AUKE BAY LABORATORY (ABL)

STOCK IDENTIFICATION PROGRAM

Yukon River Radio Telemetry Program

The Yukon River chinook salmon radio telemetry program, a cooperative study between the Alaska Department of Fish and Game (ADF&G) and the National Marine Fisheries Service (NMFS), was initiated in 2000 in response to dramatic declines in chinook salmon returns to the Yukon River Basin. The study seeks to improve management and conservation efforts by providing information on chinook salmon migratory patterns, distribution, and run abundance. Work in 2000–01 focused on developing capture methods, tracking techniques, and infrastructure. In 2002–04, researchers conducted a full-scale, basinwide tagging and monitoring program. During 2004, adult chinook salmon migrating upriver were captured with drift gill nets near the village of Russian Mission. Local fishermen were contracted to fish the area, and project personnel were responsible for tagging the fish and collecting data. The gill nets used were effective in capturing chinook salmon while minimizing summer chum salmon bycatch.

A total of 2,132 fish were captured in 2004. Catch per unit effort (CPUE) estimates at the tagging site ranged from 3.4 (Week 22) to 45.0 (Week 24). These estimates correlated closely with weekly capture numbers, especially during the peak of the run (Week 24) when CPUE spiked dramatically. A total of 995 fish were radio tagged during the study. Fish length averaged 826 mm and ranged from 395 mm to 1070 mm. Most fish captured were 6-year-olds (68.4%). A total of 1,092 fish were released without being tagged, 24 fish were recaptures, and 20 fish were handling mortalities. Radio-tagged fish migrating upriver were recorded by remote tracking stations at 39 sites located on important travel corridors and spawning tributaries. Aerial tracking surveys were flown to determine the status of radio-tagged fish in nonterminal reaches of the basin and to obtain movement and distribution information in spawning tributaries. Ninety surveys were flown during the season.

Chinook salmon responded well to the capture and tagging procedure, with 958 (96.3%) fish moving upriver. Movement rates averaged 53 km/day for fish traveling to the upper basin, including 46 km/day for Tanana River fish and 55 km/day for fish returning to the upper Yukon River. Fish returning to reaches in the lower basin traveled substantially slower (34–38 km/day). These rates were comparable to movement information obtained in previous years of the study. A total of 320 (33.4%) fish that moved upriver were harvested in fisheries, including 276 (28.8%) fish in the United States and 44 (4.6%) fish in Canada. An additional 97 fish were recovered or reported by run assessment projects in the basin.

A total of 719 fish were tracked to specific reaches within the basin. Numerous fish traveled into Canada, including 283 (39.4%) Yukon River fish and 8 (1.1%) Porcupine River fish. Most (195, 27.1%) Canadian fish were tracked to tributaries of the Yukon River main stem. Fifty-eight (8.1%) fish remained in Canadian reaches of the Yukon River main stem or traveled to associated tributaries not monitored by tracking stations or surveyed by aircraft. Chinook salmon were also located in U.S. reaches of the upper basin. Substantial numbers of fish returned to the Tanana River (195, 27.1%), and lower numbers were located in other U.S. tributaries. Twenty-four (3.4%) fish remained in U.S. reaches of the Yukon River main stem or traveled to associated tributaries not monitored by tracking stations or surveyed by aircraft. Fish (113, 15.7%) also traveled to tributaries in the lower and middle basin. Although present throughout the run, these lower and middle basin stocks were more prevalent during late June and July. Eighty-nine (12.3%) fish remained in lower and middle reaches of the Yukon River main stem or traveled to associated tributaries not monitored by tracking stations or surveyed by aircraft.

Seventy-seven fish were tagged with radio-archival tags. Fifty-five tags were recovered, including 16 tags in the lower and middle basin, 18 tags in the Tanana River, and 21 tags in reaches of the upper basin. Water depth appears to vary, with fish periodically swimming at depths of more than 20 m. Swimming depth and water temperature data are being analyzed, particularly in reference to movements through areas with fisheries and run assessment projects.

By John Eiler

OCEAN CARRYING CAPACITY PROGRAM

Functional Response of Juvenile Pink Salmon and Chum Salmon to Two Types of Zooplankton Prey

Models that predict the feeding behavior of planktivorous fish based on environmental conditions can advance our understanding of trophic dynamics in the marine environment by offering insight into the mechanistic controls limiting prey consumption. The functional response model, which is among the most simplistic models of feeding behavior, predicts the consumption rate of a predator as a function of prey density and is considered a fundamental framework for studying predator-prey interactions.

We conducted feeding rate experiments with juvenile pink (*Oncorhynchus gorbuscha*) and chum (*O. keta*) salmon by presenting them with varying densities of small copepods (*Tisbi* sp.) and large mysid shrimp (*Mysidopsis bahia*) under high light and low turbidity conditions. Prey densities ranged from 1 to 235 prey/L, and water temperatures ranged from 10.5° to 12.0°C. Both species of salmon demonstrated a type II functional response to zooplankton prey, where the rate of prey consumption by the predator rises as prey density increases, then levels off and remains constant.

Estimates of maximum feeding rate for juvenile pink (12.3 prey/min) and chum (11.5 prey/min) salmon foraging on mysid prey were similar, and were higher than feeding rates estimated from experiments where copepods were presented (0.4 prey/min for pink salmon, 3.8 prey/min for chum salmon), indicating that copepods were more difficult to capture than mysids. Smaller pink salmon fry demonstrated a type II functional response to copepod prey and consumed the relatively smaller prey more readily than did the larger juvenile pink salmon. These results indicate that smaller-bodied juvenile salmon have a competitive advantage in prey capture ability over larger-bodied conspecifics when feeding in overlapping areas dominated by smaller-bodied zooplankton species.

By Jamal Moss

Southeast Alaska Synthesis of Marine Biology and Oceanography Workshop

Ginny Eckert of the University of Alaska Southeast (UAS) and Lisa Eisner of ABL organized a workshop on the state of marine biology and oceanography in Southeast Alaska, held in Juneau in March 2005. The workshop was funded by the North Pacific Research Board (NPRB). The goals of the workshop were to 1) summarize past and present research in marine biology and oceanography in Southeast Alaska from Dixon Entrance to Cape Fairweather, including the outer coast, and 2) identify data gaps and future research needs. Overviews were presented on physical oceanography (Tom Weingartner of the University of Alaska Fairbanks (UAF)), biological oceanography (Lisa Eisner), fisheries (Gordon Kruse of UAF), seabirds (John Piatt of the U.S. Geological Survey), nearshore ecology (Ginny Eckert of UAS) and marine mammals (Jan Straley of UAS). The meeting had approximately 40 participants from universities and state and federal agencies. The presenters will be submitting their findings to peer-reviewed journals and are preparing a workshop report for the NPRB.

By Lisa Eisner

GROUNDFISH ASSESSMENT PROGRAM

Daily Predictability of Prey Available to Free-Ranging Steller Sea Lions in Southeast Alaska

Pacific herring are a major prey species for Steller sea lions in Southeast Alaska. During winter, herring in this region aggregate in dense, layered schools associated with the seafloor. If sea lions can easily find these aggregations, the net benefits from foraging trips are maximized. Predictability of prey aggregations, both in time and location, decreases search time and improves foraging profitability.

Monthly prey surveys, conducted in a previous study between June 2001 and May 2004, indicated that over-wintering herring aggregations occur consistently each year near Benjamin Island, an important sea lion haulout in Lynn Canal north of Juneau. During winter 2005, we conducted new prey surveys in this area at weekly and daily intervals to examine predictability of herring schools over shorter time scales than those examined in the 2001–04 study. Results from this fine-scale study will provide further insight into 1) the energetic benefit that sea lions derive from herring, and 2) the balance between predation avoidance by herring and the costs associated with searching by sea lions.

Replicate acoustic surveys were conducted from October 2004 to April 2005 to evaluate the daily predictability of available prey to Steller sea lions.

The survey area is located in Favorite Channel and north Stephens Passage (Fig. 1) south of the Benjamin Island haulout, and encompasses a nearly continuous submarine gully interrupted only by glacial outwash from Eagle River. The survey area appears to form important winter habitat for herring in Southeast Alaska. Five surveys of 70 nautical miles (nmi) length each were conducted per month.

In addition, gill-net sampling and midwater trawl sampling were used to collect biological samples and identify echo sign from the acoustic surveys. Gill-net sampling was conducted 2 days per month, and midwater trawl sampling was conducted for 3 days each quarter. Acoustic surveys were conducted from the fishing vessel (FV) *Sea View*, gill-net sampling from the FV *Irish Eyes*, and midwater trawl sampling from the research vessel (RV) *Medeia*, each of which were chartered for this study.

