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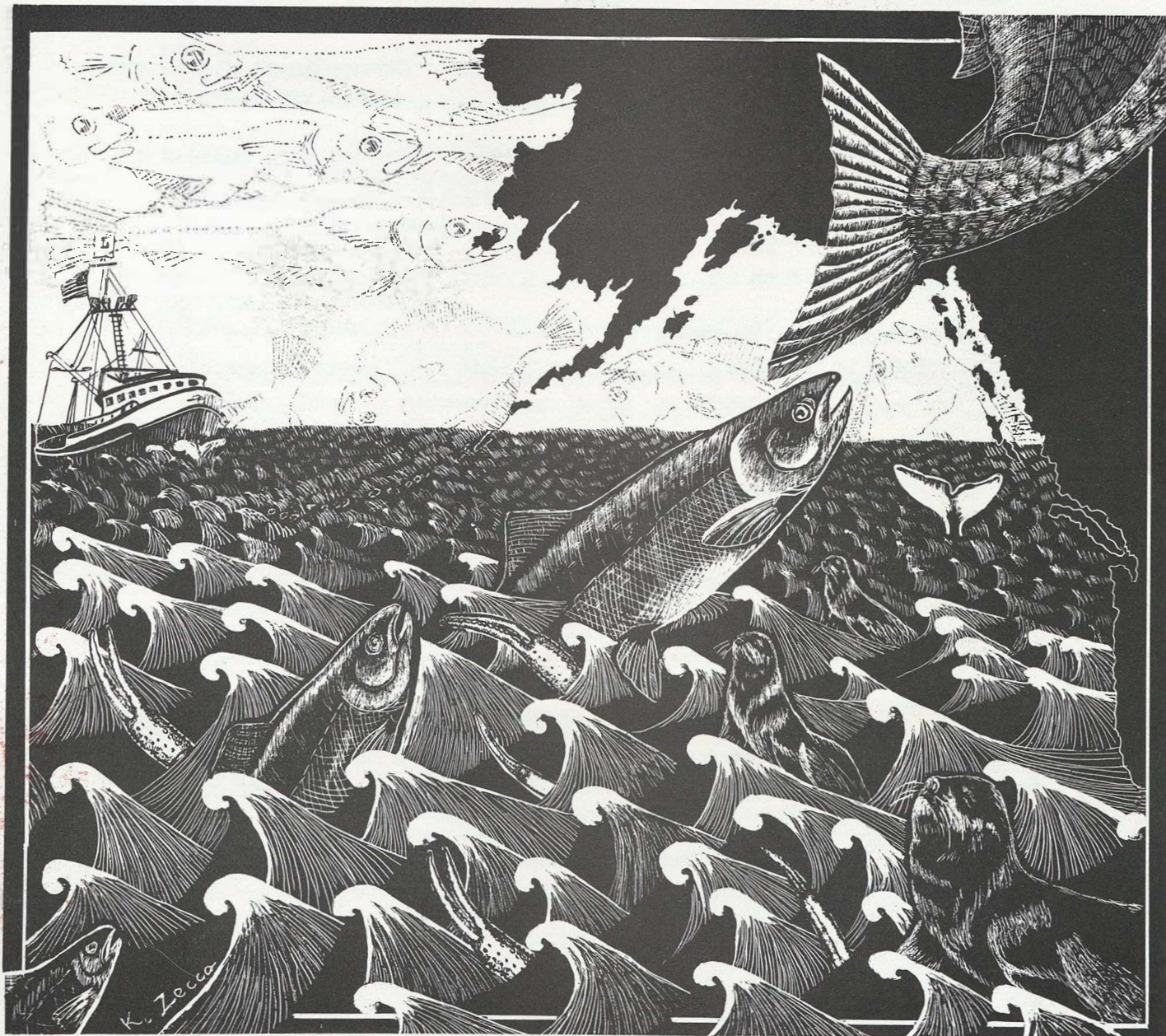
Alaska Fisheries Science Center

Quarterly Report

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Cover illustration by Katherine Zecca.

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Pat Kerlik

The Center's success is due to its incredible collection of outstanding individuals. Pat Kerlik was one of them.

In her role as Secretary to the Center Director since 1983, Pat played an essential role on the Center Director's team, working over the years with an assortment of Directors, Deputies, personalities, temperaments, and management styles. Pat handled them all, cool as a cucumber, always professionally, and always with a twinkle in her eye. Pat was an important liaison with the outside community, particularly the Center's constituents in the fishing community and our colleagues in Washington, D.C. Despite these individuals' frequent and urgent requests, all requiring immediate priority, Pat was unfailingly polite and effective in channeling their demands. She was quick to recognize the voices and positions of the callers and made them feel they were dealing with an old friend who really wanted to help. And Pat did. She set an important tone for the Center, often converting an angry caller to an admirer. She had many admirers.

Pat made each of us feel as if we were a special person to her—probably we were. She remembered personal details of each of our lives. Whether we were concerned over careers, pet dogs, or our children's report cards, Pat was also concerned. Pat was the one who remembered birthdays and the one who brought the cake. Pat was born on November 1, which is All Saints' Day. To many, she was a saint.

Pat helped the Center through several difficult transitions. The move from the Montlake Laboratory to the Sand Point facilities in 1985 was accomplished quickly and efficiently, with people, files, communication networks, and furniture disappearing from Montlake one day and magically appearing at Sand Point the next, with virtually no down time. The

second transition was more subtle and perhaps more difficult—the change from IBM Selectrics to the current PC regime. (Younger staff may have to ask their older colleagues what an IBM Selectric is.) The confusion, frustration, and anguish of the change, especially for those over 30, was indeed difficult. Pat coped with the complexities, kept her sense of humor, and kept the Center Director's Office functioning—no small accomplishment.



The fighting spirit that marked Pat's last few years may very well be a reflection of her strong interest in professional hockey. Pat was well versed on pucks, icing, and two line passes, and rarely missed a home game of the Seattle Thunderbirds. It was a plus on her score sheet, for the two most recent Center Directors have had more than a passing interest in the sport. And although it's unclear that Dr. Aron ever really understood the substitution rules, it's certain that Pat did.

Pat's people skills were outstanding, as well demonstrated by the overwhelming response by Center staff to the request for leave donations during her battle with cancer. She died on March 26, 1998. She will be deeply missed by all of us fortunate enough to have known her.



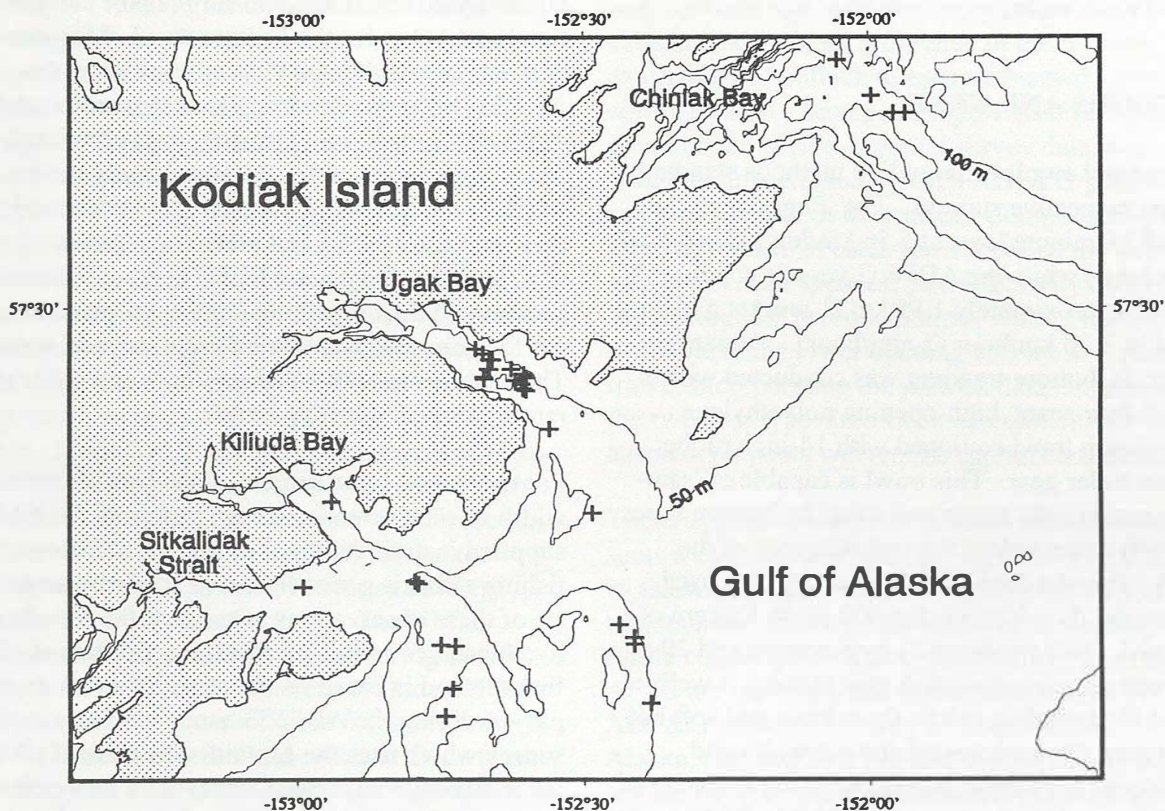


Figure 1. Station locations of the fishing vessel *Peggy Jo* and the research vessel *Resolution* during the October 1997 NMFS/ADF&G trawl comparison study.

National Marine Fisheries Service/Alaska Department of Fish and Game Trawl Comparison Study

By Eric Brown and Harold Zenger

Scientists from the Alaska Fisheries Science Center's (AFSC) Resource Assessment and Conservation Engineering (RACE) Division in cooperation with the Alaska Department of Fish and Game (ADF&G) completed a 12-day fishing gear calibration study in waters off the east side of Kodiak Island, Alaska, (Fig. 1) on 24 October 1997 (see *Quarterly Report*, October-November-December 1997). The purpose of the study was to detect and measure fishing power differences between the net and vessel configuration used by the National Marine Fisheries Service (NMFS) during their Gulf of Alaska (GOA) triennial groundfish surveys and the net and vessel configuration used

by the ADF&G during their annual crab/groundfish survey of the western and central GOA. The results will allow both NMFS and the ADF&G to augment each of their surveys by allowing direct comparisons of their respective databases for the dominant species encountered during the experiment.

Three vessels, the state of Alaska research vessels *Resolution* and *Pandalus*, along with the NMFS chartered fishing vessel *Peggy Jo* participated in the experiment. After completing only nine tows, the *Pandalus* was forced to drop out of the experiment due to mechanical problems. The results of the trawl comparison experiment are reported

only for the activities conducted aboard the *Peggy Jo* and *Resolution*.

