alaska, 20 June–03 July, 20 July–01 August 2005.

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 2005.

Vessel cruise #	Period (days)	Research focus	Sampling conducted
<i>John N. Cobb</i> JC-05-06	22–26 May (5 days)	Oceanography	CTD, chlorophyll and nutrients, zooplankton All 13 core NSEAK stations
<i>John N. Cobb</i> JC-05-08	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-05-10	20 July–01 August (13 days)	Oceanography Fish survey (trawl) Regional comparisons	CTD, chlorophyll and nutrients, zooplankton, fish 9 core NSEK stations and SSEAK
<i>John N. Cobb</i> JC-05-13	23–29 August (7 days)	Oceanography Fish survey (trawl)	CTD, chlorophyll and nutrients, zooplankton All 13 core NSEAK stations

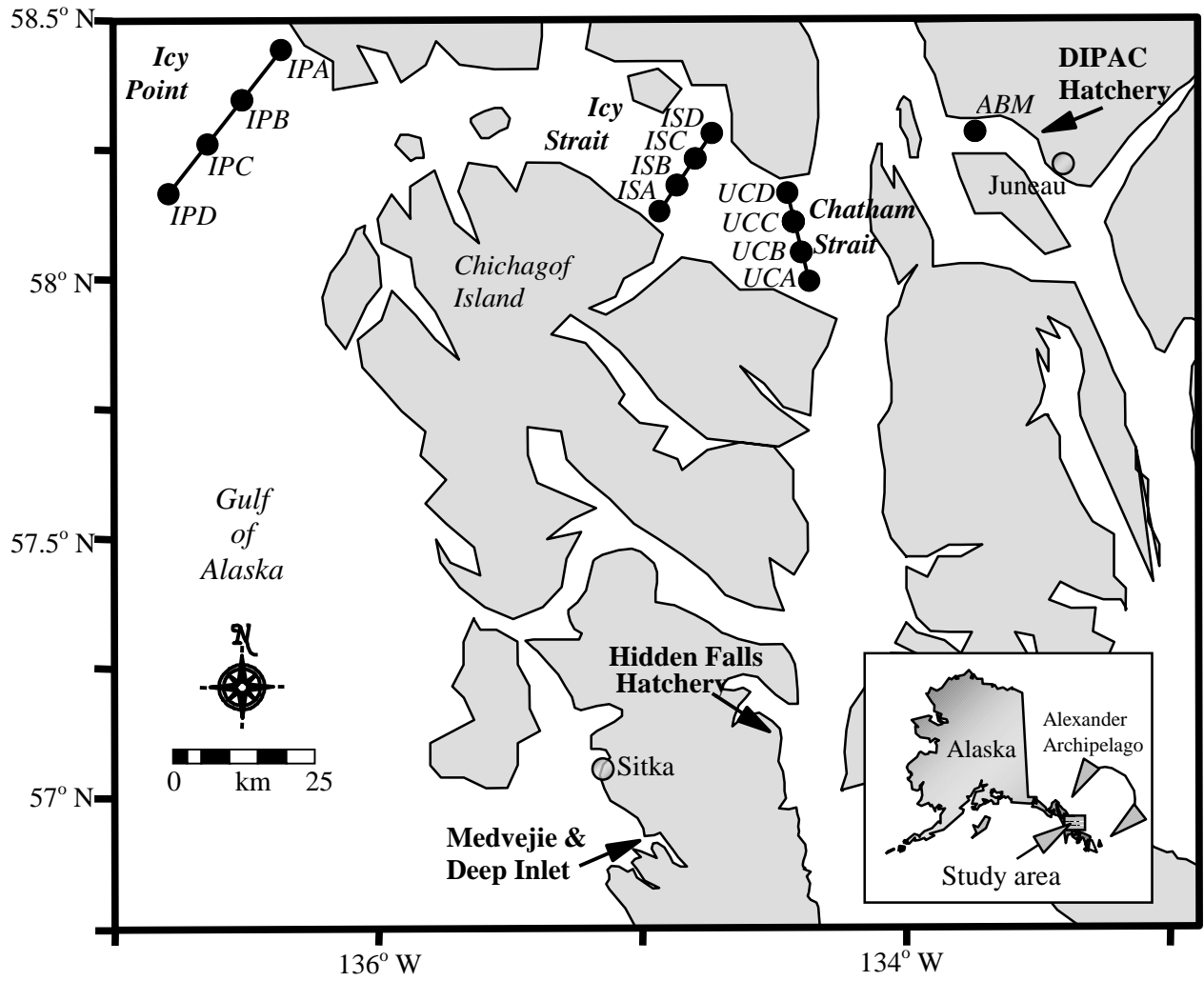


Figure 1.—Stations sampled monthly in marine waters of the northern region of southeastern Alaska, May–August 2005.