In previous study years, midwater trawling was used exclusively to collect biological samples. Gill-net sampling methods were tested in 2004–05 because the charter vessel cost for gill-net sampling is about one-third of the cost for midwater trawl sampling. Gill-net sampling methods were developed and tested by ABL scientists J.J. Vollenweider and Dave Csepp and were effective for sampling near-bottom forage species, including herring and eulachon.

Herring behavior in 2004–05 was similar to behavior in previous years. Few herring were found during October, and large, dense schools of herring

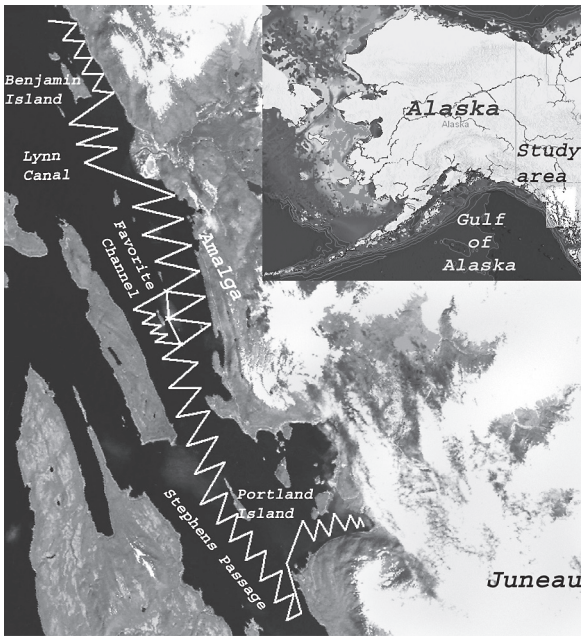

Figure 1. Southeast Alaska acoustic survey area.

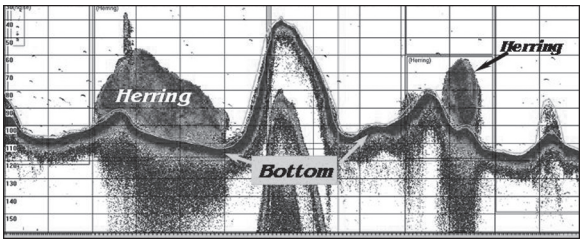

Figure 2. An acoustic echogram of two large, dense Pacific herring schools in their fall schooling behavior near Benjamin Island, Alaska.

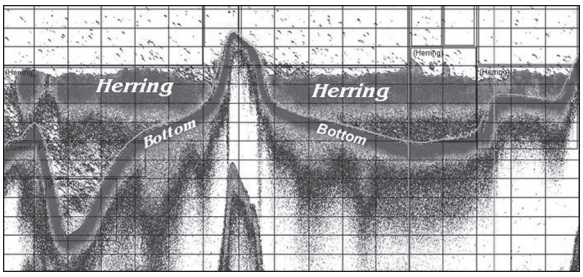

Figure 3. An acoustic echogram of Pacific herring in typical, dense winter layering behavior in the Amalga Harbor area near Juneau, Alaska.

appeared near Benjamin Island in November (Fig. 2). In December, one-half of the herring moved south into Favorite Channel (Amalga Harbor) and by January and February, the majority of the herring formed dense layers there (Fig. 3). The southward movement continued in March, when herring were concentrated near Portland Island. The winter layer began breaking up in March, forming a thinner layer and starting to form separate, scattered schools.

Adult eulachon were mixed with juvenile walleye pollock in midwater trawl sampling and gill-net sampling. In addition to the replicate surveys, an acoustic survey was conducted in Berners Bay north of Benjamin Island in January that targeted larval eulachon and capelin. The acoustic survey showed two distinct weak layers throughout the bay, one layer at 50 m depth and another at 100 m. Midwater trawling of these layers in December caught larval capelin at 50 m depth and larval eulachon at 100 m.

By David Csepp and Mike Sigler

Performance of Modern Age-Structured Stock Assessments with High Survey Measurement Error

The objective of AFSC bottom trawl surveys in Alaska is to obtain biomass estimates for all major Alaska groundfish species. However, many species

of rockfish (*Sebastes* spp.) are patchily distributed and therefore are imprecisely estimated in these multispecies surveys, which are based on a stratified random design. This same general problem pervades the stock assessments of many fish species worldwide.

In our study, the stock assessment model for Pacific ocean perch (*Sebastes alutus*) in the Gulf of Alaska was used to explore the consequences of survey imprecision and other uncertainties in components of this type of model. The characteristics of the Pacific ocean perch assessment can be generalized to other long-lived, iteroparous fish species with uncertain survey biomass estimates. The results of the 2003 stock assessment model served as the "true" values, and simulated data sets were constructed in five experiments to answer the following questions:

1) What is the effect of measurement error in survey biomass estimates on stock assessment results?

2) What is the effect if the catchability coefficient changes over time from either gear changes or environmental changes?

3) Does adding an additional biomass index increase model precision?

4) How sensitive are model results to applying arbitrary weights to different data sources such as fishery length distributions and survey ages?

5) How sensitive are model results to prior distributions (a distribution representing prior knowledge about a parameter that influences estimation) imposed on key parameters?

The five simulation experiments yielded the following general answers to these questions:

1) High measurement error (coefficient of variation equal to 50%) rendered the stock assessment inaccurate and imprecise.

2) A catchability trend in the biomass index was undetectable and created a large bias in biomass and parameter estimates.

3) The addition of a second, more precise biomass index with a shorter time series improved performance of the model. Examples of an additional index could be a hydroacoustic index or a dedicated rockfish survey.

4) This type of assessment was robust to various data weightings, indicating that the stock assessment scientist could merely give each data source equal weight.

5) The prior distribution for natural mortality needed to be precisely specified, while the prior distributions for the catchability coefficient and recruitment variability could be relatively uninformative.

Overall, the study showed that the high measurement error in the survey index (for species such as rockfish) can render stock assessment intractable, data weighting was less important than expected, and prior distributions on parameters (except natural mortality) could be uninformative.

By Dana Hanselman

2005 Sablefish Longline Survey

The AFSC has conducted an annual longline survey of sablefish and other groundfish off the coast of Alaska since 1987. The survey is a joint effort involving the ABL and the Center's Resource Assessment Conservation Engineering (RACE) Division. In February 2005, a new longline survey contract was awarded to two vessels over a period of 4 years. The *Ocean Prowler* will conduct the survey in 2005 and 2007, and the *Alaskan Leader* in 2006 and 2008. The schedule will be similar to previous years, with sampling in the Gulf of Alaska annually and biennial sampling of the Bering Sea (2005, 2007) and Aleutian Islands region (2006, 2008). The 2005 survey begins on 28 May and ends on 1 September.

By Chris Lunsford

MARINE SALMON INTERACTIONS PROGRAM

Annual Auke Creek Cooperative Research and Planning Meeting

Cooperative research on salmon, trout, and char that use the Auke Lake system continued in the

first quarter of 2005. The Auke Lake system supports endemic populations of pink, chum, sockeye, and coho salmon, cutthroat and steelhead trout, and Dolly Varden. Some of the data sets have been continued since the early 1960s and are filed at the ABL.

In 1983, an interagency cooperative agreement relating to ABL's Auke Creek fish counting weir was established between NMFS, UAF, and the ADF&G. Many cooperative studies and graduate theses have been conducted under this agreement. An interagency meeting of all participating interagency personnel is held annually. A report of fish counts from daily weir operations and other information related to salmonid research at Auke Creek is prepared by the NMFS project leader. The Auke Creek weir annual report is available on the ABL web site at *www.afsc.noaa.gov/abl/MarFish/3auke.htm*.

The Auke Creek interagency meeting was held on 24 February 2005 and focused on salmonid research projects. Summaries and operational plans were presented on projects for 2005 at the Auke Creek weir. Currently 19 projects are scheduled at Auke Creek for 2005. In general, NMFS will continue the long-term data collections on all species, emphasizing the marine survival and freshwater production of pink, coho, and sockeye salmon. The ADF&G will continue the long-term research programs on Dolly Varden, cutthroat trout, and coho salmon. The UAF will resume the outbreeding depression study on pink salmon in 2005 and is actively recruiting a graduate student for the project.

An interesting report was given by Leon Shaul (ADF&G) on Southeast Alaska coho salmon index stocks. Marine survival of these stocks has decreased in all index areas over the last 2 years (2003–04). Auke Creek is one of the ADF&G index coho stocks. Rick Focht of the Macaulay Hatchery (Douglas Island Pink and Chum Corporation) provided a summary of the 2004 return of chinook salmon released in Auke Bay near Auke Creek and discussed plans for the release of chinook salmon juveniles in Auke Bay in 2005. Meeting participants also discussed continuing the multi-agency cooperative agreement for work at the NMFS weir and experimental fish hatchery at Auke Creek, which expires at the end of the 2005 field season. All participating agencies expressed a strong interest in continuing cooperative salmonid research at Auke Creek.