METHODS AND GEAR

Each vessel employed trawling methods standard to their respective surveys. The *Peggy Jo* conducted 15-minute tows at 5.56 km/hour (3 nautical miles/hour) while the ADF&G vessels conducted tows of approximately 1.85 km (1 nmi) at a towing speed of 3.70 km/hour (2 nmi/hour). Aboard the *Peggy Jo*, bottom trawling was conducted with a NMFS four seam, high-opening polyethylene Nor'eastern trawl equipped with 14-inch rubber bobbin roller gear. This trawl is capable of sampling moderately rough and irregular bottom types typically encountered throughout much of the GOA. The standard ADF&G survey gear used aboard the *Resolution* is the 400-mesh Eastern otter trawl. This net has a 21-m headrope and 29-m footrope which lacks roller gear making it well suited for sampling relatively smooth and soft bottom types. On each vessel, the net width and height was constantly monitored using a system of headrope and wing sensors (SCANMAR) that was linked acoustically to the vessel. Actual distance fished was determined using a combination of global positioning system (GPS), footrope-mounted bottom contact sensors (BCS), and headrope-mounted micro-bathythermograph units (MBT), which recorded depth along with temperature. Catches on each vessel were sorted, weighed and enumerated by species using methods common to each survey. Length-frequency measurements were collected for selected species.

RESULTS

A total of 33 paired tows were completed by the two vessels. Tows made by the *Peggy Jo* with the NMFS survey gear averaged 0.27 hour in duration and 1.45 km in length, while those made by the *Resolution* averaged 0.41 hour and 1.74 km. The mean towing speed of the *Peggy Jo* was 5.28 km/hour compared to 4.23 km/hour for the *Resolution*. Trawl measurements obtained with the SCANMAR system indicated mean net widths of the NMFS and ADF&G nets were virtually identi-

cal at 13.8 m while the vertical openings were significantly different at 6.9 m for the Nor'eastern trawl and 1.9 m for the Eastern trawl. Mensuration data also indicated that on some tows, the ADF&G net had a tendency to narrow somewhat as the tow progressed, probably related to catch accumulation in the codend. Occasionally the net width of the 400-mesh Eastern trawl decreased and then increased by several meters in a pulsating pattern, as if the doors were losing contact with the bottom and then regaining contact, or perhaps as if the footrope was running into sand or mud waves. The NMFS net with its larger doors and roller gear rarely showed a similar pattern.

For each vessel, the distance fished and mean net width of each tow was determined from the NMFS-supplied instrumentation. For the NMFS tows, the fishing effort is generally based solely on an analysis of these observations. On board the *Resolution*, two measures of fishing effort were obtained. The first method is based on the standard methods employed during the ADF&G annual crab/groundfish survey which uses the captain's estimate of distance fished along with a constant 12.2 m estimate of trawl width. During this study a second estimate of fishing effort was measured based on an analysis of the instrumentation data collected aboard the *Resolution* during each tow.

Comparing the two measures of fishing effort obtained aboard the *Resolution* indicates the effort based on the data collected by the NMFS electronic instrumentation was 17% higher than the effort based on the captain's estimate of distance fished and a constant net width of 12.2 m. A major factor in this difference is the net staying on bottom and continuing to fish after initiating trawl retrieval resulting in a mean distance fished of 1.85 km compared to the captain's bridge estimate of 1.74 km. Another factor contributing to a higher fishing effort is an observed mean net width 1.6 m wider than the standard estimate of 12.2 m.

Four groundfish species dominated the catches. Flathead sole (*Hippoglossoides elassodon*) was the most abundant species accounting for over 30,000 kg of total catch between both vessels. The second most dominant species was walleye pollock (*Theragra chalcogramma*) with 26,000 kg

followed by arrowtooth flounder (*Atheresthes stomias*)—17,000 kg, and Pacific cod (*Gadus macrocephalus*)—2,000 kg. Other species or species groups such as snow (Tanner) crabs, scallops, sculpins, skates, and other flatfish were taken throughout the comparison study but represent far lower abundance levels and far fewer occurrences in catches.

In general, the NMFS trawl configuration with higher vertical opening and roller gear was more efficient in capturing the two roundfish species while the lower opening ADF&G trawl without roller gear was most efficient for the two flatfish species. Mean CPUEs based on the standard methods of calculating fishing effort common to each survey indicated the greatest relative difference in catch rates was for walleye pollock where the Nor'eastern trawl was 3.1 times more efficient than the 400-mesh Eastern trawl. The NMFS trawl was also most efficient at capturing Pacific cod by a factor of 1.59. Conversely, the ADF&G configuration was most efficient for the two dominant flatfish species, flathead sole and arrowtooth flounder, with relative differences of 1.61 and 1.49, respectively.

While the *Resolution* generally captured considerably more flathead sole and arrowtooth flounder than the *Peggy Jo* did, the respective size compositions of those species were quite similar between the two vessels (Fig. 2). On the other hand, the *Peggy Jo* captured far more walleye pollock of all sizes than the *Resolution* did. The size compositions of pollock captured by each vessel were quite similar for fish 30 cm or larger, but the absence of age-0+ and age-1+ pollock from catches by the *Resolution* was very notable. These observations are not surprising given the lower vertical opening of the 400-mesh Eastern otter trawl, which is designed for maximum bottom contact, compared to the high opening Nor'eastern trawl with roller gear and the demersal distribution of flatfish and semipelagic distribution of pollock.

DISCUSSION

While the experiment was successful in determining the relative differences between the two sur-

veys in catchability of walleye pollock, Pacific cod, flathead sole, and arrowtooth flounder, the results indicate a large difference in the relative availability of pollock to each of the two survey configurations. Incorporating the ADF&G pollock data into the NMFS triennial survey database would require expanding each ADF&G pollock catch by a factor of over three. Compounding the large difference in catch rates between the two gear types is an apparent size selectivity difference suggesting that juvenile pollock are not readily available to the lower opening 400-mesh Eastern trawl. Incorporating the pollock data collected by the two gear types into stock assessments for management purposes will require careful consideration.

The cooperative nature of the experiment represents a commitment by both NMFS and ADF&G to assist and support each other on problems of mutual interest. Plans are already well under way for future cooperative efforts. Researchers from the AFSC are making plans to participate in an ADF&G seasonality study of Marmot Bay, Alaska, planned for 1998 and 1999. The AFSC has also committed supplemental resources to the ADF&G annual crab/groundfish survey in an effort to provide stock assessment scientists with additional biological information for selected groundfish species.

The AFSC would like to acknowledge the cooperation and teamwork demonstrated by the captains, crews, and scientists aboard each of the three vessels. Their commitment and enthusiasm were instrumental in meeting the study objectives. Particular thanks go to Captain Ron Kutchick of the *Resolution* whose intimate knowledge of the study area resulted in choosing tow sites that provided consistent catches for the major target species. Thanks also to Captain Brian Beaver and crew of the *Peggy Jo* and Captain Paul Desjardin and crew of the *Pandalus* for their skill and patience in executing the research plan. ADF&G biologists Dan Urban of the *Resolution* and Bill Bechtol of the *Pandalus* willingly shared their expertise and provided valuable leadership throughout the experiment.

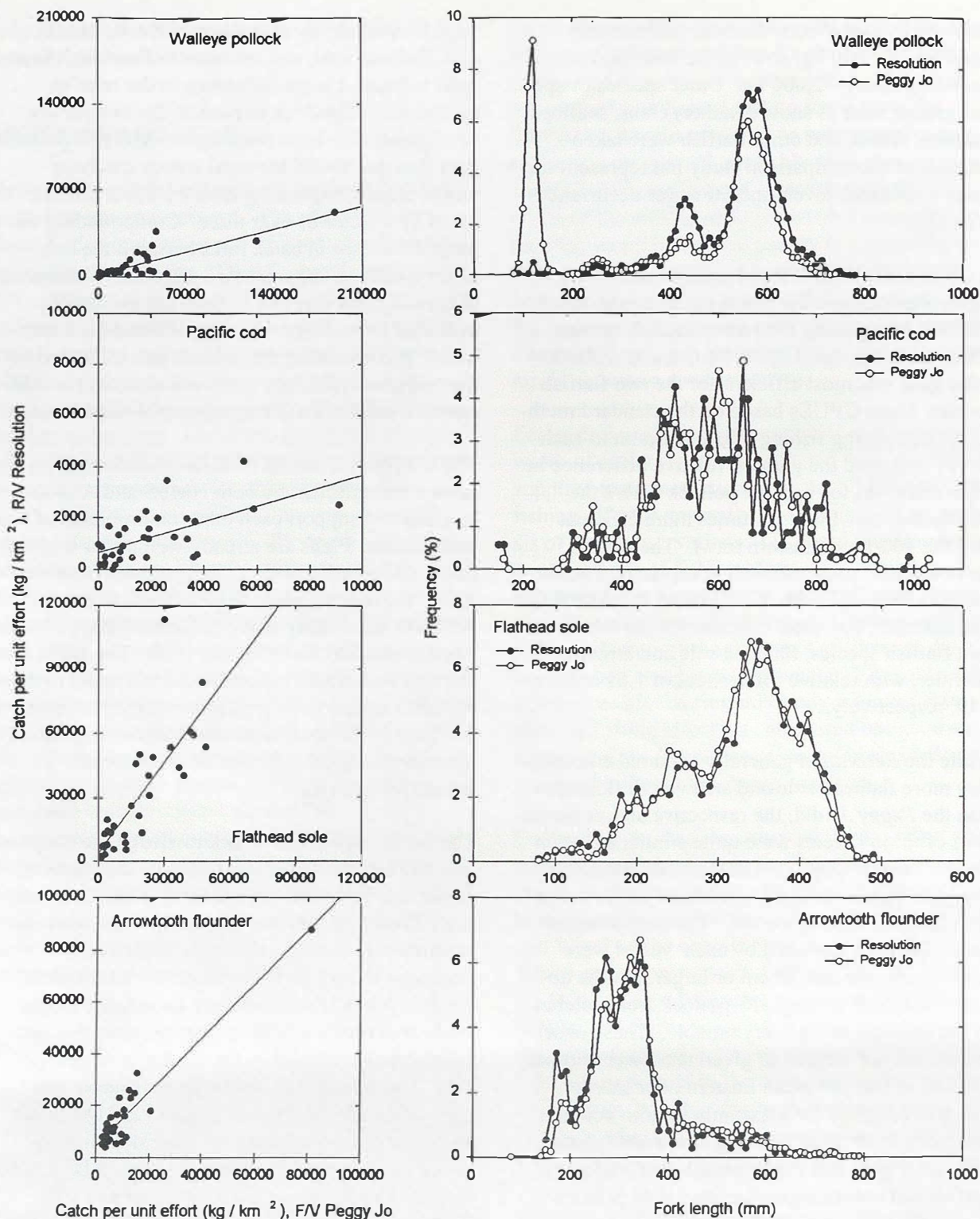


Figure 2. Catch per unit effort and unweighted size compositions for the four predominant species captured during a fishing gear calibration study conducted by NMFS and the ADF&G.