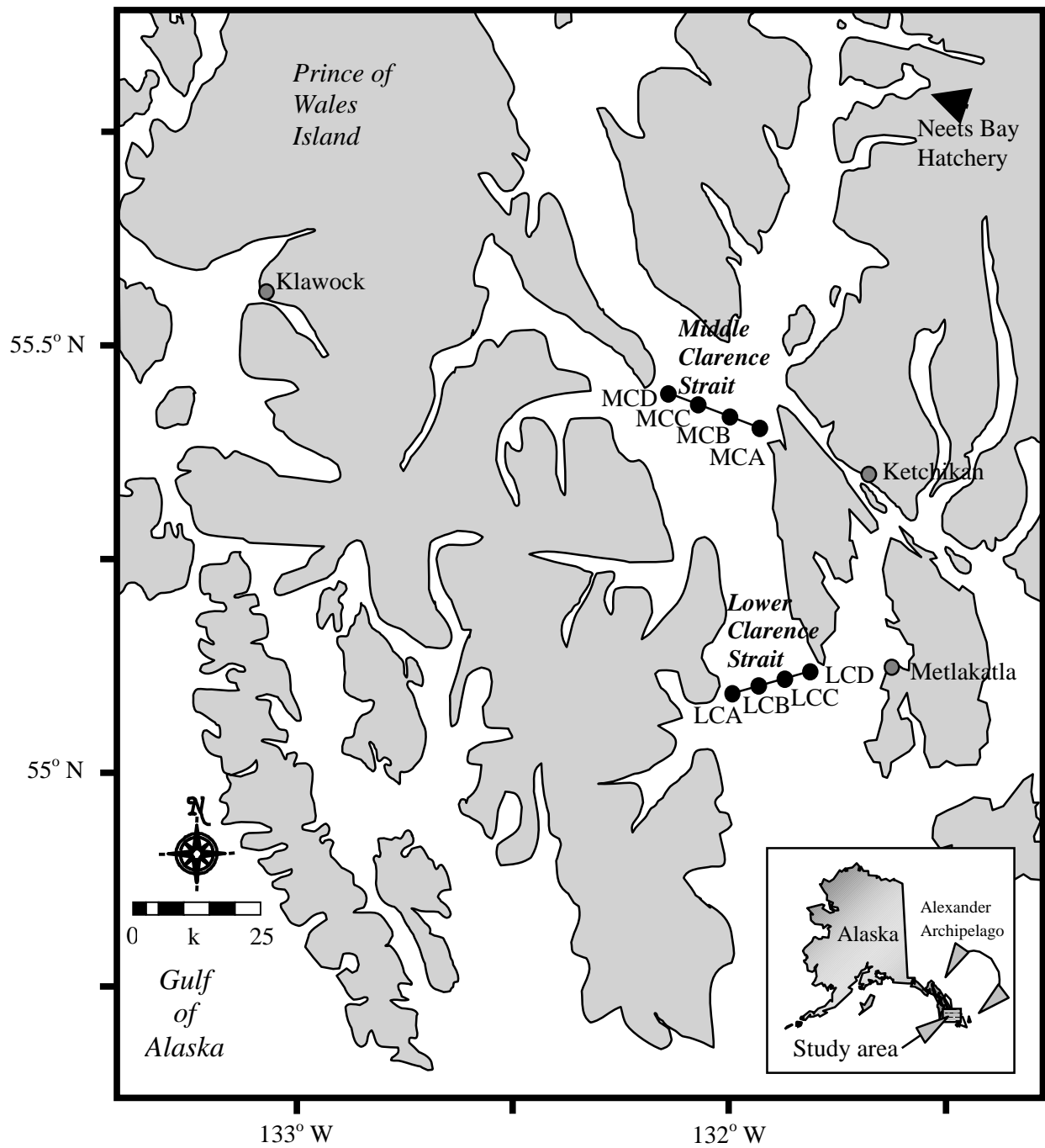


Figure 2.—Stations sampled monthly in marine waters of the northern region of southeastern Alaska, June and July 2005.

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