By Jerry Taylor

Auke Creek Fish Counting Weir Operations Begin for 2005

The Auke Creek fish counting weir is key to all salmonid research projects at Auke Creek. The weir is a permanent structure with the capability of capturing all emigrant and immigrant salmonids, and can operate during extreme water flows. The annual weir schedule of operation is developed at the annual Auke Creek cooperative research meeting, which was held on 24 February for 2005.

The weir was installed in the downstream capture mode on 28 February 2005. Stream flow was high, and the weir was operating within minutes of the last installation of weir panels. Continued rainfall and snowmelt during the first weeks of operation maintained streamflow at high levels. There were no icing problems at the weir during March. Auke Lake remained ice-covered throughout March, and water temperatures were between 1.8° and 3.1°C.

Usually during March, pink and chum salmon fry dominate the number of emigrant salmonids, with an occasional Dolly Varden or cutthroat trout captured. A total of 5,967 pink salmon fry were counted at the weir through March. The daily counts for March 2005 were less than the historical daily averages for March. The average number of pink salmon fry leaving Auke Lake in March 2005 was 10,082. The highest count during any March from 1973 to 2003 was 45,000 in 1984. Pink salmon fry emigrations usually reach the midpoint of migration by 20 April, and the earliest recorded midpoint of emigration was 1 April 1998. Only 15 chum salmon fry were captured in March, less than average for Auke Creek. Eight Dolly Varden were captured during March. Numbers of all fish are expected to increase during April.

By Jerry Taylor

2005 Pink and Chum Salmon Workshop

The 22nd Northeast Pacific Pink and Chum Workshop was held in Ketchikan, Alaska, in February 2005. The Pink and Chum Workshop series was initiated in 1962 to promote communication among scientists involved with pink salmon research and management in the Pacific Northwest, British Columbia, and Alaska. The need for a workshop emerged because of concerns over the status of pink salmon stocks in the northeast Pacific Ocean. Initial workshops focused on pink salmon, but chum salmon research was included after 1970 because of

the similarities in the life cycles, ecology, and management of the two species.

Several ABL scientists helped plan and stage the workshop, and also presented scientific papers. Alex Wertheimer of ABL's Marine Salmon Interactions Program (MSI) was cochair of the steering committee that organized the workshop program and logistic arrangements. Scientists from ABL who organized and led sessions included K Koski of the Habitat Program (*Habitat Management and Restoration*), Bill Heard of MSI (*Salmon Farming and Impacts on Pink and Chum Salmon*), Kalei Shotwell of the Marine Fish Program (*Forecasting and Recruitment Prediction*), and Jamal Moss of the Ocean Carrying Capacity Program (OCC) and Molly Sturdevant of MSI (*Ocean Ecology of Pink and Chum Salmon*). Individuals who presented papers on ABL pink and chum salmon research included Chris Kondzela (OCC), Cara Rodgveller (OCC), K Koski, Alex Wertheimer, Jamal Moss, and Molly Sturdevant.

By Alex Wertheimer

HABITAT PROGRAM

Hydrocarbons and Fisheries Habitat in Berners Bay, Alaska: Long-term Monitoring Associated With the Kensington Gold Mine

Several projects associated with development of the Kensington Gold Mine have been proposed for the Berners Bay area 65 km north of Juneau Alaska (Fig. 4). Construction of two ferry terminals and other related infrastructure may affect as many as 80 hectares (ha) within the Berners Bay watershed. Potential sources of hydrocarbons to the bay include fuel spills, chronic pollution from vessels, and parking lot runoff near the terminal facilities. ABL researchers have documented damage to pink salmon and Pacific herring (*Clupea pallasii*) embryos by concentrations of polynuclear aromatic hydrocarbons (PAHs) as low as 1 ppb. Both species, as well as eulachon (*Thaleichthys pacificus*) and capelin (*Mallotus villosus*), spawn in intertidal areas of the bay. In 2004, AFSC scientists initiated baseline studies in Berners Bay to document hydrocarbon concentrations and fish use of important habitats (e.g., eelgrass and understory kelp) before mine development.

Hydrocarbons were measured using passive samplers developed at ABL called polyethylene membrane devices (PEMDs). Samplers were deployed at seven sites in Berners Bay and at two sites in Bridget Cove, a nearby control site. These devices provide a sample of bioavailable PAHs in seawater and air integrated over 30 days. Conventional seawater, sediment, and mussel tissue (*Mytilus trossulus*) hydrocarbon samples were also taken at four of the PEMD sites to compare to state water quality standards for Alaska. Most hydrocarbon concentrations were at or below minimum instrument detection levels in PEMDs, seawater, sediment, and mussel tissue, indicating near pristine conditions in Berners Bay. Total PAH concentrations in all matrices were below levels considered baseline for Prince William Sound, Alaska: 10 to 100 ng/L for water, 100 ng/g dry wt for sediment, and 90 ng/g dry wt for mussel tissue. The PAH patterns observed in the PEMDs with the highest concentrations are consistent with patterns for diesel fuel, and the higher concentrations coincided with increased commercial fishing in the area.

Eelgrass beds were mapped and the linear extent of understory kelp beds were determined in Berners Bay and Bridget Cove with GPS (global positioning system) technology. Both vegetation communities are limited to relatively narrow bands during the summer by glacial turbidity that reduces light attenuation. Eelgrass beds consisted of *Zostera marina* with some ephemeral algae, *Ulva*, and *Prophyra* in the more sandy areas. Area of eelgrass mapped ranged from small patches to large beds; the bed in Bridget Cove is the largest (5.76 ha) measured to date in the Juneau area. Kelp beds were dominated by ***Laminaria*** and ***Alaria*** spp.

Fish were sampled in eelgrass and kelp with a 37-m long beach seine. Six hauls were done in Berners Bay and six hauls in Bridget Cove. Twelve seine hauls yielded 9,653 fish comprising 24 species; 18 species were in eelgrass and 16 species were in kelp. Chum salmon (*O. keta*) fry were the most abundant species, comprising 87% of the total catch. Other federally or state-managed species that were captured included coho salmon, pink salmon, crescent gunnel (*Pholis laeta*), rock sole (*Lepidopsetta bilineata*), snake prickleback (*Lumpenus sagitta*), great sculpin (*Myoxocephalus polyacanthocephalus*), walleye pollock (*Theragra chalcogramma*), Pacific cod (*Gadus macrocephalus*), capelin, and Pacific herring. Total catch per seine haul, species richness, and species diversity were similar to those parameters observed