AUKE BAY LABORATORY (ABL)

Essential Fish Habitat Studies

A new provision of the Magnuson-Stevens Fishery Conservation and Management Act of 1996 requires NMFS to describe, identify, conserve, and enhance essential fish habitat (EFH). Currently, NMFS lacks information needed to identify and describe EFH for several species of fish that inhabit the North Pacific Ocean. For example, the EFH Technical Team for North Pacific Groundfish designated the knowledge currently available on habitat requirements for egg, larval, and juvenile stages of most groundfish species as insufficient to determine species distributions or to describe the types of habitat where a species might occur. Thus, basic life history information is needed to carry out the mandate of the Act to identify and conserve EFH. Recently, NMFS headquarters allocated funding to its different regional offices, and the EFH Core Team in each region determined the spending plan for these funds. The ABL received funding for four studies, two of which will begin in spring 1998.

The first project will study nearshore habitat use by juvenile groundfish. An underwater video system will be used in conjunction with traps, nets, and other gear to evaluate methods for capturing juvenile groundfish in nearshore marine habitats as well as for characterizing structure of that habitat. In following years, these methods could be used to characterize EFH according to physical and biological parameters and to develop indices of relative abundance of groundfish.

The second project will study urban development-related effects on eelgrass habitat. The most significant consultation activity of NMFS in Alaska concerns Clean Water Act Section 404 permits for filling nearshore areas associated with urban development. Frequently, NMFS has recommended to deny or modify 404 permits. Of primary concern are the effects of nearshore development on eelgrass habitat, which is thought to be important rearing habitat for juvenile salmon during their critical early-ocean period. The ramifications of widespread approval of 404 permits could signifi-

cantly impact the population levels of anadromous salmonids. The focus of the EFH study is to 1) assess cumulative effects of the 404 permitting program by inventorying existing eelgrass and areas already filled in the vicinity of Craig, Alaska; 2) provide updated digital GIS (geographical information systems) maps of existing eelgrass and other estuarine habitats near Craig; and 3) determine the role of eelgrass and other estuarine habitats as essential fish habitat for anadromous salmonids.

By Mike Murphy and Scott Johnson.

Duck Creek Salmon Habitat Restoration Project

The Duck Creek Salmon Habitat Restoration Project is a community-based program designed to maintain and restore salmon habitat in urban streams near Juneau, Alaska. Ongoing projects led by ABL staff include evaluation and monitoring of existing habitat quality, evaluation of restored salmon spawning habitat, and creation of a storm water treatment marsh.

In 1997, ABL staff received funding from the NOAA Restoration Center to restore the channel and clean spawning gravel in a 300-m reach of Duck Creek, an impaired urban stream. Before restoration, salmon eggs that had been placed in hatch boxes and buried in Duck Creek died almost immediately. Mortality was attributed to large amounts of fine sediment and low dissolved oxygen in the intergravel water. In February 1998 after restoration of the Duck Creek reach, 84 Whitlock-Vibert hatch boxes containing eyed coho salmon eggs and a standardized substrate were buried in selected reaches of Duck, Jordan, Steep, and Vanderbilt creeks. University students and community members are helping to monitor and gather samples from the sites. Egg-to-fry survival will be compared over time and between streams. As the boxes are removed from the streams, sediment retained in the hatch boxes and spawning gravel in the immediate area are collected and sieved to compare survival with substrate composition. Water samples are also taken periodically from

each box and measured for dissolved oxygen levels. The stages of the developing embryos or fry when the boxes are removed will be compared to control groups incubating at the Auke Creek Hatchery and also in aerated Duck Creek water.

Coho salmon eggs and fry incubated in urban stream treatments in 1996 have been dissected and photographed with a digital camera. The images are being downloaded into a digitizing program in which the larvae yolk sac and length can be measured. The ratio of yolk sac to body length will be used to compare the effects of various restoration methods on salmonid embryo development.

A 2-acre storm-water treatment marsh designed by ABL staff is under construction in cooperation with local landowners and the City and Borough of Juneau. Project staff expect that the marsh will filter storm water and poor quality ground water, thereby improving water quality downstream of the project and providing better rearing habitat for anadromous fish. Previously, the pond provided little fish habitat because it intercepted ground water high in minerals, such as iron and manganese and with almost no dissolved oxygen. The pond also contained many urban pollutants from the storm water that was routed to it. Much of the pond has now been filled to levels that will support marsh and aquatic vegetation. Sandy material supplied from municipal construction projects makes up the bulk of the fill and is topped with 6-12 inches of peat and organic soil. Over 1,000 starts of plants such as sedges, horsetail, and marsh marigold have been gathered from local marshes and planted in the constructed marsh.

By Mitch Lorenz.

Adaptive Sampling of Rockfish in the Gulf of Alaska

AFSC scientists have relied heavily on results of research trawl surveys to assess stock condition of rockfish (*Sebastes* spp.) that live along the continental slope (slope rockfish). However, these surveys are believed to be inadequate for estimating rockfish abundance. Biomass estimates for rock-

fish often show large fluctuations from survey to survey, which do not seem reasonable given the slow growth and low natural mortality rates of all *Sebastes* species. Several factors may contribute to the surveys' performance regarding rockfish assessment. 1) The surveys are multispecies in design and attempt to determine abundance of all groundfish species residing on the continental shelf and upper continental slope, not just rockfish. Because of the large survey area necessary to sample species residing on the shelf, relatively little sampling effort is directed toward the habitat occupied by slope rockfish. 2) The standard survey net is designed for a relatively smooth seafloor and cannot be fished at many of the rough-bottom locations where rockfish are often found. 3) The surveys use a stratified random methodology to select their pattern of trawl stations. This approach may be inappropriate for many slope rockfish species that are known to have a highly clustered distribution, such as Pacific ocean perch (*Sebastes alutus*).

In cooperation with the Juneau Center, School of Fisheries and Ocean Sciences at the University of Alaska Fairbanks (UAF), ABL scientists have initiated a 2-year study to evaluate a new survey method specifically designed for slope rockfish. This study was selected for funding under the Sea Grant-NOAA Partnership National Strategic Initiative competition. The study will focus on three commercially important species of slope rockfish: Pacific ocean perch, shortraker rockfish, and rougheye rockfish. The net used will be equipped with tire gear to facilitate trawling over rough substrate, and a new survey design, adaptive sampling, will be investigated. Scientists from the AFSC's ABL and Resource Assessment and Conservation Engineering (RACE) and Resource Ecology and Fisheries Management (REFM) Divisions are participating in the planning and field data collection for this study. For the 1998 study, a chartered commercial trawling vessel will be used for a period of 17 days in August in waters near Kodiak Island, Alaska.

Adaptive sampling is a relatively new technique that has been rarely used in fisheries applications. However, this sampling method appears to be particularly appropriate for populations with a clustered distribution, such as that observed for Pacific

ocean perch. An application of adaptive sampling to larval fish populations by scientists at the Southwest Fisheries Science Center resulted in increased survey precision as well as information about the dimension of egg and larval patches. In adaptive sampling, random or systematic sampling is initially used to locate concentrations of the targeted species and is then followed by intensive sampling in the vicinity of the concentrations. A brief adaptive sampling experiment for Pacific ocean perch was conducted in April 1996 using the NOAA ship *Miller Freeman*, and it indicated that adaptive sampling may have benefits over random sampling in assessment surveys for rockfish. The 1998 study will be a follow-up to the 1996 work but will be expanded in duration and area so that a comprehensive evaluation of the adaptive sampling methodology can be made.

By Jon Heifetz and Dave Clausen.

ABL Sablefish Tag Recovery Program

The sablefish tag recovery and reward program continued during 1997. Data entry and production of tag reward letters were streamlined further by the development of Oracle forms and reports more suited to a UNIX environment. The database for sablefish tagged and released in Alaska waters now contains 288,910 release records and 20,192 recovery records. The number of recoveries per year (about 700 in 1997) continued to decline due to low numbers of tags released since the final Japan-U.S. cooperative longline survey in 1994. Over 38% of fish recovered in 1997 had been at liberty for more than 10 years, and five of those fish had been out for more than 24 years. Tagging was resumed in 1997, with 3,847 adult sablefish tagged and released during the annual longline survey.

Otoliths from 7 known-age sablefish (i.e., fish tagged as juveniles) were recovered during 1997, bringing the total otolith collection of these fish to 81. These otoliths will be used to evaluate ageing criteria for sablefish. In another study, some tagged sablefish were injected with oxytetracy-

cline (OTC), a chemical which is taken up by bony tissues, including otoliths, and leaves a distinctive mark. Otoliths from three more OTC-tagged fish were recovered during 1997; in all, otoliths have been collected from 68 of the OTC-tagged fish. Some OTC-marked otoliths have been collected in each of the 9 years since the tagging was carried out. To date, most of these otoliths have not been examined.

By Nancy Maloney.

Early Marine Growth Affects Interannual Variability in Production of Southeast Alaska Pink Salmon

Scales were collected from the late-run adult pink salmon (*Oncorhynchus gorbuscha*) returning to the Auke Creek weir in the northern region of Southeast Alaska from 1979 to 1996, and scale circuli distances (C) were used as an index of body growth. Approximately 50 scales were selected each year, and a Calcomp Digitizing Tablet was used to count circuli and measure distances between circuli along an axis 20 degrees from the anterolateral line. Commercial catch data were used to estimate Southeast Alaska pink salmon production (data provided by the Alaska Department of Fish and Game). Spawning escapement data were excluded from the estimate of production because escapement data are derived mostly from peak counts of salmon in index spawning streams and the actual numbers of spawners are unknown.

We found differences in scale growth between years of high and low production of Southeast Alaska pink salmon. The largest difference in growth occurred at the earliest circuli (C), and the difference in growth persisted through C8. Little difference in scale growth was observed between years of high and low production levels from C8 to C15, which coincides with the scale circuli associated with the supplementary check typically found on pink salmon scales. Scale growth was again higher during years of higher production from C18 to C19, during the later coastal residency in pink salmon.

Year-to-year changes in early marine scale growth (C1-C6) were highly correlated ($p < 0.001$) with production (commercial catch) of pink salmon in Southeast Alaska. This association remained significant even after differencing both time series to remove trends, and when early marine scale growth was included in a spawner-recruit model. However, scale growth during later coastal ocean residency (C15-C19) was not significantly correlated with production. These findings are consistent with previous studies on chum salmon (*O. keta*) that found that production was most significantly related to scale growth from C2 to C4.

This relationship between growth and production supports the concept that growth during the early marine life of Southeast Alaska pink salmon may be particularly important in determining their survival to adulthood. Changes in climate, therefore, might affect salmon production by affecting growth and size-selective mortality, where the risk of predation for young salmon is greater for slower growing and smaller individuals. Although, predation during the residency of young pink salmon in coastal waters may be important, the size of the salmon may not be as important in determining predation risk in coastal waters as it is during early residency in the ocean.

