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**United States National Cruise Plan for BASIS Research, August - September, 2006**

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by the

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## **Introduction**

Pacific salmon returns to rivers draining to the eastern Bering Sea have been inconsistent and at times very weak. Low returns of chinook and chum salmon to the Yukon River, Kuskokwim River, and Norton Sound area of Alaska prompted the State of Alaska during 2000 to restrict commercial and subsistence fisheries and declare the region a fisheries disaster area. Weak salmon returns to these river systems follow several years of low sockeye salmon returns to Bristol Bay, which was declared a fisheries disaster region during 1998 by the State of Alaska and the U.S. Department of Commerce. Causes of the poor salmon returns to these river systems are not understood; however, the regional scale decline of these stocks indicates that the marine environment may play a critical role. Ocean conditions, particularly in the first few months after leaving freshwater, are known to significantly affect salmon survival (Holtby et al. 1990; Friedland et al. 1996; Beamish and Mahnken 2001). Mechanisms affecting marine survival of the eastern Bering Sea salmon stocks are unknown principally due to the lack of information on salmon during their marine life-history stage. In an effort to improve our understanding of the marine life-history stage of salmon in the Bering Sea, the North Pacific Anadromous Fish Commission (NPAFC) initiated a proposal for an internationally coordinated research program on salmon in the Bering Sea called the Bering-Aleutian Salmon International Survey (BASIS) (NPAFC, 2001). As part of BASIS, scientists from the National Marine Fisheries Service (NMFS), Ocean Carrying Capacity (OCC) program will conduct a survey during Fall 2006 over the eastern Bering Sea shelf to provide key ecological data of the eastern Bering Sea salmon stocks during their juvenile life-history stage. The goal of OCC/BASIS salmon research cruises is to understand mechanisms underlying the effects of environment on the distribution, migration, and growth of juvenile salmon in the eastern Bering Sea. Primary objectives of the BASIS survey will be to: 1) determine the extent of offshore migrations of juvenile salmon from rivers draining into the eastern Bering Sea, 2) describe the physical environment of the eastern and northeastern Bering Sea shelf waters occupied by juvenile salmon, and 3) collect biological information on other ecologically important species.

## **Survey**

The annual OCC/BASIS survey will be conducted at stations located over the eastern Bering Sea shelf (Figure 1). During fall 2006, the survey will begin in Dutch Harbor, Alaska about August 4 and end in Dutch Harbor about September 20 (Tables 1 and 2). Participating scientists are listed in Tables 3 and 4. Fish sampling north of 59°N will be along latitudinal parallels; transects and sampling stations within Bristol Bay will be along longitudinal meridians (Figure 1).

The cruise will be conducted aboard the Research Vessel *Oscar Dyson* (Stations – ‘X’ in Figure 1) and a chartered fishing vessel (to be determined; Stations - ‘Dots’ in Figure 1). Fish samples will be collected using a midwater rope trawl, models 400/580, made by

Cantrawl Pacific Limited<sup>1</sup> of Richmond, B.C., Canada. The net is approximately 198 m long, has hexagonal mesh in wings and body, and a 1.2-cm mesh liner in the codend. The 400/580 has a typical spread of 50 m horizontally and 18 m vertically. At each station, the net will be towed at or near the surface for 30 minutes at speeds between 3.5 and 5 kts.

Salmon and other fishes will be sorted by species and counted. We expect 12,000 juvenile salmon (pink (750), chum (5,000), sockeye (5,000), coho (750), and chinook (500)) will be caught during the survey. Standard biological measurements including fork length, body weight, and sex as well as scale samples from the preferred area (for growth analyses) will be taken from subsamples of all salmon species. All other fish species will be counted and standard biological measurements including length and weight will be taken from subsamples of each species. Diets of subsamples of salmon as well as other marine fish will be examined onboard.

Oceanographic data will be collected at each trawl station. Depth profiles of salinity, temperature, density, chlorophyll a fluorescence (indicates phytoplankton biomass), beam transmission (indicates particle load), irradiance (light) and dissolved oxygen will be taken from surface to near bottom depths at each trawl station using a CTD (conductivity, temperature, and depth meter, SBE-25 or SBE-911, Sea-Bird Electronics, Inc<sup>1</sup>, Bellevue, WA). Water samples for nutrients, phytoplankton and microzooplankton species and chlorophyll a (size fractionated and total) will be collected at 5 m and below the thermocline. Continuous measurements of surface temperature and salinity will be collected with a thermosalinograph (SBE-45, Sea-Bird Electronics, Inc<sup>1</sup>). Zooplankton samples will be collected at each trawl station using double oblique bongo tows taken to near bottom depths using a 60-cm diameter frame with 505 and 333 micron mesh nets.