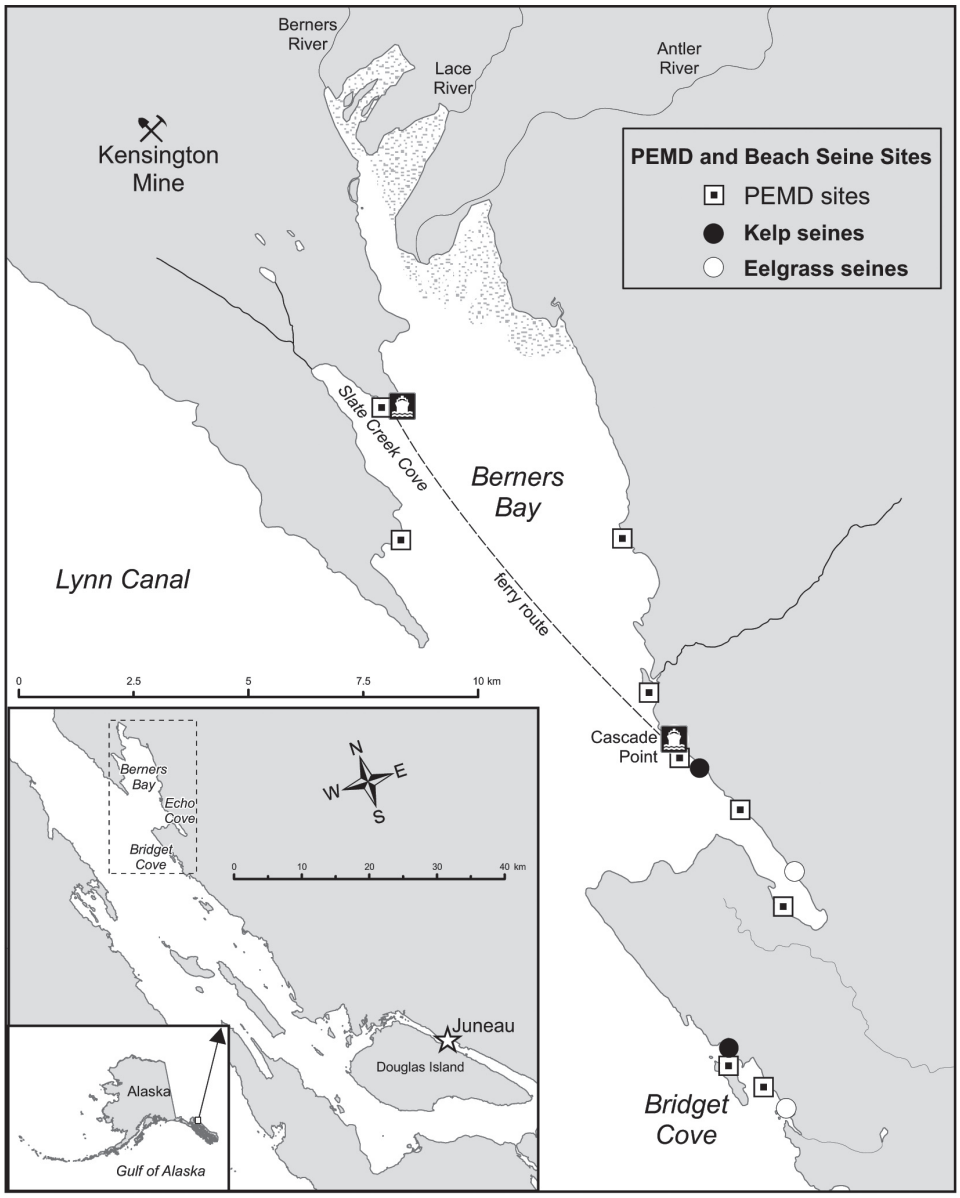

Figure 4. Location of polyethylene membrane devices (PEMDs) that sampled hydrocarbons in seawater and air, integrated over two 30-day deployment periods in 2004. Also shown are beach seine sites in eelgrass and kelp communities, and proposed ferry terminals and routes associated with the development of the Kensington Gold Mine in Berners Bay, Alaska.

at other sites in northern inside waters of southeastern Alaska. Most captured fish were juveniles, indicating the importance of nearshore habitats as nursery or rearing areas.

After another year of baseline sampling in 2005, frequency of monitoring will be determined by the rate of development and length of operation of the mine. We anticipate a project duration of 15 to 20 years. Information from this project will help resource managers track changes in hydrocarbons, fish use, and habitat quality in Berners Bay before, during, and after closure of the mine.

By Pat Harris

SOUTHEAST ALASKA REGIONAL SCIENCE FAIR

ABL scientists played an integral role in the 2005 Southeast Alaska Regional Science Fair. The fair, held on 5 March in Juneau, is for high school students in Southeast Alaska. The fair is affiliated with Intel's International Science and Engineering Fair, which is the world's largest science fair and has more than $3 million in awards in scholarships. Scientists from ABL mentored many of the 112 projects entered in this year's fair, and 4 of the ABL-mentored projects advanced to the final round of judging.

One of the ABL-mentored projects, "Evaluating Changes in PAHs in Gastineau Channel" by students Brenna Heintz and Clay Wertheimer and mentored by ABL fisheries scientist Bonita Nelson, was among the four projects selected to advance to the international science fair in Phoenix in May 2005. Bonita Nelson, Ron Heintz, and Lawrence Schaufler of ABL were on the judging and organizing committee for the Alaska Science Fair. The ABL also provided several judges to the fair, including Molly Sturdevant, Bonita Nelson, Mark Carls, Dean Courtney, Pat Harris, John Thedinga, and Alex Wertheimer, (who also mentored projects), and Mitch Lorenz, Angela Middleton, Phil Rigby, Cara Rodgveller, JJ Vollenweider, and Neal Muirhead. Other project mentors from ABL included Lisa Eisner, Sharon Hawkins, Jon Heifetz, Tom Rutecki, and Bruce Wing.

By Bonita Nelson

NATIONAL MARINE MAMMAL LABORATORY (NMML)

ALASKA ECOSYSTEM RESEARCH PROGRAM

Conferences and Symposiums

Lowell Fritz from the Alaska Ecosystem Program (AEP) was a keynote speaker at the Marine Science in Alaska Symposium (Anchorage, AK), sponsored by the *Exxon Valdez* Oil Spill Trustee Council and cosponsored by the AFSC on 24-26 January 2005. The theme for the symposium was "Marine Science in Alaska: Managing Alaskan Ocean Resources." Fritz discussed the differences in recent trends in the populations of western Steller sea lions and northern fur seals. Personnel of the AEP also were invited to participate in the Pribilof Islands Collaborative (PIC) northern fur seal meetings during January and March. The PIC, which is a coalition of environmental groups, fishing industry members, and islanders, was established to promote a strong economy and healthy ecosystem in the Bering Sea. Program scientists presented an overview on the status and life history of northern fur seals as well as future research needs.

Field Work

As part of a continuing effort to understand the factors affecting survival of juvenile Steller sea lions, AEP scientists are preparing for their annual sea lion capture field work, which will begin in mid-April in Dutch Harbor, Alaska, aboard the Alaska Bureau of Wildlife Protection vessel *Stimson*. This year the cruise will be a joint effort between researchers from the National Marine Mammal Laboratory (NMML) and the Alaska Department of Fish and Game (ADF&G) As in previous years, satellite-linked dive recorders will be deployed on juveniles to monitor their movements and diving behaviors. Additionally, indices of condition and health will be assessed. These ongoing studies will continue to provide valuable information pertaining to the foraging ecology and physiology of juvenile Steller sea lions. Captures will be concentrated in the Central Aleutian Islands where there has been substantial industrial growth and changes in commercial fisheries. In the near future, readers can log onto *http://nmml.afsc.noaa.gov/AlaskaEcosystems/sslhome/Satellite/* to view an interactive map containing the most recent data resulting from the April cruise.

By Michelle Lander

CALIFORNIA CURRENT ECOSYSTEMS PROGRAM

Field Work

Program research activities focused on pinnipeds at San Miguel Island (SMI) to support the demographic and foraging studies on California sea lions and the marine mammal component of NOAA's Ocean and Human Health Program.

To evaluate sea lion pup growth and health, 27 branded and 30 nonbranded pups were handled during 7-8 February 2005. Pups in the Adam's Cove area of SMI were herded and held in a temporary enclosure to facilitate evaluation including recording of pup weight, standard length, girth, and sex. Blood samples and fecal swabs were collected from both branded and nonbranded pups. Blood samples were analyzed for packed cell volume (PCV), and fecal swabs were sent to laboratories to test for the presence of hookworm eggs and various harmful pathogens that can be transmitted to humans. Two pups were outfitted with time-depth recorders and satellite transmitters (Fig. 1), and fecal swabs obtained from 30 elephant seal pups were also sent to a lab for analysis.

From 17 to 29 March 2005, juvenile sea lions were sampled and instrumented for a study examining the development of diving and foraging behaviors of juvenile sea lions. One of the two pups instrumented in February was recaptured in March.

Figure 1. A California sea lion pup on San Miguel Island, California, fitted with a satellite transmitter and time-depth recorder in March 2005 for the study of the development of diving and foraging behaviors. Photo by Tony Orr.

Five additional pups were captured and instrumented, and blood and fur samples were taken. Blood and fur samples were also obtained from three yearlings and three juveniles (2-3 year olds). Fecal samples were collected from areas that were primarily inhabited by immature animals. Preliminary investigation of the telemetry data indicate that the pups are diving to depths of 40 to 110 m and making daily or multiple day trips to areas around the island (north and south) and to areas north of Santa Rosa Island.

By Jeff Laake

CETACEAN ASSESSMENT & ECOLOGY PROGRAM

Bowhead Whale Workshop

On 23-24 February 2005, a Workshop on Bowhead Whale Stock Structure Studies in the Bering-Chukchi-Beaufort Seas in 2005-2006 was held at the AFSC. The workshop was convened by Sue Moore (AFSC) and J. Craig George (North Slope Borough). Thirty-two scientists from the United States, Russia, Norway, and Japan attended the workshop, including Doug DeMaster (AFSC Science Director) and Irina Benson (interpreter) and Dave Rugh, Kim Shelden, John Brandon, Paul Wade, Jeff Breiwick, Julie Mocklin, and Marcia Muto (Rapporteur) from the NMML Cetacean Assessment and Ecology Program.

The intention of the workshop was to provide an opportunity for open discussion of research approaches to investigate possible sub-stock structure in the Bering-Chukchi-Beaufort (BCB) population of bowhead whales, which inhabits waters around Alaska and is currently thought to consist of only one stock. Many papers on bowhead whale stock structure were presented at the 2004 International Whaling Commission Scientific Committee (IWC SC) meeting, from which a team of 12 U.S. researchers developed a provisional five-part plan for studying the stock structure of BCB bowhead whales. This provisional plan underwent review at the workshop, where participants discussed the applicability of techniques such as increased tissue sampling during the harvests, biopsies, development of additional genetic markers, photo-identification, satellite tagging, isotopic analysis of baleen, acoustic detection, and statistical modeling.