By Jim Murphy.

Spring Cruise of the NOAA Ship *Miller Freeman* Finds Ocean Chum and Sockeye Salmon

ABL's Ocean Carrying Capacity (OCC) program used the *Miller Freeman* between 27 March and 3 April 1998 to 1) collect oceanographic data for characterizing ocean conditions during the current el Niño event, 2) evaluate the effectiveness of two midwater trawls in capturing Pacific salmon, and 3) locate immature and maturing salmon in the Gulf of Alaska during early spring. Temperature, salinity, and plankton data were collected along the Cape Chiniak transect, a 60-nautical mile (nmi) transect beginning at Cape Chiniak, outside Kodiak, and ending beyond the edge of the continental shelf. This transect is one of several coastal

monitoring transects established by OCC and Canadian high-seas salmon researchers. Additional temperature and salinity data were at 60-nmi intervals as the vessel moved south in search of salmon.

The principal goal of the cruise was to look at the winter distribution of immature and maturing salmon in the Gulf of Alaska. Two trawls were used: a Canadian rope trawl rigged to fish near the surface (headrope depth of less than 20 m) and an Aleutian wing trawl that fished at depths from 20 m to the deep scattering layer, which ranged from 320 to 390 m. The Canadian trawl was used during the day, at dusk, and before sunrise; the Aleutian trawl was used both day and night.

Repeated weather fronts restricted the number of trawl samplings to 16 and limited the southward extent of the survey. Overall, we captured 14 chum salmon and 7 sockeye salmon, all near the Jones, Gibson, and Hecht seamount areas located about 288-360 nmi south southeast of Cape Chiniak. The salmon were generally caught near the surface and appeared to be in small and widely scattered schools.

One immature chum salmon with a fork length (FL) of 265 mm and weight of 167 g was from the 1995 brood year. The remaining chum salmon were maturing (eight were from the 1994 brood year and five from the 1993 brood year); of these, lengths ranged from 570 to 612 mm (average 594 mm) and weights ranged from 2.0 to 2.9 kg (average 2.4 kg). The brood years of the seven sockeye were 1992 (two individuals), 1993 (one individual), 1994 (four individuals). One of the 1992 brood year sockeye salmon had two freshwater annuli, and all of the other sockeye had just one freshwater annulus each. Fork lengths were 426-547 mm (average 504 mm), and weights were 0.9-1.9 kg (average 1.5 kg). Eight chum salmon had from one to three newly formed circuli after the last annulus, and in six chum salmon the annulus was in the process of forming with no new circuli present. All of the sockeye salmon scales had from two to four circuli after the last annulus, indicating new spring growth.

By Dick Haight.

Feeding Interactions of Nearshore Forage Fish in Single-species and Multi-Species Aggregations in Prince William Sound, Summer 1996

One component of the Alaska Predator Ecosystem Experiment (APEX) investigates feeding competition among forage fish (food for seabirds and marine mammals) in Prince William Sound (PWS), Alaska. Evidence for competition among forage fish may help to explain changes in their populations and the lack of recovery of predatory seabird populations affected by the *Exxon Valdez* oil spill.

We compared the stomach contents of juvenile herring, pink salmon, and sandlance to each other and to zooplankton samples collected at the same time to investigate whether food habits were different when any of these species occurred together compared to when they occurred alone.

Sandlance and herring both ate smaller proportions of their principal prey when they occurred together or with pink salmon, and the total amount of food eaten decreased for all three species when they occurred with each other (Fig. 1). The feeding declines also may have been related to lower zooplankton abundance in areas where these fish species occurred together. These changes suggest that when fish interact in common feeding areas they individually eat less. If these forage species regularly compete for food in areas where zooplankton are less available, then seabird and mammal populations could continue to be affected because fewer or smaller forage fish would be available as food.

By Molly Sturdevant, Leland Hulbert, and Audra Brase.

Feeding Variation of Walleye Pollock and Pacific Herring in Prince William Sound, Fall 1994-95

The composition of forage fish in PWS has changed dramatically since the early 1970s. Various monitoring studies have observed that schooling forage fishes such as capelin, sandlance, and Pacific herring have been in a decline, and demersal species such as walleye pollock and Pacific cod

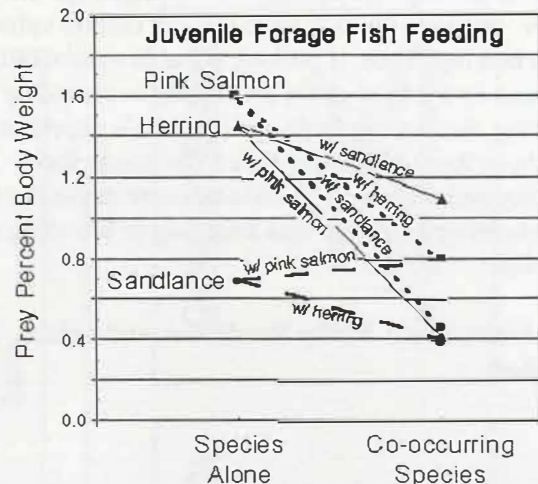


Figure 1. Decline in prey consumed by juvenile pink salmon, herring, or sandlance occurring together compared to each species occurring alone.

have been increasing. This shift has been attributed to many stressing factors, such as an increase in El Niño events leading to increased sea surface temperatures, a herring virus, and the *Exxon Valdez* oil spill. While it is unclear which events caused the shift, it is clear from catch data that the interaction of walleye pollock and Pacific herring is increasing and therefore the potential for food competition has increased as well. An APEX study has focused on determining 1) the effect the increased interactions may have on walleye pollock and Pacific herring and 2) the effect these changes in forage fish might have on the marine birds and mammals of PWS.

Forage fish and their prey were collected from PWS in November 1994 and October 1995 with midwater trawls and vertical plankton nets. The contents of the fish stomachs and the available food organisms caught in the plankton nets were then examined in the laboratory to compare feeding between single species and multispecies aggregations of walleye pollock and Pacific herring. The conclusions of the study were that young-of-the-year (YOY) walleye pollock and YOY Pacific herring occur together during at least part of the year in PWS. They consume similar prey, and they do not selectively feed upon dramatically different prey. Therefore, these species may be in direct competition for food, which may result in one

species having a competitive advantage over the other. Walleye pollock have a lower caloric value than herring. Thus, if pollock are able to take over a space in the food chain previously occupied by herring, the marine birds and mammals dependent on these forage fish may face a decline in food quality and may have to allocate more resources towards foraging rather than breeding or brooding activities.

By Audra Brase, Molly Sturdevant, and Leland Hulbert.

ABL Reference Collection

Curator of the ABL reference collections lent specimens of *Gymnocanthus* to the RACE Division for studies on Alaskan sculpins and specimens of the black-spined sea star, *Lethasterias nanimensis*, to the British Columbia Royal Museum for studies on echinoderms of British Columbia and Alaska. He also received 133 specimens of snailfish, *Liparis* spp., that had been on an extended loan to the Royal Museum, and he received from the NMFS Enforcement Sitka Office the carapace of a Pacific Ridley turtle that had been found on a beach near Ketchikan, Alaska in 1991. This is the first confirmed Pacific Ridley turtle found in Alaska.

By Bruce Wing.

Seabird Avoidance in Longline Fisheries

A draft of "Test Plan to Evaluate Effectiveness of Seabird Avoidance Measures Required in Alaska's Hook-and-Line Groundfish Fisheries" was prepared in late March by staff of the ABL, the Protected Resources Division and Sustainable Fisheries Division, and the NMFS Alaska Regional Office (RO). The plan consolidates an earlier plan drafted by the ABL and RO with significant contributions by staff of the U.S. Fish and Wildlife Service (USFWS), International Pacific Halibut Commission, and Washington Sea Grant Program.

The Food and Agricultural Organization (FAO) of the United Nations, Japan, and the United States have agreed to organize an FAO consultation on incidental catch of seabirds in longline fisheries to be held in Rome, Italy, in October-November 1998. In preparation for the FAO consultation, the Seabird Technical Working Group (STWG) was established and is preparing three background papers which 1) describe the pelagic and demersal longline fisheries (areas, catches, technology and fishing effort), 2) review the incidental catch of seabird in specific longline fisheries, and 3) review seabird bycatch mitigation measures and their effect on other marine species. Mike Sigler prepared a description of longline fisheries for groundfish in Alaska for the first report. The principal author of this report is Svein Lokkeborg, Institute of Marine Resources, Norway.

NATIONAL MARINE MAMMAL LABORATORY (NMML)

Organization of the National Marine Mammal Laboratory Changes

Over the last 24 months, the National Marine Mammal Laboratory (NMML) has lost through retirement or employment elsewhere seven key scientists. To accommodate these changes and to allow a greater emphasis on the three stocks of harbor seals in Alaska, the NMML has reorganized, as presented in Figure 1. The following changes are notable: 1) Charles Fowler, in addition to directing the Ecosystem Management and Ecology Program, will also direct the Program Management Task; 2) responsibility for harbor seal research will move from the Alaska Ecosystem Program to the Polar Pinniped Program (PPP). Along with this change in responsibility, Dave Withrow and Jack Cesarone will be moved to the PPP, where they will continue to work on harbor seal studies; 3) Rich Ferrero and Rod Hobbs will serve as acting Program Leaders for the Cetacean Assessment and Ecology Program (CAEP) until a replacement for the previous program leader (D. DeMaster) can be hired; 4) Marilyn Dahlheim and

ORGANIZATION OF THE ALASKA FISHERIES SCIENCE CENTER'S NATIONAL MARINE MAMMAL LABORATORY (April 98)