## References

- Beamish, R.J., and C. Mahnken. 2001. A critical size and period hypothesis to explain natural regulation of salmon abundance and the linkage to climate and climate change. *Progress in Oceanography* 49:423-437.
- Friedland, K.D., R.E. Haas, and T.F. Sheehan. 1996. Post-smolt growth, maturation, and survival of two stocks of Atlantic salmon. *Fishery Bulletin* 94:654-663.
- Holtby, L.B., B.C. Andersen, R.K. Kadowaki. 1990. Importance of smolt size and early ocean growth to interannual variability in marine survival of coho salmon (*Oncorhynchus kisutch*). *Canadian Journal of Fisheries and Aquatic Sciences* 47:2181-2194.
- North Pacific Anadromous Fish Commission 2001. Draft plan for NPAFC Bering-Aleutian Salmon International Survey (BASIS). NPAFC Doc. 579. 27 p.

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<sup>1</sup> Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

Table 1. Tentative cruise itinerary for the NMFS, OCC August 4 – September 6, 2006 BASIS research cruise – R/V *Oscar Dyson*.

Date	Location/Activity
Leg 1	
3-August	Scientists arrive in Dutch Harbor, AK
4-August	Load scientists and gear
5-August	Load scientists and gear
6-August	Test Gear
7-August	Leave Dutch Harbor; Begin sampling Bering Sea stations
19-August	Enroute Dutch Harbor, AK
21-August	Unload Leg1 scientists and gear; load Leg 2 scientists
Leg 2	
19-August	Scientists arrive Dutch Harbor, AK
21-August	Load scientists and gear
22-August	Leave Dutch Harbor; Begin sampling central Bering Sea stations
26-August	Window for paired trawling with contract vessel
27-August	Window for paired trawling with contract vessel
28-August	Window for paired trawling with contract vessel
4-September	Enroute Dutch Harbor, AK
6-September	Unload Leg 2 scientists and gear; end survey
7-September	Scientists depart Dutch Harbor, AK

Table 2. Tentative cruise itinerary for the NMFS OCC August 12 – September 20, 2006  
BASIS research cruise – Contract Vessel.

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Date	Location/Activity
Leg 1	
11-August	Scientists arrive in Dutch Harbor, AK
12-August	Load scientists and gear
13-August	Load scientists and gear
14-August	Leave Dutch Harbor; Test Gear; Begin sampling Bering Sea stations
26-August	Window for paired trawling with R/V <i>Oscar Dyson</i>
27-August	Window for paired trawling with R/V <i>Oscar Dyson</i>
28-August	Window for paired trawling with R/V <i>Oscar Dyson</i>
30-August	Enroute Nome, AK
1-September	Unload Leg1 scientists and gear; load Leg 2 scientists
Leg 2	
30-August	Scientists arrive Nome, AK
1-September	Load scientists and gear
2-September	Leave Nome; Begin sampling
17-September	Enroute Dutch Harbor, AK
19-September	Unload Leg 2 scientists and gear
20-September	Unload Leg 2 scientists and gear
21-September	Scientists depart Dutch Harbor, AK

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Table 3. Participating scientists during the August 4 – September 6, 2006 OCC, BASIS research cruise aboard the R/V *Oscar Dyson* in the coastal waters of the eastern Bering Sea.

Scientists	Affiliation
Leg 1 (Aug 4 – Aug 20)	
FPC Ed Farley	NMFS/ABL
Lisa Eisner	NMFS/ABL
Jim Murphy	NMFS/ABL
Scientist (TBD)	NPAFC
Scientist (TBD)	NPAFC
Scientist (TBD)	NPAFC
Scientist (TBD)	NPAFC
Scientist (TBD)	Teacher at Sea
Scientist (TBD)	
Scientist (TBD)	
Leg 2 (Aug 21 – Sep 6)	
FPC Ed Farley	NMFS/ABL
Lisa Eisner	NMFS/ABL
Jim Murphy	NMFS/ABL
Scientist (TBD)	NPAFC
Scientist (TBD)	NPAFC
Scientist (TBD)	NPAFC
Scientist (TBD)	NPAFC
Scientist (TBD)	Teacher at Sea
Scientist (TBD)	
Scientist (TBD)	

- FPC - Field Party Chief
- NMFS - National Marine Fisheries Service
- ABL - Auke Bay Laboratory
- TBD - To Be Determined
- NPAFC - North Pacific Anadromous Fish Commission

Table 4. Participating Scientists during the August 12 – September 20, 2006 OCC, BASIS research cruise aboard the contract vessel (to be determined) in the coastal waters of the eastern and northeastern Bering Sea.