A summary report describing the workshop and revisions to the study plan was prepared, circulated to participants, and will be submitted as a "For Information" document to the Bowhead-Right-Gray (BRG) Subcommittee at the 2005 IWC SC meeting in Ulsan, Republic of Korea, 30 May to 10 June 2005.

By Marcia Muto, Dave Rugh, and Sue Moore

Minerals Management Service Meetings

The tenth Information Transfer Meeting for the Minerals Management Service's (MMS) Alaska Outer Continental Shelf (OCS) Program was held in Anchorage, AK, 14-16 March 2005. NMML was represented by Dave Rugh, from the Cetacean Assessment and Ecology Program, and Peter Boveng, from the Polar Ecosystems Program. Rugh presented information on photographic identification of bowhead whales, a process that has been employed for most of the past two decades. The MMS is supplying some funds to assist in the analysis of photographs collected in 2003 and 2004 near Point Barrow during the whales' spring migration. Boveng presented results from studies of harbor seals in Cook Inlet, particularly in regard to abundance, distribution, and habitat use. This study has been funded by the MMS since 2003.

The MMS also had an information update meeting in Barrow, Alaska, on 18 March 2005. The intent was to provide local natives with better access to results of research pertaining to the North Slope Borough. Eleven scientific reports were presented, including the bowhead photographic work presented by Dave Rugh.

By Dave Rugh and Peter Boveng

POLAR ECOSYSTEMS PROGRAM

Research Planning for Co-management of Seals in Alaska

Members of the Polar Ecosystems Program participated in two meetings with Alaska Native organizations to plan research and other activities in support of co-management of seals as subsistence resources. The first meeting, in Anchorage during January, was convened by the Ice Seal Committee, an organization representing subsistence hunters from five Alaska Native regional organizations: North Slope Borough, Maniilaq, Kawerak, and Bristol Bay Native Associations, and the Association of Village Council Presidents. Other participants included researchers from the NMFS Alaska Regional Office (AKR), the ADF&G, and the University of Alaska Southeast. A draft research plan for arctic ice seals (bearded, spotted, ringed, and ribbon seals) was developed to identify and coordinate the research priorities of these organizations. The plan, which is to be refined and updated annually, identified approximately $1.9M of research critical funding for 1) defining the identity and status of ice seal populations, 2) conducting comprehensive assessment of ice seal mortality including harvest, and 3) understanding the impact of industrial and climatological events on ice seal habitat and ecology. Only a small portion of this research is currently funded.

In March, a meeting of the Alaska Harbor Seal Co-management Committee was held in Juneau. This group is composed of three representatives from NMFS (two from AKR and one from the Alaska Fisheries Science Center), and three from the Alaska Native Harbor Seal Commission. An important agenda item for the meeting was consideration of steps to be taken following the independent scientific review of NMFS research on harbor seal population structure that was held in October, 2004 (*AFSC Quarterly Report* Oct-Nov-Dec 2004). A plan was developed for incorporating information relevant to improved definitions of harbor seal stocks (abundance, distribution, trends, genetic structure, subsistence harvest rates and zones, commercial fishing areas, etc.) into a GIS (geographic information systems) to support a joint discussion of possible revised stock boundaries.

By Peter Boveng

RESOURCE ASSESSMENT & CONSERVATION ENGINEERING (RACE) DIVISION

GROUNDFISH ASSESSMENT PROGRAM

Fiber-Optic Habitat-Mapping System Tested

RACE scientists are developing a fiber-optic interface (FOI) for mapping and groundtruthing seabed habitat in Alaska. The FOI is intended to support both digital sidescan sonar and a towed high-resolution video system to depths of 500 m. A fundamental requirement of this system is rapid switching between the sonar and video systems, according to mission requirements, based on a common subsea connection.

The FOI consists of 1) a high-speed cantilevered tow winch that permits rapid exchange of the spooled drum and slip ring as a unit, 2) 1,200 m of armored multimode fiber tow cable, 3) a combined electrical-optical rotary joint, 4) a stainless steel mechanical cable termination with electrical and mechanical connections, plus 5) subsea and topside electronics

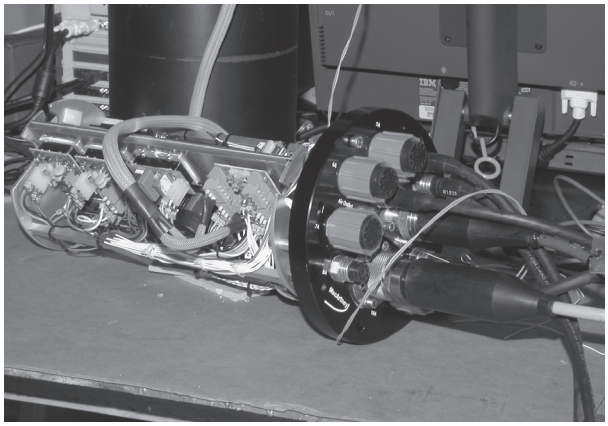

Figure 1. Subsea electronics that support multiplexed data communications between submerged instruments and topside computers. Photo by Karna McKinney.

Figure 2. Sidescan sonar being prepared for launch during sea trials in Puget Sound. Photo by Doug Swain.

to provide power to lights, cameras and the sonar, and to manage multiplexed data from multiple serial ports, analog video, and uncompressed 400 Mbps ("Firewire") video (Fig. 1).

A prototype system was tested during the week 31 January – 4 February 2005. Bench testing in Seattle confirmed general capabilities of the system, while sea trials in Puget Sound aboard the 57-m U.S. Navy vessel *Battle Point* evaluated performance with a Klein 5410 sidescan sonar and a revamped towed automatically compensating observation system (TACOS) video system (Fig. 2). Technical support was provided by the Naval Undersea Warfare Center (Keyport, WA), as well as DWS International Inc. (Corpus Christi, TX), L-3 Klein Associates (Salem, NH), MacArtney Underwater Technology A/S (Esbjerg, Denmark), and the University of New Hampshire (Durham, NH). Additional Puget Sound sea trials will occur later this year. Operational deployment in the eastern Bering Sea is planned for summer 2006.

By Bob McConnaughey

MIDWATER ASSESSMENT & CONSERVATION ENGINEERING PROGRAM

Winter Surveys in the Gulf of Alaska and the Southeast Aleutian Basin

Scientists from the Midwater Assessment and Conservation Engineering (MACE) Program conducted echo integration-trawl (EIT) surveys of the Shumagin Islands and Sanak Trough in the Gulf of Alaska 9-19 February (Fig. 3), and of the Bogoslof Island area in the southeastern Aleutian Basin, 7-12 March 2005 (Fig. 4) aboard the NOAA ship *Miller Freeman*. The surveys provided data on the abundance, distribution, and biological composition of spawning walleye pollock (*Theragra chalcogramma*). Echo integration and trawl data were collected 24 hours per day. A total of 16 trawl hauls were made in the Shumagin Islands and Sanak Trough regions, and 19 trawl hauls were conducted in the Bogoslof Island region. With a few exceptions, pollock dominated the trawl catches. The most notable exceptions were rockfish captured during the southeastern Aleutian Basin survey between Umnak Island and Unalaska Island.

For the Gulf of Alaska surveys, the densest pollock aggregations were located off Renshaw Point in the Shumagin Islands, and in the southern part of Sanak Trough (Fig. 3). The pollock size composition was unimodal in each of the two areas. Most of the pollock in the Shumagin Islands measured between 46 and 48 cm fork length (FL), and most of the pollock in Sanak Trough were between 48 and 49 cm FL. The unweighted maturity composition of female pollock with lengths greater than 40 cm, was 64% mature, 5% spawning, and 23% post-spawning (spent) in the Shumagin Island area, and 70% mature, 7% spawning, and 17% spent in Sanak Trough.