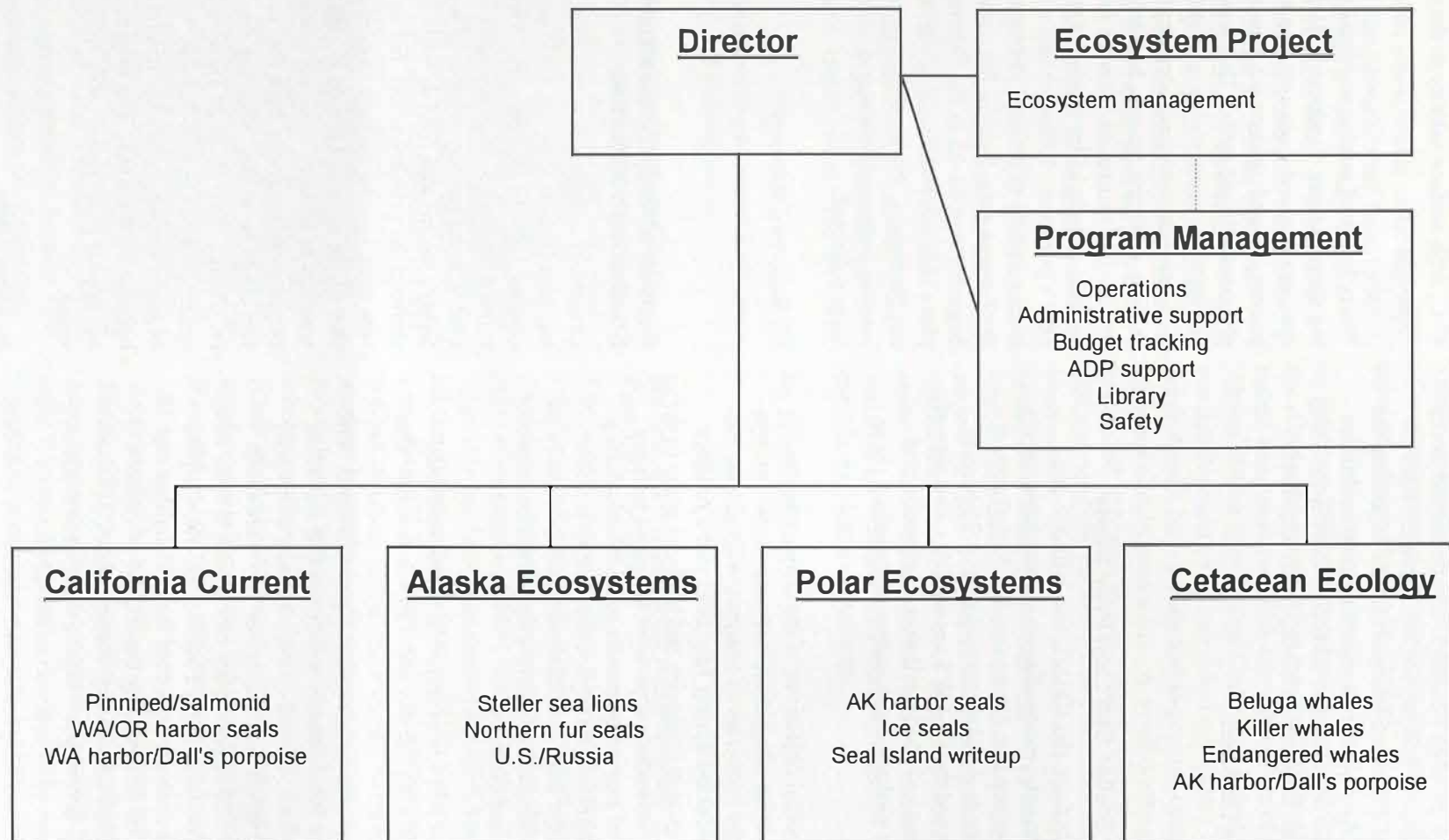


Figure 1. Reorganization chart of the National Marine Mammal Laboratory.

Marcia Muto, formerly in the Ecosystem Management and Ecology Program, will be moved to the CAEP; and 5) Robyn Angliss, formerly with the Office of Protected Resources, will be joining the CAEP. Any questions regarding responsibilities under this organization should be directed to Doug DeMaster, Director, NMML, (206) 526-4047.

By Doug DeMaster.

Winter Steller Sea Lion Prey Study

Scientists from the NMML and USFWS conducted an echo integration-midwater trawl survey for Steller sea lion (*Eumetopias jubatus*) prey at three sites in Alaska waters during 4-25 March 1998 aboard the USFWS vessel *Tila*. The area of operations included the Buldir, Kasatochi, and Ugamak rookeries and waters surrounding these sites.

The principal objectives of the cruise were to 1) conduct echo integration-midwater trawl surveys around the rookeries to compare with similar surveys conducted during July 1997 and 2) collect scat samples at rookeries and haul-out areas in the region. Secondary objectives included sighting surveys of marine mammals and seabirds during echo integration surveys, collection of blubber samples for fatty acid analysis, counts of sea lions by age and sex, and capture and instrumentation of juvenile sea lions.

A total of 483 km of transects were completed—355 km during the day and 128 km at night. One midwater trawl survey using a 6-m modified herring trawl was conducted at Ugamak Island. The midwater trawl found a variety of fish including adult pollock, as well as euphausiids, a few jelly fish, and larval fish. Longline sets were made within 2 nmi of Kasatochi and Buldir Islands and caught Pacific halibut, Pacific cod, and sculpins. Stomach contents collected from 15 halibut and 18 cod will be analyzed by the REFM Division's Food Habits Laboratory. Seventy-six CTD (conductivity-temperature depth) casts were made during the survey. Continuous sea surface temperature (SST) and salinity data were obtained

during all transects. SST was typically around 3°-4° C, with surface salinity in the range of 32‰-33‰.

Thirty hours of marine mammal and seabird sighting surveys were conducted. The most common species observed were common and thick-billed murres, crested auklets, white winged scoters, and glaucous-winged gulls. This was distinctly different from the species observed at the sites during summer—shearwaters, northern fulmars, tufted puffins, common murres, black-legged kittiwakes, and ancient murrelets. Marine mammal species sighted include killer whales, a minke whale, and Dall's porpoise. Killer whales were seen in sufficient numbers to attempt photographing them: 8 in the Kanaga area, 8-10 in Amchitka Pass, 5 near Seguam, and 12-15 in the Ugamak area. Scat samples (184) were collected at various sites throughout the region. No juveniles were captured for satellite instrumentation and no blubber samples were collected.

By Kathryn Chumbley.

Census of Gray Whales During Their Southbound Migration

Observers conducted counts of gray whales migrating past Granite Canyon, California, from 13 December 1997 to 24 February 1998. Observers were rotated through 3-hour standard watches and covered 9 hours per day whenever weather allowed. Severe storms and road damage on 2 February stopped the primary effort, but an alternate site was used 11-24 February to continue documentation of the seasonal trends in sighting rates. Most watches in January were conducted as paired, independent observations such that comparisons of effort could be made. Sighting rates were low (< 1/hour) from 13 to 24 December, increasing to nearly 14/hour in mid-January, then decreasing until mid-February when the migration reversed and became northbound. The migration timing does not appear to be remarkably different from other years.

By Dave Rugh.

Comanagement of Marine Mammal Subsistence Use

Section 119 of the 1994 amendments to the Marine Mammal Protection Act authorizes the Secretaries of Commerce and Interior to "enter into cooperative agreements with Alaska Native organizations to conserve marine mammals and provide comanagement of subsistence use by Alaska Natives." The purpose of such cooperative agreements would be to enhance communication and cooperation between the Federal Government and Alaska Native organizations by forming partnerships to

- 1) collect and analyze data on marine mammal populations,
- 2) monitor the harvest of marine mammals for subsistence use,
- 3) participate in marine mammal research conducted by the Federal Government, state governments, academic institutions, and private organizations, and
- 4) develop marine mammal comanagement structures with Federal and state agencies.

Beginning in 1995, representatives from NMFS, the USFWS, and the Biological Resources Division of the U.S. Geological Survey met with representatives of Alaska Native organizations to explore ways to implement the provisions of Section 119. Those discussions revealed a strong mutual desire both by the Federal Government and Alaska Natives to work more closely with each other to conserve marine mammal populations and to ensure the long-term sustainability of subsistence harvests. All parties expressed interest in finding ways to prevent marine mammal stocks from diminishing beyond the point at which they cease to fulfill their role in their ecosystem and to levels that do not allow sustainable subsistence harvests. The negotiations concluded successfully in August 1997 with the signing of a Memorandum of Agreement between the Federal agencies noted above and the Indigenous People's Council for Marine Mammals, which provides a foundation for developing individual agreements under Section 119. This umbrella agreement outlines the framework within which Federal agencies and Alaska Native

organizations will work together to formulate individual agreements that will address specific issues of marine mammal conservation and comanagement of subsistence use in Alaska.

In February 1998, representatives from NMML, the Alaska Regional Office, and the Office of Protected Resources met with representatives of the Alaska Native Harbor Seal Commission to discuss the development of an individual agreement to conserve Alaska harbor seals and to provide comanagement of subsistence use. A small drafting group met in March to move that process forward, and a conceptual framework and draft outline has been agreed. Drafting of a potential agreement between NMFS and the Alaska Native Harbor Seal Commission is expected to continue over the next several months. It is hoped that if an agreement can be finalized, it will serve to strengthen NMFS' ability to meet its Alaska harbor seal conservation and management goals by working together with the Alaska Native community.

By John Bengtson.

Marine Mammal Stock Assessment Reports Revised

The NMML in conjunction with the Alaska Scientific Review Group (SRG) has revised 15 of the 33 stock assessment reports for stocks of marine mammals recognized to inhabit Alaska waters. The revised Alaska stock assessments for 1998 include all the strategic stocks (western U.S. Steller sea lions, eastern U.S. Steller sea lions, northern fur seals, Cook Inlet beluga whales, sperm whales, western North Pacific humpback whales, central North Pacific humpback whales, fin whales, right whales, and bowhead whales), plus harbor seals (Gulf of Alaska, Bering Sea, and Southeast Alaska stocks), and killer whales (eastern North Pacific transient and northern resident stocks).

Additionally the NMML, in conjunction with the Pacific SRG, has revised five of six stock assessment reports for marine mammal stocks in the Pacific Region. The revised Pacific stock assessments include the following stocks: Oregon

and Washington coastal waters harbor seal; Washington inland waters harbor seal; San Miguel Island, California, northern fur seal; Oregon and Washington coast harbor porpoise; and inland Washington harbor porpoise.

Fishery mortality sections in the revised reports have been updated where possible to include Observer Program data, fisher self-reporting data, and stranding data through 1996. Similarly, subsistence harvest information through 1996 has been included for those stocks which are taken by Alaska Natives for subsistence purposes. New abundance estimates are available and have been included in the revised assessments for both Steller sea lion stocks, both northern fur seal stocks, Cook Inlet beluga whales, both humpback whale stocks, Gulf of Alaska harbor seals, both killer whale stocks, Oregon and Washington coastal waters harbor seals, inland Washington harbor seals, and Inland Washington harbor porpoises. Revised potential biological removal (PBR) levels have been calculated for all stocks having new abundance estimates. The new information on abundance and mortality did not change the status (strategic or not) of any of these stocks relative to the 1996 stock assessment reports. Finally, habitat concerns have been addressed for all strategic stocks.

The revised 1998 Marine Mammal Stock Assessments are currently in draft form and soon will enter a 90-day public comment period. It is anticipated that the 1998 stock assessment reports will be finalized in October 1998.

By Scott Hill.