Scientists		Affiliation
Leg 1 (Aug 12 – Sept 1)		
FPC	Jamal Moss	NMFS/ABL
	Angela Middleton	NMFS/ABL
	Kris Cieciel	PSMFC
	Mary Courtney	PSMFC
	Cara Rodgeveller	PSMFC
Leg 2 (Sept 2 – Sep 20)		
FPC	Jamal Moss	NMFS/ABL
	Angela Middleton	NMFS/ABL
	Kris Cieciel	PSMFC
	Mary Courtney	PSMFC
	John Pohl	NMFS/ABL

- FPC - Field Party Chief
- NMFS - National Marine Fisheries Service
- ABL - Auke Bay Laboratory
- PSMFC - Pacific States Marine Fish Commission

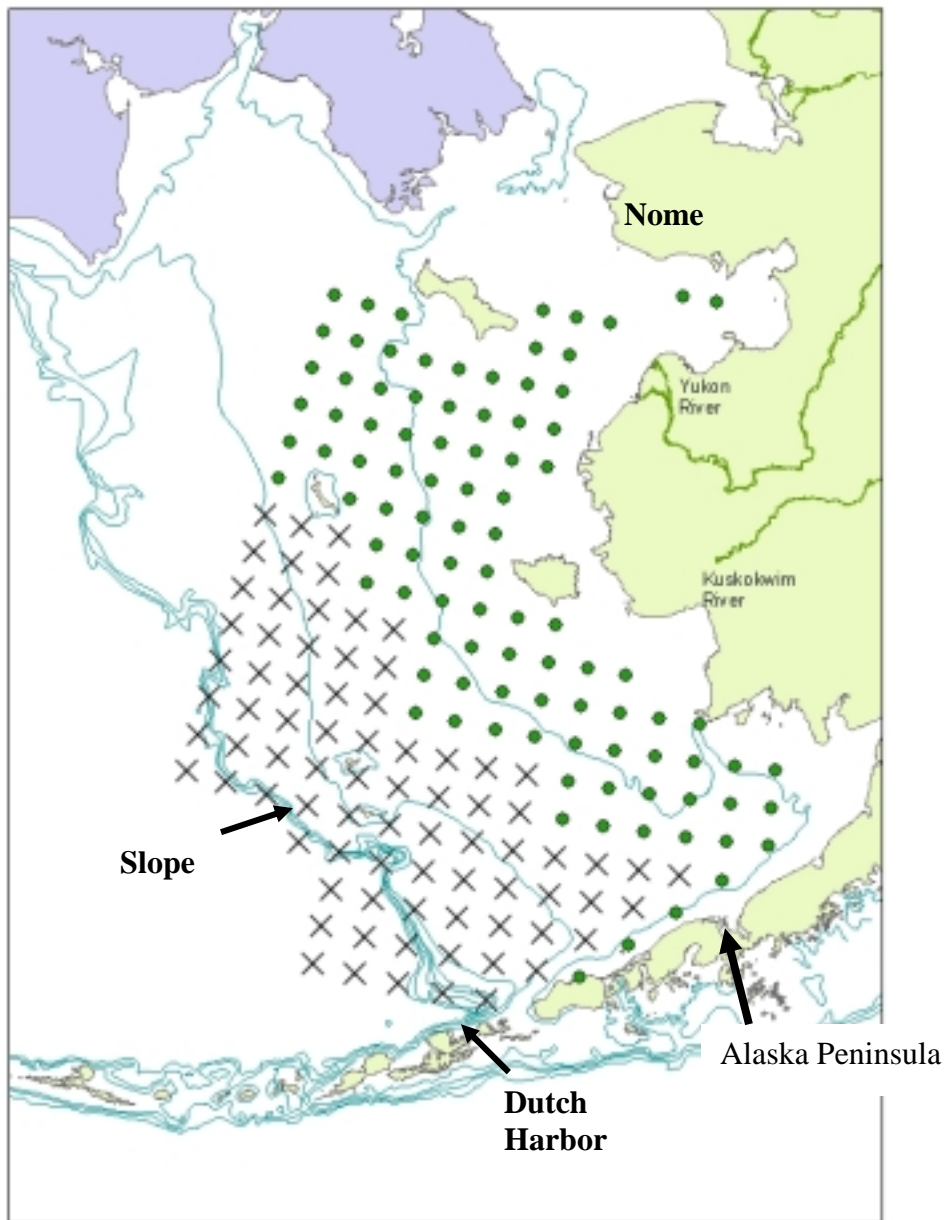


Figure 1. Proposed station locations to be sampled by NMFS, OCC, BASIS program along the eastern Bering Sea shelf. The 'X' – denotes proposed stations to be sampled by the R/V *Oscar Dyson*, August 4 – September 6, 2006. The 'Dot' denotes proposed stations to be sampled by the contract vessel, August 12 – September 20, 2006.