In the southeastern Aleutian Basin survey, pollock were concentrated in two main locations: northeast of Umnak Island, off Cape Idak, and just north of Samalga Pass, between the Islands of Four Mountains and Umnak Island (Fig. 4). Although pollock ranged between 37 cm and 73 cm FL for

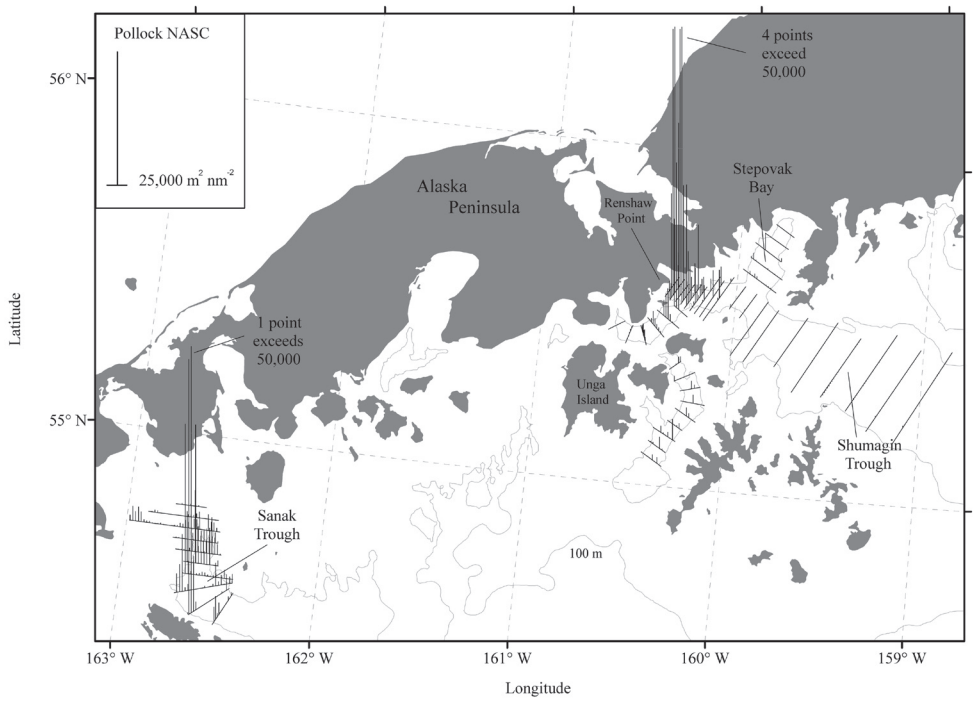

Figure 3. Relative backscattering (NASC) (m^2 nm^{-2}) attributed to pollock observed to within 3 m off bottom along tracklines surveyed during the 9-19 February 2005 echo integration-trawl survey of the Shumagin Islands and Sanak Trough in the Gulf of Alaska.

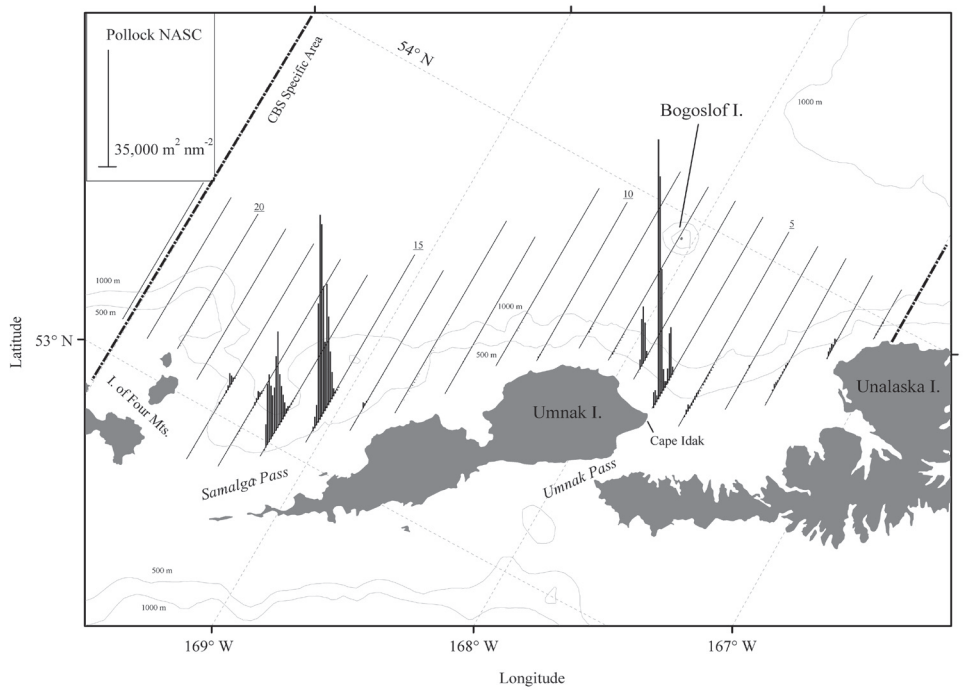

Figure 4. Relative backscattering (NASC) (m^2 nm^{-2}) attributed to pollock observed to within 3 m off bottom along tracklines surveyed during the 7-12 March 2005 echo integration-trawl survey of the southeastern Aleutian Basin near Bogoslof Island. Transect numbers are underlined and the Central Bering Sea (CBS) Specific Area boundary is marked.

each of the two regions, pollock off Cape Idak were predominately 42-45 cm FL, while most of the pollock in the Samalga Pass area were about 59-63 cm FL. The reproductive condition of female pollock was observed as 68% mature, 5% actively spawning, and 14% spent.

By Denise McKelvey

Acoustic Testing of NOAA Ship *Oscar Dyson*

Alex De Robertis of the MACE Program participated in sonar-self noise testing of the new NOAA ship *Oscar Dyson* from 10 to 13 December. The vessel underwent acoustic testing conducted by the U.S. Navy and NOAA personnel to confirm that sounds produced by the vessel do not interfere with the onboard scientific echosounders used for fisheries work. During the tests, De Robertis took measurements from onboard Simrad EK60 echosounders and SM2000 multibeam sonars, which will be compared to measurements from hull-mounted hydrophones to identify sounds produced by the vessel, and their influence on acoustic data collection.

By Alex De Robertis

Conservation Engineering

The Conservation Engineering Program continued cooperative work developing salmon excluders for the Alaska pollock fisheries. Carwyn Hammond travelled to Dutch Harbor in February to provide camera and sonar systems to fishers with these devices installed in their trawls and to train crews to use the observations systems. In March, Craig Rose participated in tests of the excluders aboard the FV *Destination*. Those tests were one of four such trips authorized under an exempted fishing permit issued to industry partners. The latest version of the excluder continued to allow significant salmon escape with little loss of pollock. Modifications alleviated most problems involving accumulation of animals and partial blockage at the excluder associated with high catch rates or jellyfish concentrations. Further improvements in exclusion rates and performance will be the goal of continuing work.

By Craig Rose

RESOURCE ECOLOGY & FISHERIES MANAGEMENT (REFM) DIVISION

RESOURCE ECOLOGY & ECOSYSTEM MODELING PROGRAM

Fish Stomach Collection and Lab Analysis

Laboratory analysis was performed on 4,905 groundfish stomachs from the eastern Bering Sea, 0 from the Gulf of Alaska, and 1,066 from the Aleutian Islands. During this quarter, 1,979 stomachs were returned by observers. No stomachs were collected aboard research vessels in the Bering Sea or the Gulf of Alaska, and 19,928 records were added to the groundfish food habits database.

By Troy Buckley, Geoff Lang, and Mei-Sun Yang

Seabird-Fishery Interactions Research

Shannon Fitzgerald continues his work with the Pollock Conservation Cooperative and Washington Sea Grant Program to develop seabird mitigation measures for large catcher/processor vessels in Alaska. The first part of the project is currently taking place on board the fishing vessel ***Northern Jaeger***, where a streamer line apparatus and third wire crane are being tested as seabird bycatch reduction devices. The next phase will involve a vessel with no meal plant.

By Shannon Fitzgerald

Multispecies Modeling

The project "Modeling of multispecies groundfish interactions in the eastern Bering Sea" has been awarded 2 years of funding from the North Pacific Research Board. The main goals for this project are to update Bering Sea multispecies models (multispecies virtual population analysis (MSVPA), multispecies forecasting (MSFOR), and multispecies statistical catch-at-age (MSM)) and to include recent food habits and fisheries (catch-at-age) data. A new module that includes technological interactions will be developed and tested for the MSFOR and MSM. The new version of MSM (with the technological interactions module) will make available the current tools used in single-species stock assessment in a complete multispecies context and will provide probabilistic statements on the future state of commercially important components due to alternative management scenarios.