RESOURCE ASSESSMENT AND CONSERVATION ENGINEERING (RACE)

Winter 1998 Bogoslof Survey of Spawning Walleye Pollock

Scientists in the AFSC's Midwater Assessment and Conservation Engineering (MACE) program

conducted an echo integration-trawl (EIT) survey of walleye pollock (*Theragra chalcogramma*) in the southeastern Aleutian Basin near Bogoslof Island 1-10 March 1998. Scientists from Korea and Japan also participated in the survey. The work was conducted aboard the NOAA Ship *Miller Freeman*. This was the 10th annual survey (excepting 1990) in a series that began in 1988 with the objective of assessing the population distribution and abundance of spawning pollock in this region. The survey area extended from approximately long. 166°00'W to long. 170°20'W and from the Aleutian Island chain to 20-80 nmi offshore. Acoustic data were collected along a trackline consisting of 27 transects spaced at 10 nmi east of long. 167°10'W and 5 nmi to the west. Fourteen midwater trawl hauls were made to sample echosign and provide biological data on spawning pollock. The geographic distribution of pollock was similar to that observed in 1996 and 1997. Approximately 70% of the biomass was located in the off-shelf waters between the Islands of Four Mountains and the west end of Umnak Island. The majority of the fish encountered were in prespawning condition. Lengths ranged from 34 to 66 cm with a major mode at 54 cm, and fish less than 48 cm comprised 17% of the surveyed population. Preliminary analyses resulted in a biomass estimate of 0.5 million metric tons.

By Taina Honkalehto.

Winter 1998 Shelikof Strait Survey of Spawning Walleye Pollock

An EIT survey to assess the distribution and abundance of spawning walleye pollock within Shelikof Strait was conducted between Chirikof Island and Cape Chiniak during 11-25 March 1998. This is the 17th annual spawning stock survey of walleye pollock in the Shelikof Strait area since 1980 (no survey in 1982). A total of 1,800 nmi of transect trackline and 31 hauls were completed during the survey. As in previous years, most spawning pollock were distributed along the western side of the strait with greatest densities near Capes Kekurnoi and Kuliak. Fish were most abundant within 50-150 m of the bottom. The size distribu-

tions of pollock from hauls within the strait generally exhibited dominant modes around either 30-39 cm or 50-60 cm FL. Sixty percent of the females greater than 34 cm FL were in either prespawning or spawning condition and only 9% were spent. Pollock from the 1994 year class (30-39 cm FL mode) formed a strong, well-defined midwater layer (150-200 m depth) that was broadly distributed from about Uyak Bay south to Sitkinak Strait. The areal extent and strength of this layer of 4-year-old fish supports earlier EIT survey observations that the 1994 year class is relatively strong.

By Michael Guttormsen.

RESOURCE ECOLOGY AND FISHERIES MANAGEMENT (REFM)

Status of Stocks and Multispecies Assessments

Status of Stocks and Multispecies Assessments staff in collaboration with geneticists from the Northwest Fisheries Science Center, Seattle, Washington, conducted an analysis of length-at-age and weight-length growth patterns from over 500 Atka mackerel (*Pleurogrammus monopterygius*) and 37 protein-coding gene loci. The purposes of the study were to analyze geographic variation in genetic and growth patterns of Atka mackerel collected during the 1993 and 1994 NMFS summer trawl surveys in the Gulf of Alaska and Aleutian Islands region, respectively, and to determine the relationship among Atka mackerel stocks in the Aleutian Islands region. Atka mackerel growth data differed significantly by area for length and weight characteristics, suggesting the formation of local aggregations which develop differential growth patterns. However, potential stock delineations based on growth patterns were not supported by the genetic data. Atka mackerel showed a high degree of genetic variability. Variation was detected at 30 of 37 loci; 14 of the 30 loci were variable at the $P_{0.95}$ level. Average heterozygosity for 329 specimens was 0.137, an unusually high value for a marine fish. Between-sample variation

among samples was extremely low ($F_{ST} = 0.004$), suggesting considerable gene flow throughout the range represented by the samples. Based on the genetic data, the null hypothesis that the samples came from a single genetically homogenous population of Atka mackerel was not rejected. It is presumed that gene flow occurs throughout the population through the dispersal of pelagic larvae and juveniles. We concluded that despite the genetic homogenization, phenotypic variation in Atka mackerel post-larvae life history stages warrants consideration in fisheries management. The results of this analysis were presented at the 1998 Western Groundfish Conference in Asilomar, California (see Items section in this issue), and a paper on the subject is in press for *Fishery Bulletin*.

By Sandra Lowe.

U.S. Groundfish Observer Program

During the first quarter of 1998, 162 observers were trained, briefed, and equipped for deployment to fishing and processing vessels and shoreside plants in the Gulf of Alaska, Bering Sea, and Aleutian Islands. They sampled aboard 231 fishing and processing vessels and at 18 shoreside processing plants. These observers were trained or briefed in various locations. The AFSC Observer Program in Seattle briefed 68 observers who had prior experience. The University of Alaska Anchorage Observer Training Center trained 25 first-time observers and briefed 67 prior observers. At the Observer Program's field office in Dutch Harbor, two more observers were briefed. The first quarter 1998 observer workforce thus comprised 15% new observers and 85% experienced observers.

The Observer Program conducted a total of 80 debriefings during the first quarter of 1998. Two debriefings were held in Kodiak, 12 in Dutch Harbor, and 66 in Seattle.

At its February 1998 meeting, the North Pacific Fishery Management Council approved the third-party, joint partnership agreement with the Pacific States Marine Fisheries Commission (PSMFC) to

provide observer procurement services starting in 1999. Under this modified pay-as-you-go Observer Program, the PSMFC would act as an interface between observer companies and vessels or shoreside plants required to carry observers, thus resolving some conflict of interest issues. The current Interim Observer Program, where fishing vessel owners obtain observers directly from observer contracting companies, will continue through 1998.

The Council also requested that NMFS resume work on a fee-based observer procurement system. Under this system, which is authorized in the Magnuson-Stevens Fishery Conservation and Management Act, vessels and processors participating in halibut, crab, and groundfish fisheries in the Exclusive Economic Zone off Alaska would pay up to 2% of the landed value of their catch. This money would be used to procure and deploy observers consistent with coverage requirements. Implementation of the fee collection portion of the program is targeted for the year 2000.

Substantial improvements in our information systems were implemented in 1997 and early 1998. Electronic reporting of observer sampling data from sea is now occurring on about 70 vessels and will be further implemented to cover all fisheries by the end of 1998. This will provide the Observer Program with an improved ability to solve sampling problems which observers encounter at sea and will streamline the debriefing process.

By Bob Maier.

Age and Growth Task

Estimated releases of production ages for January to March 1998 were flathead sole—466, rock sole—336, Dover sole—247, yellowfin sole—466, walleye pollock—187, sablefish—715, Pacific whiting—1,760, for a total of 4,177. Also, 1,057 were tested, 541 were updated, and 63 were examined and determined to be unreadable.

By Dan Kimura.

ECOSYSTEMS MODELING:

Russian Trawl Data

From 1952 to 1977 Available on Orca

Members of the Resource Ecology and Ecosystems Modeling Task have developed an Oracle database that contains trawl data collected during Russian research surveys of the eastern Bering Sea shelf in the years 1952 and 1957-77. Over 14,000 hauls were conducted from Norton Sound south to the Alaska Peninsula. Haul, catch, and length data were collected on more than 150 species. At present, only data on the following species are available in Oracle tables: Pacific cod, walleye pollock, arrowtooth flounder, flathead sole, Pacific halibut, rock sole, yellowfin sole, longhead dab, starry flounder, Alaska plaice, Greenland turbot, and 26 species of Cottidae grouped under the general category of sculpins. The data are in the tables FOODLAB.VIDAR_HAUL, FOODLAB.VIDAR_CATCH, and FOODLAB.VIDAR_LENGTH. Plans for the database include adding data from the remaining species and adding further data acquired from the Russians in their surveys of the Gulf of Alaska and Washington-Oregon-California coast regions. For assistance using these data, contact Doug Smith, (Doug.Smith@noaa.gov, (206)526-4225).

By Doug Smith.

Food Habits of Pacific Hake off Northern California and Southern Oregon

Because of its large biomass, Pacific hake (*Merluccius productus*) is an important predator in the California Current ecosystem. The impact of Pacific hake on other commercially valuable species has been the object of several studies. During the 1995 NMFS Slope Surveys the stomach contents of 377 Pacific hake were collected from waters over the outer continental shelf and upper continental slope in the Eureka INPFC (International North Pacific Fisheries Commission) area from approximately Cape Mendocino, California to Cape Blanco, Oregon. By weight, the stomach contents consisted mostly of euphausiids (31%), flatfish (25%), sergestid shrimp (13%), lanternfish (13%), cannibalized Pacific hake (8%), and pink shrimp

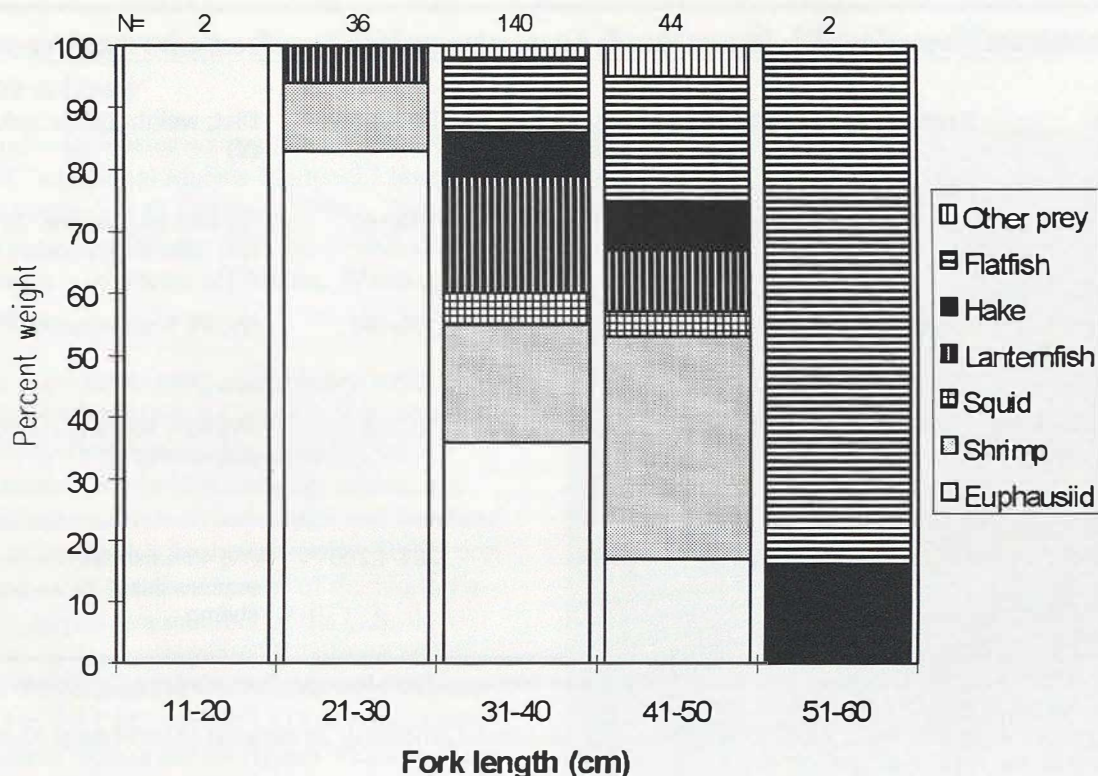


Figure 1. Diet composition, by weight, of Pacific hake size categories sampled during the 1995 slope survey of the Eureka INPFC area.