By Jesus Jurado-Molina

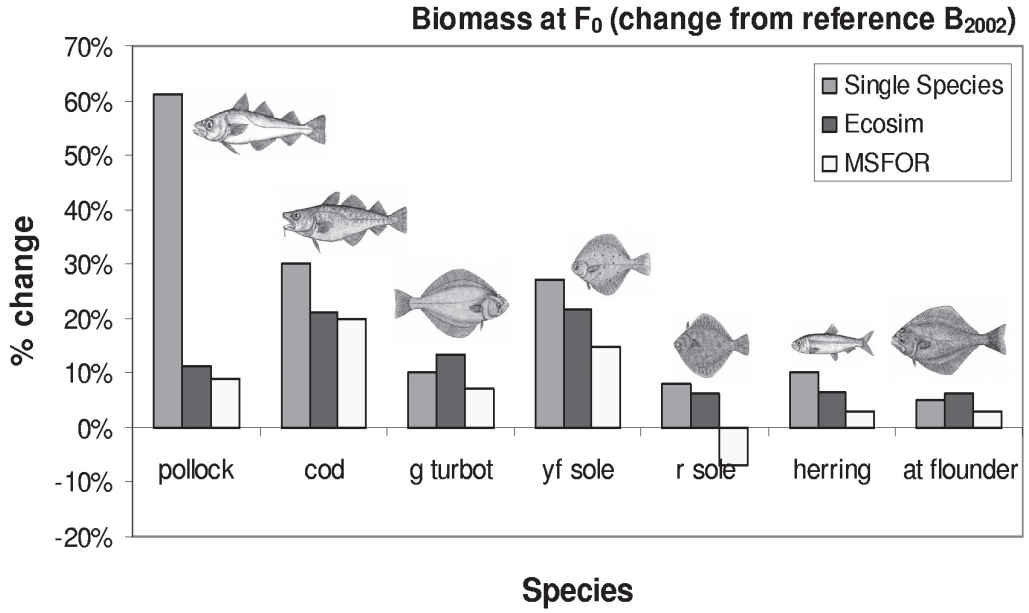

Figure 1. Simulated percent change of adult biomass for several target species in the eastern Bering Sea, after removing all fishing pressure for 20 years and assuming average recruitment over that time period, as reported by single species, multispecies (MSVPA), and ecosystem (Ecosim) models.

Multispecies and Ecosystem Modeling

NOAA's 5-year plan, "Towards Understanding and Predicting Earth's Environment," lists as a 3- to 5-year goal "developing the next generation of multispecies fisheries and food web production models." To aid in this development for the Alaska region, Kerim Aydin, Jesus Jurado-Molina, and Ivonne Ortiz helped organize a workshop on multispecies and ecosystem modeling, hosted by the North Pacific Fishery Management Council's Scientific and Statistical Committee in February 2005. At the workshop, 12 scientists from the Alaska Fisheries Science Center (including those mentioned above), University of Washington, and University of Alaska presented recent and upcoming work in developing assessment-quality models of species (predator/prey), technical (fishing gear) and management (management strategy) interactions for input into stock assessment, and other decision-making processes within a multispecies, multisector fishery.

Of specific interest to the workshop attendees was the investigation of simulations in which single-species models and multispecies models gave contrasting results. For example, Figure 1 shows the results of a simulated scenario consisting of removing all fishing pressure within the eastern Bering Sea ecosystem, then predicting the biomass of target species 20 years later under conditions of average recruitment. This same scenario was run with three models: a set of single species models similar to the current stock assessment models, a MSVPA model, and an Ecosim model. Results between models were similar for top predators such as Pacific cod and Greenland turbot. However, results for walleye pollock, a key forage species, showed different results when predator/prey interactions were included. Both the multispecies and ecosystem models predicted much more modest increases in pollock biomass than did the single-species model, as predation increased to compensate for the increase in food supply. It is hoped that the continued presentation of results such as these will become a useful addition to the management process.

By Kerim Aydin

U.S. NORTH PACIFIC GROUNDFISH OBSERVER PROGRAM

Biasing Observer Data Results in Fines and Imprisonment

Halibut bycatch in the groundfish fisheries is managed through caps on the total weight of halibut caught by vessels targeting groundfish. Estimates of halibut bycatch are based on data collected by onboard observers. After the observer has sampled the entire catch for species composition, any halibut present are discarded by the vessel. Effective man-

agement of the halibut bycatch caps in groundfish fisheries depends on high quality, accurate data provided by observers.

NOAA Fisheries Office for Law Enforcement (OLE) released information in January regarding the prosecution of two individuals for biasing observer data and fines levied against the individuals' employer. Unimak Fisheries was fined $300,000 by the OLE for infractions of the Magnuson-Stevens Fishery Conservation and Management Act by filing false reports to NMFS regarding halibut bycatch during groundfish fisheries in the Bering Sea and Gulf of Alaska (GOA) in 1999 and 2000. The crew of a vessel owned by Unimak Fisheries, the F/V *Unimak*, attempted to hide catch of halibut from the onboard observer in an effort to under-report the catch of halibut. Unimak Fisheries also must pay $200,000 in restitution to the International Pacific Halibut Commission, was suspended from fishing during the January 2005 groundfish season for 14 days, is on 18 months probation, and must hire an expert to examine and correct policies which may have promoted the criminal activity. For their parts in the crime, Captain Paul Ison and First Mate Daniel Skauge of the F/V *Unimak*, were sentenced to 4 months in prison, fined $25,000, ordered to pay $25,000 in restitution to the International Pacific Halibut Commission, must forego employment in the fishing industry for one year, and write an article for a fishing journal explaining their criminal behavior. Efforts to stop and penalize the biasing of observer data are important to the AFSC because of the reliance of scientists and managers on the data provided by the Observer Program.

Presentation to North Pacific Fishery Management Council

Members of the Observer Program gave an evening presentation about the Observer Program during the North Pacific Fishery Management Council (NPFMC) meeting in February. The informational meeting provided an opportunity for NPFMC members, industry members, and other interested parties to learn more about the Observer Program and to ask questions of staff.

Observer Services

Brian Mason taught a large class of 28 observer trainees in January. Observer training is an intensive 3-week course. Topics include sampling techniques and procedures, identification of fish, invertebrate, marine mammal, and seabirds, at-sea safety, and use of ATLAS, our electronic data entry and transmission system. The classes held at the AFSC afford trainees opportunities to meet and interact with Observer Program staff and some of the scientists who use the data collected by observers. Training classes are also held at the University of Alaska Anchorage Observer Training Center.

Field Operations

The Pacific States Marine Fisheries Commission (PSMFC) in cooperation with the Observer Program and NMFS Alaska Regional Office will be conducting an experiment this summer similar to work done in 2003. The project will occur during the summer central GOA trawl fishery from 5 July through mid-August. This period will cover three different fisheries and allow the agencies to conduct further trials of an alternative observer deployment model. In this model, the agency dictates where and when observers are deployed rather than the current system where individual vessels decide when to take observer coverage. An addition to this summer's project will be the use of brailers (nylon meshed collapsible bags), for collecting species composition samples at sea on a subset of the vessels. Observers typically collect catch using baskets or by diverting some of the catch from the vessel's stern deck. Brailers may offer a way to collect samples randomly while eliminating the potential bias of catch stratification on the deck. Both the traditional sampling and brailer sampling methods will be compared to a census of observed deliveries to evaluate the accuracy of these methods.

Information and Monitoring Technologies

During the first quarter of this year, 542,319 data records from vessels and processing plants were received, checked for errors, and loaded into the NORPAC inseason database. Quality control data checks are performed by both automated computer routines and by Observer Program staff. Staff members review the data for potential errors or problems and contact observers at sea via our custom software (ATLAS) to ask the observers to check and correct any errors or problems identified in their data. This system enables us to provide near real-time data to our clients.

Operations and Administration

Observer Program staff members are working with NPFMC staff on analyses to support the NPFMC decision-making process relative to the future status of the Observer Program. Staff members are also working with staff from the NMFS Alaska Regional Office on issues related to the implementation of other NPFMC actions. Amendment 80, a proposal to reduce bycatch, minimize fish waste, and improve utilization of fish resources in the Bering Sea and Aleutian Islands, will rely in part on bycatch and discard data collected by observers. The GOA Rockfish Pilot Program, a 2-year program intended to improve management of the GOA fisheries, will likely impact observer sampling and coverage protocols.

By Allison Barns

ECONOMICS & SOCIAL SCIENCES RESEARCH PROGRAM

New Research Funding

The Economics and Social Sciences Research Program (ESSRP) was awarded approximately $275,000 in new research funds for socioeconomic projects for FY05. These include three data collection projects: 1) to collect information for input in regional economic models; 2) to begin understanding aspects of the Bering Sea fishing operations (a Bering Sea operations survey); and 3) to complete community profiles for fishing communities in Alaska, Washington, Oregon, and California. Other projects include: 1) a project to develop an integrated regional economic-ecological model of Alaskan fisheries; 2) a project to measure the productivity changes in the offshore Alaska catcher-processor fleet; and 3) a project to convert historical employment data for Alaska fisheries to the North American Industry Classification System (NAICS), a new system for classifying economic activity.

Other Activities

Center economists worked with the NMFS Alaska Regional Office to implement the final rule for the Bering Sea Crab Rationalization Program and finalized the Economic Data Reports (EDR) that will be used to collect historic data for the fisheries for 1998, 2001, and 2004. The reports will be mailed to the parties that landed or processed crab during those years. The data collected within the EDRs will be used to establish a baseline in evaluating the effects of this novel and controversial program.