(3%). The importance of euphausiids in the diet decreased with increasing size of Pacific hake (Fig. 1). The diet composition of Pacific hake examined in this study contained more lanternfish and sergestid shrimp and less pink shrimp than other studies conducted in the Eureka INPFC area. Differences between the results of this study and other studies conducted in the same area were attributed mainly to the water depths where the samples were collected (Table 1).

By Pat Livingston.

Socioeconomic Assessment Task

The Task participated in the following activities in support of the Pacific and North Pacific Fishery Management Councils, the implementation of the Magnuson-Stevens Act, and other cooperative efforts within the Agency and beyond.

Council Activities

1. Inshore Offshore Allocation III. Task members assisted in preparing a status report and the draft analysis environmental assessment-regulatory impact review-initial regulatory flexibility analysis (EA/RIR/IRFA) for the February and April council meetings, respectively.

2. Cost Recovery Program for the IFQ and CDQ Programs The Magnuson-Stevens Act requires the Secretary of Commerce to implement a program to recover the management and enforcement costs of the Alaska Individual Fishing Quota (IFQ) and Community Development Quota (CDQ) programs. Task members assisted in preparing a draft proposal for the cost recovery program.

3. Increased Retention and Utilization (IRU) Task members assisted the Regional Office in preparation for the IRU Industry Working Group meeting to review post-implementation issues with the IRU program.

Table 1. - Summary of studies on feeding habits of Pacific hake in the Eureka INPFC area.

Study	Season	Size (cm)	Number w/food	Depth (m)	Diet: weight (W) or volume (V)
Gotshall 1969 ¹	All	10-81	449	109-185	(V) 44% pink shrimp, 29% fish, 18% euphausiids
Livingston 1983 ²	Autumn	10-20	40	130-160	(W) 98 % euphausiids
Buckley and Livingston 1997 ³	Summer	40-50	23	55-182	(W) 60% euphausiids, 35% pink shrimp
This study	Autumn	12-55	224	227-1,206	(W) 46% fish, 31% euphausiids, 13% sergestid shrimp

¹Gotshall, D.W. 1969. Stomach contents of Pacific hake and arrowtooth flounder from northern California. Calif. Fish Game 55:75-8.

²Livingston, P.A. 1983. Food habits of Pacific whiting, *Merluccius productus*, off the west coast of North America, 1967 and 1980. Fish. Bull., U.S. 81:629-636.

³Buckley, T.W. and P.A. Livingston. 1997. Geographic variation in the diet of Pacific hake with a note on cannibalism. Calif. Coop. Oceanic Fish. Invest. 38:53-62.

4. Supplemental Environmental Impact Statement

(SEIS) Task members assisted in preparing a draft SEIS for the Bering Sea-Aleutian Islands and Gulf of Alaska groundfish fisheries.

5. Aleutian Islands Atka Mackerel Management

Task members assisted in preparing the draft EA/RIR/IRFA for an amendment package containing alternatives that incorporate various combinations of apportionments by season and area—inside and outside of critical habitat areas—for purposes of reducing the effects of this fishery on Steller sea lion populations.

6. PFMC Groundfish Management. A task member prepared and presented projections for the 1998 fixed-gear sablefish three-tiered fishery and presented preliminary results from an analysis of the viability of an industry-funded buyback of limited-entry permits.

Magnuson-Stevens Act

Task members contributed to implementation of the Magnuson-Stevens Act by: 1) participating in a successful effort to use a broad definition of "by-

catch" in the NMFS Bycatch Plan; 2) preparing the Alaska bycatch summary for the short version of the NMFS Bycatch Plan; and 3) reviewing a paper and preparing information for the National Research Council (NRC) review of IFQ programs.

Other Cooperative Activities

Task members participated in the following cooperative activities: 1) review of the NOAA State of the Coast information system; 2) development of programs to collect and model economic data for the Pacific Coast and Alaska commercial fisheries; 3) development of the Alaska Fisheries Information Network (AKFIN); 4) development of a socio-economic communication group within NMFS; 5) review of a Sea Grant research paper; 6) review of the draft EA/RIR/IRFA for monitoring the expanded CDQ program; 7) participation on the Pacific Fishery Management Council Groundfish Management Team; 8) preparation of information for Senate Bill 1221, the American Fisheries Act; and 9) preparation of papers for the International Institute for Fisheries Economics and Trade.

By Joe Terry.

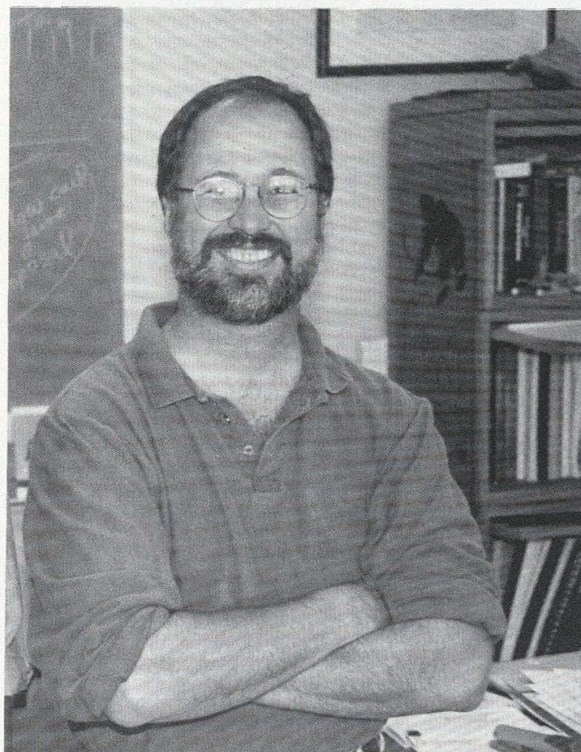
Center Appoints New Director of National Marine Mammal Laboratory

Dr. Douglas DeMaster was named the Director of the AFSC's National Marine Mammal Laboratory (NMML) effective 17 February 1998. The NMML is responsible for NMFS research on marine mammals in waters off Alaska, Washington, and Oregon.

Between November 1992 and January 1998, DeMaster lead the NMML's Cetacean Assessment and Ecology Program. In that position he conducted research on beluga and gray whales and helped direct research on humpback and bowhead whales, killer whales, harbor porpoise, Dall's porpoise, and other small cetaceans of the North Pacific. He served as a member of the U.S. delegation to the International Whaling Commission's (IWC) Scientific Committee where he participated in the IWC's effort to 1) develop a new management regime for aboriginal whaling, 2) assess the status of stocks of bowhead and gray whales, and 3) incorporate environmental data in the management regime for large whales.

Prior to coming to the AFSC, DeMaster headed the Marine Mammal Division at the Southwest Fisheries Science Center in La Jolla, California, where he worked primarily on research related to the bycatch of dolphins in the tuna fishery. Under his direction, one of the largest marine mammal surveys in terms of ship time and geographic coverage was carried out from 1986 to 1992. The objective of this research was to determine the extent to which the practice of setting on large schools of dolphins in the eastern tropical Pacific associated with large schools of yellowfin tuna adversely affected dolphin populations. During the survey, abundance estimates for more than 20 species of cetaceans were derived. The results of these surveys were used to set sustainable levels of fishery-caused mortality, which the industry has been able to stay well under in recent years.

DeMaster is recognized as one of the leading experts on marine mammal stock assessment and marine mammal-fishery interactions. To date he has 58 peer-reviewed publications on marine mam-



mals and an additional 38 reports related to the population ecology of marine mammals. His field research has focused on a variety of species including polar bears, walrus, sea otters, California sea lions, harbor seals, northern elephant seals, northern fur seals, Antarctic and Arctic ice seals, beluga whales, gray whales, and dolphins. In cooperation with other NMFS scientists, DeMaster helped develop the system under which marine mammals are managed in the United States under the Marine Mammal Protection Act. For these efforts, he along with three others received the Department of Commerce's Gold Medal award in 1996.

Since receiving his Ph.D. from the University of Minnesota in 1978, DeMaster has been an active member of the academic community. Between 1991 and 1997 he was an adjunct professor at the Scripps Institution of Oceanography, where he taught courses on marine mammal biology and population dynamics. Since 1994, DeMaster has been an affiliate professor at the University of

Washington's School of Marine Affairs. He also serves on the Hawaiian monk seal recovery team and as the chair of the southern sea otter recovery team.

Shaw Heads Fisheries Information Systems

Gary Shaw was appointed Director of the Office of Fisheries Information Systems (OFIS) effective 1 April 1998.

Prior to coming to the AFSC, Shaw spent 23 years with the U.S. Fish and Wildlife Service (USFWS) as a biologist and information resources manager. A graduate of Oregon State University, he spent his early career as a field biologist conducting habitat impact assessment studies. He developed mitigation plans for fishery and wildlife impacts on the Columbia Basin Federal Reclamation project and later for the U.S. Army Corps of Engineer's projects on the lower Columbia River. He wrote fishery management plans for several National Wildlife Refuges and was the lead USFWS field biologist for post eruption impact analysis of Mt. St. Helens.

As an information resources manager, Shaw was responsible for activities within the USFWS Ecological Services program on the West Coast and Pacific Islands. He later accepted an assignment in Washington, D.C., as senior technical specialist for the Office of Information Resources Management, where he served on several Department of the Interior standards and policy committees. After his Washington tour he assumed responsibility for information resource management for the USFWS east coast region, which covered operations throughout 13 mid-Atlantic states. In 1988 he took a position in Denver, Colorado, to help initiate a national telecommunications infrastructure for the USFWS. In 1991 he assumed management of Data Center Operations for the USFWS National Finance Center where he worked on mission-critical information systems. Mr. Shaw has received 17 major awards for his work in information resources management.

National Stock Assessment Workshops

Following a 4-year hiatus, the NMFS series of national stock assessment workshops (SAWs) was re-instituted in February 1998 in Key Largo, Florida. This, the fifth national SAW, was structured around the theme "Providing scientific advice to implement the precautionary approach under the Magnuson-Stevens Fishery Conservation and Management Act." The theme stemmed from a requirement in the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) that all fishery management plans be amended by October 1998 for the purpose of addressing the MSFCMA's new provisions relating to the prevention of overfishing. These new provisions have been interpreted by NMFS as requiring a precautionary approach to fishery management, the key elements of which have been described as follows. 1) Target reference points, such as optimum yield, should be set safely below limit reference points, such as the catch level associated with overfishing. 2) A stock that is below its maximum sustainable yield (MSY) level should be harvested at a lower rate of fishing mortality than if it were above its MSY level. 3) The criteria used to set target catch levels should be explicitly risk-averse, so that greater uncertainty regarding a stock's status or productive capacity corresponds to greater caution in setting target catch levels. The SAW was convened for the purpose of providing technical guidance on how to specify harvest strategies satisfying these criteria.