Harrison Fell, a graduate student in the Economics Department at the University of Washington, began work that analyzes the market demand and supply of the commercial Alaska pollock fishery. Fell has also recently been awarded a 2-year NMFS fellowship to continue this work, which will form the basis of his doctoral dissertation.

By Ron Felthoven

STATUS OF STOCKS & MULTISPECIES ASSESSMENT PROGRAM

Essential Fish Habitat Environmental Impact Statement

The Final Environmental Impact Statement for Essential Fish Habitat Identification and Conservation in Alaska (EFH EIS) is nearing completion. Status of Stocks & Multispecies Assessment (SSMA) staff and analysts from the AFSC's Auke Bay Laboratory and RACE Division completed substantial revisions and additions to Appendix B: *Evaluation of Fishing Activities That May Adversely Affect Essential Fish Habitat*. A new and innovative quantitative fishing effects model served as the basis for evaluating potential adverse effects of fishing on EFH. This model and the subsequent assessment methodology were the subject of an independent peer review by the Center for Independent Experts (CIE) in June 2004. The North Pacific Fishery Management Council's Scientific and Statistical Committee (SSC) also provided extensive comments on various technical aspects of Appendix B.

Appendix B was greatly expanded to address the comments and recommendations by the CIE review panel, the SSC, and the public. The analysts considered habitat effects with respect to species distribution, spawning/breeding, growth, condition (e.g., weight at length), feeding, and stock trends. Although the Appendix B analyses concluded that fisheries do have long-term effects on habitat, these impacts were considered minimal and would not have detrimental effects on fish populations or their habitats. Nevertheless, continuing with its long his-

tory of precautionary, ecosystem-based management policy, the Council adopted several new and significant measures to conserve EFH at its February 2005 meeting. The specifics of these measures can be found on the Council's web site at *www.fakr.noaa.gov/npfmc/current_issues/efh/efh.htm*.

By Dan Ito

Cod Local Depletion Study Completes Successful Field Season

REFM's Fishery Interaction Team has completed a third year of winter cruises for the Pacific cod local depletion study near Unimak Pass in the southeast Bering Sea. This year's cruises were conducted 8-28 January 2005 (before the start of the cod trawl fishery) and 12-31 March 2005 (after the main portion of the winter trawl season). The experiment, developed in 2002-03 under the Steller Sea Lion Research Initiative, is designed to test for the presence of local depletion effects from the winter trawl fishery on seasonal aggregations of Pacific cod. At issue is whether commercial fisheries affect food availability for endangered Steller sea lions by creating a localized depletion of sea lion prey.

Both winter 2005 cruises were highly successful, achieving good replication over the full array of 80 experimental stations. Auxiliary studies of cod spawning biology, temporal patterns in pot catch rate, and effects of depth and physical oceanography on catch rate were also completed. Project scientists M. Elizabeth Conners, Peter Munro, Yunbing Shi, and Sandi Neidetcher will present results of the experiment to the North Pacific Fishery Management Council at its June meeting in Girdwood, Alaska, and at the September meetings of the American Fisheries Society in Anchorage, Alaska.

This year is the third replication of the local depletion study. The experiment uses the 10-nautical mile (nmi) no-trawl boundary zone around Cape Sarichef on Unimak Island to define "treatment" (subject to heavy trawl fishing) and "control" areas (open to fixed gear, but closed to trawling). Both zones intersect a shelf area at 40-50 fathoms that has historically been a popular cod trawling ground. The experiment uses modified pot gear to measure an index of local cod abundance. The goal of the experiment is a statistical test of whether cod local abundance in the trawled area declines relative to the control area.

Results of the experiment in 2003 and 2004 showed no differences in cod local abundance or in the seasonal rate of change in abundance between the treatment and control areas. While 2003 results were considered inconclusive due to a small sample size, 2004 results were based on a full sample of three to five fishing days at each experimental station in each cruise and had good statistical power. Analysis of auxiliary biological and tagging data collected during the experiments indicated that cod in the study area were highly mobile over short time scales. The experiment is designed to look for a local depletion effect that covers a small area (5-10 nmi) and persists in time over several weeks. The negative results of the 2004 experiment suggest that fishing effects may be dispersed over a wider spatial scale or may not persist long enough to be measured. The experiment is being repeated to see if these results are consistent over year-to-year changes in ocean conditions and timing of cod spawning migrations.

By M. Elizabeth Conners

Peter Munro of the Fisheries Interaction Team (FIT) during the winter FIT survey inspects as Pacific cod dump from the pot onto the sorting table. Photo by Sandi Neidetcher.

Evaluation of Localized Depletion for Aleutian Islands Pacific Ocean Perch

Localized depletion has been identified as a potential conservation issue for rockfish. Stock structure of certain species of rockfish could occur at relatively small spatial scales; thus, local depletions could affect these local populations to a greater degree than the overall population. Declines in fishery catch-per-unit-effort (CPUE) within small spatial areas could be indicative of population declines and thus localized depletion. In this study, we examine Pacific ocean perch (POP) CPUE from the Aleutian Islands POP fishery in recent years, to investigate the extent to which CPUE has declined during the course of the fishery. The POP fishery

in the Aleutian Islands is characterized by relatively few vessels fishing for a few weeks in July. Data were obtained from three areas (two near Buldir Island and one near Atka Island) where large POP catches recently have occurred.

A total of 10 datasets from the three areas were examined from 2000 to 2004. Of these 10 datasets, 8 did not show a significant decline in CPUE that would be expected with a fishery-induced localized depletion. The two area-year combinations where declines in CPUE were significant were northwest Buldir in 2003 and 2004. If localized depletion occurs at temporal scales longer than 1 year, one would expect the CPUE in 2004 to be consistent with estimates observed near the end of the 2003 fishery. However, CPUE in 2004 was consistent with most of the days in 2003, suggesting that localized depletion does not seem to have carried over between years. It appears that any population decline during the 2003 fishery has been replenished by population movement and/or recruitment before the 2004 fishery. One of the features of the POP fishery is that it is limited to only a few days each year in any given area, and the total number of hauls from which a daily CPUE can be computed may be limited to three or less for some area-day combinations. The small number of hauls can potentially have large influence on the results.

The appropriate spatial and temporal scales at which localized depletion becomes important for rockfish is a subject for future research. The extent to which localized fishing becomes problematic for rockfish is dependent upon the ability of rockfish to replenish fished areas such that local spawning populations are not negatively impacted. Considerations regarding localized depletion for rockfish should reflect the spatial scale characterizing fish movement within a year and the location and spatial extent of spawning populations, but this information is largely unknown for Aleutian Islands rockfish.

By Paul Spencer and Rebecca Reuter.

Stock Assessment Research

A growing portion of the research at the AFSC focuses on approaches to assessing groundfish stock conditions. These analyses formulate the basis of catch recommendations that are made to the North Pacific Fishery Management Council (NPFMC). The Council goes through a process of reviewing these recommendations relative to the fishery management plan (FMP) and, following extensive discussions, develops Total Allowable Catch (TAC) recommendations which are then submitted to the Secretary of Commerce for approval. These are generally accepted as is and implemented in the subsequent year by the NMFS Alaska Regional Office. The analyses at the early stages of this process are contributed in large part by the AFSC scientists. Part of this research entails evaluating the overall management strategy, also known as a "Management Strategy Evaluation" or MSE. In an MSE, alternative hypotheses about the population dynamics and ecosystem responses can be posed in a model framework and tested using our current system of management (e.g., a "standard" stock assessment model using typically available data and managed under typical FMP/Council situations). Large numbers of simulations can be generated and statistics evaluated to understand how well the current management system will perform under different scenarios. For example, SSMA staff developed an approach that can evaluate hypothetical productivity changes (i.e., due to short- and medium-term climate variability) for flatfish species in the eastern Bering Sea. Also, a University of Washington graduate student (Teresa A'mar) is conducting research using an MSE approach to evaluate impacts specific to Gulf of Alaska pollock. SSMA staff have held mini-workshops on MSE approaches. This is likely to be a long-term activity, particularly as the current NMFS National Standard Guidelines for fisheries management are under revision and new management strategies will need to be evaluated.

By Jim Ianelli

AGE & GROWTH PROGRAM

Estimated production figures for 1 January 2005 through 31 March 2005

Species	Number Aged
Arrowtooth flounder	49
Walleye pollock	4,434
Pacific cod	713
Atka mackerel	1,555
Sharpchin rockfish	569

Total production figures were 7,320 with 1,408 test ages and 33 examined and determined to be unageable. The Age and Growth Program is documenting methods for a future ageing manual.

By Dan Kimura