The SAW agenda was devoted primarily to presentation of papers providing background information on key issues, reporting on developments in other countries, identifying examples of precautionary approaches, and proposing new alternatives. In addition, each participant joined one of four working groups to discuss technical aspects of precautionary stock assessment advice. Each working group was assigned a particular context within which to address the subject of precautionary advice. The contexts for three of the working groups consisted of single-species stock assessments distinguished by different levels of information availability, ranging from "data rich" to "data poor." The fourth group dealt with management of fisheries in which

bycatch considerations are incorporated explicitly into the computation of allowable harvest levels.

Participants from the AFSC included Science and Research Director Jim Balsiger, Jon Heifetz, Anne Hollowed, Jim Ianelli, Loh-Lee Low, Sandra Lowe, Grant Thompson, and Tom Wilderbuer. Papers were presented by Ianelli and Thompson. Ianelli's paper was titled, "Alternative ways to evaluate uncertainty and risk in data-poor and hypothesis-rich situations." This paper used Bayesian methods to reflect assessment uncertainty, for example, by incorporating measurement error in historical catch estimates and key parameters that are typically assumed to be known without error. It also presented a general method for determining MSY and related quantities in a complex assessment model. Thompson's paper was titled, "Optimizing harvest control rules in the presence of natural variability and parameter uncertainty." The paper described the use of a simple, two-parameter function to specify both limit and target fishing mortality rates in a way that satisfies NMFS' criteria for a precautionary approach. It also presented a method for evaluating the trade-offs between magnitude of yield and constancy of yield that are typically implicit in alternative harvest strategies.

By Grant Thompson.

Symposium on Marine Mammal Survey and Assessment Methods

An international symposium on survey and assessment methods for marine mammal populations was held 25-27 February 1998 in Seattle. The symposium was sponsored by the NMML and the Alaska Biological Science Center of the Biological Resources Division, U.S. Geological Service (BRD, USGS). Seventy scientists from Australia, Canada, New Zealand, Norway, Russia, the United Kingdom, and the United States participated. Both applied and theoretical subjects were covered in the 24 papers presented by biologists and statisticians. The late Dr. Gerald Garner, BRD, USGS, who faced many of the challenging problems of surveying marine mammal populations, initiated

the symposium to encourage interaction between biologists and statisticians to foster development of methods for surveying and assessing the status and trends of marine mammal populations. Under the able direction of Dr. Lyman McDonald and Donna Robertson of the consulting firm WEST, Inc., of Cheyenne, Wyoming, the symposium was a successful forum for generating many discussions and useful ideas.

Scientists from NMML presented four papers at the symposium: Jeff Laake—"Distance sampling with independent observers: reducing bias from heterogeneity by weakening the conditional independence assumption"; Doug DeMaster and Paul Wade—"Determining the optimal interval for abundance surveys for management"; Anne York and Dave Withrow—"Haulout behavior and a correction factor estimate for the proportion of harbor seals, *Phoca vitulina*, missed during aerial surveys"; and Paul Wade—"Estimation methods for fitting population dynamics models to abundance and other biological data." The symposium proceedings will be published later this year.

By Jeff Laake.

Ecosystem Ecology and Assessment Presentations

Charles Fowler of the NMML gave several presentations regarding management at the ecosystem level. The first presentation, "Sustainability: Empirical Examples and Management Implications" was given at a briefing of the NMFS Science Board on 23 February in Key Largo, Florida. Similar presentations were also given at the National Research Center for Statistics and the Environment at the University of Washington in Seattle on 3 March and at the Museum of Vertebrate Zoology at the University of California, Berkeley on 1 April. Dr. Fowler also presented the paper "Nature's Monte Carlo Experiments in Sustainability" at a NMFS Stock Assessment Workshop held in Key Largo on 24 February.

The substance of Fowler's presentations is based on a form of management that uses other species

as empirical examples of sustainability. Fowler has proposed that any form of management adopted must not only apply to ecosystems but also must 1) be consistent with management at other levels of biological organization (e.g., for species and the biosphere); 2) account for reality and complexity; 3) maintain components of each level of biological organization within their normal ranges of natural variation; 4) exercise precaution and consider risk in achieving sustainability; 5) be information-based and interdisciplinary; 6) include monitoring and assessment; 7) have clear objectives; 8) recognize control as limited to human action; and 9) consider humans as part of living systems. Each of these requirements can be achieved by management action guided by collections of empirical examples of sustainability, represented by other species. The variability among other species demonstrates both diversity and the limits to natural variation.

A specific example of such an approach is the management of resource consumption within ecosystems. Both commercial fisheries and predators consume biomass from ecosystems. To be sustainable, consumption rates of humans would be confined to within the normal range of natural variation exhibited by the consumption rates exhibited by predatory species in nature. To achieve optimal sustainability, human consumption rates would be restricted to consumption rates exhibited by most species. This places importance on the central tendencies, such as the mode or mean, of consumption rates among other species. The same would apply to harvesting from individual resource species. Other predatory species represent empirical examples of sustainable consumption rates and the means or modes of their consumption rates provide estimates of ecologically sustainable harvest rates. Monitoring and assessment are fundamental to this approach to management because of the need to document the normal ranges of natural variation in consumption rates.

By Chuck Fowler.

Exxon Valdez Oil Spill Restoration Workshop

Staff from the ABL gave 7 oral presentations and 10 poster sessions at the 1998 *Exxon Valdez Oil Spill Restoration Workshop* held 26-30 January in Anchorage, Alaska. Topics ranged from the interpretation of 9 years of hydrocarbon samples to the potential use of fatty acid profiles to understand trophic interactions. The workshop served as a forum for all principal investigators to review research activities conducted in the past year and set the stage for discussions and future proposals. The workshop was open to the public.

Three ABL scientists made special presentations to a group of community facilitators from several small villages in the oil spill area. Christine Brodersen presented a detailed description of the shoreline restoration and monitoring study conducted on subsistence beaches near Chenega (see the *AFSC Quarterly Report*, April-May-June 1997 and July-August-September 1997). Alex Wertheimer and Ron Heintz presented a summary of our research on the effects of oiled substrate on the toxicity to pink salmon embryos and on straying of returning pink salmon adults (see *AFSC Quarterly Report*, July-August-September 1997). And chemist Jeff Short gave a presentation on pristane monitoring studies.

Western Groundfish Conference

The following AFSC scientists gave presentations and posters sessions at the Western Groundfish Conference held at the Asilomar Conference Center in Monterey, California, on 1-5 February 1998. The 1998 conference was sponsored by the Southwest Fisheries Science Center and the California Department of Fish and Game.

Taina Honkalehto presented "Sex-biased egg cannibalism in spawning walleye pollock,"

coauthored by Ric Brodeur. **Ric Brodeur** presented the poster "In situ observations of habitat dependencies of fish in the Bering Sea." **Robin Harrison** presented a paper coauthored by Mark Zimmermann and Tony Jones entitled "Differential copepod parasitism on two species of rock sole (*Lepidopsetta* spp.) in Alaska. **Art Kendall** presented a paper, coauthored by Jay Orr, called "Analysis of *Sebastes* systematics using morphological characters of adults and young." **Peter Munro** presented the poster "Estimating size-dependent capture rates at the footrope of two different kinds of survey trawls."

Jay Orr presented a paper, coauthored by J.A. Lopez, P. Wimberger, entitled "The systematics of *Sebastes ciliatus*: a case of mistaken identity?" **Craig Rose** presented the paper "In situ observation of fish behavior in trawls for the development and testing of methods to reduce bycatch." **David Somerton** presented a poster entitled "Parasitism of golden king crab by *Careproctus* snailfishes." **James Stark** presented a paper titled "Female spawning and maturation of two rock sole species, *Lepidopsetta bilineata* (southern rock sole) and *Lepidopsetta* sp. cf. (northern rock sole) off Kodiak Island in the Gulf of Alaska, October 1996 to July 1997."

Steve Syrjala presented a paper titled "On the robustness of the delta-distribution unbiased estimator of the mean." **Ken Weinberg** presented a paper, coauthored by Peter Munro, entitled "The effect of artificial light on escapement beneath a survey trawl." **Matt Wilson** presented a paper entitled "Distribution patterns of age-0 pollock (*Theragra chalcogramma*) in relation to biotic and abiotic variability in the eastern Bering Sea during August-October, 1987." **Mark Zimmermann** presented "Untrawlable areas in the NMFS West Coast bottom trawl triennial survey."

Bruce Wing presented "Use of mitochondrial DNA analysis to corroborate identification of preflexon larval rockfish (*Sebastes* spp.) by pigment patterns," coauthored by Andrew Gray, Jon Heifetz, Mark Carls, and Tony Gharrett. **Chris**

Kondzela presented "Genetic population structure of rougheye rockfish (*Sebastes aleutianus*) inferred from allozyme variation," coauthored by Sharon Hawkins, Jon Heifetz, John Pohl, and Richard Wilmot. **Jon Heifetz** presented "Validation of otolith-based ageing from marked and recaptured sablefish (*Anoplopoma fimbria*)," written with Delsa Anderl, Nancy Maloney, and Tom Rutecki.

Lincoln Freese presented the poster session "The impacts of trawling on seafloor habitat in the Gulf of Alaska: changes in habitat structure and associated invertebrate taxa." **Chris Lunsford** presented "An updated maturity schedule for Pacific ocean perch (*Sebastes alutus*) and it's effects on the stock synthesis model," coauthored by Lewis Halderson. **Ken Krieger** presented "*Primnoa* spp. observed inside and outside a bottom-trawl path from a submersible." Also, **Jon Heifetz** coauthored "Fishing practices under maximum retainable bycatch rates in Alaska's groundfish fisheries" with Sue Salvesson and Dave Ackley, who presented the paper.

By John Karinen and Ron Erickson.

Ageing Workshop Held at AFSC

The Ageing Unit hosted the "Second Workshop on Ageing Methodology of Walleye Pollock (*Theragra chalcogramma*)" held 17-20 March 1998 at the Center. The workshop was requested by the Second Annual Conference of the Parties to the Convention on the Conservation of the Pollock Resources in the Central Bering Sea held in November 1997 in Seattle. The goal of the workshop was to standardize the otolith ageing methodology and criteria for Bering Sea walleye pollock. Age readers from Japan, Poland, Russia, and the United States gave scientific presentations, aged reference samples, and reconciled ageing results. Special attention was given to the problem of identifying false annuli in the otoliths of 1-year-old pollock.

By Dan Kimura.

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