AUKE BAY LABORATORY (ABL)

Ocean Carrying Capacity Program

FISHING POWER MODELS AND TRAWL COMPARISONS DURING THE 2002 BASIS SURVEY

At the 2004 Marine Science Symposium in Anchorage, Jim Murphy of Auke Bay Laboratory (ABL) presented a poster on fishing power models and trawl comparisons of vessels used during the 2002 Bering-Aleutian Salmon International Survey (BASIS). The BASIS survey is a cooperative research program by member nations of the North Pacific Anadromous Fish Commission. The program was created to address critical information gaps for the marine phase of Pacific salmon (*Oncorhynchus* spp.), through seasonal pelagic trawl surveys to determine distribution, abundance, and stock origins of salmon in the Bering Sea.

A key factor in the ability of BASIS to accomplish this objective is ensuring that catches are comparable between different BASIS research vessels. Trawl comparisons were completed by the Japanese research vessel *Kaiyo Maru*, the U.S. chartered fishing vessel *Northwest Explorer*, and the Russian research vessel *TINRO* in the central Bering Sea between 14 and 17 September during the 2002 BASIS survey, and fishing power models were constructed accordingly.

Fishing power was highest for the *Kaiyo Maru*, followed by the *TINRO*, and the *Northwest Explorer*. Higher fishing power by the *Kaiyo Maru* reflects the larger vertical opening of this vessel's trawl. Catch rates were based on area trawled rather than volume, and therefore do not account for differences in trawl height. The largest difference in fishing power between vessels was observed for juvenile Atka mackerel (*Pleurogrammus monopterygius*). The larger fishing power coefficients for Atka mackerel are primarily due to the deeper vertical distribution of these fish.

By Jim Murphy

DISTRIBUTION OF JUVENILE PINK SALMON IN THE GULF OF ALASKA RELATIVE TO SURFACE SALINITY AND POTENTIAL IMPLICATIONS FOR FORAGING AND GROWTH OPPORTUNITIES

The NOAA ship *Miller Freeman* and the research vessel *Alpha Helix* participated in a coordinated oceanographic and fisheries sampling effort on the Alaskan continental shelf near the Seward Line during July 2003. On this occasion, the brackish Alaska Coastal Current (ACC) (27 psu (practical salinity unit) surface salinity) ran near shore and was separated from saltier midshelf water (31 psu) by a frontal region (29 psu) a few kilometers in width. Sampling in all three zones consisted of conductivity-temperature-depth (CTD) casts, multiple opening/closing net and environmental sensing system (MOCNESS) hauls, and juvenile salmon trawls. Juvenile pink salmon diet was quantified onboard the *Miller Freeman*, and potential zooplankton prey items were collected via MOCNESS onboard the *Alpha Helix*.

The observations were designed to determine how juvenile pink salmon are distributed relative to surface salinity and to assess the energetic costs and benefits associated with physical and biological conditions across a salinity gradient. The working hypothesis was that juvenile pink salmon would be confined to the ACC and would not be found farther offshore. However, juvenile pink salmon were found both in the ACC and offshore, thus negating the hypothesis. Juvenile pink salmon inhabiting the brackish core of the ACC had the highest diversity of zooplankton prey in their diet. The highest growth efficiencies were obtained in midshelf water and the lowest in the brackish core water of the ACC. The greatest variation in juvenile pink salmon consumption demand occurred in the brackish core water of the ACC.

By Jamal Moss

JUVENILE SALMON, WATER CHARACTERISTICS, AND PHYTOPLANKTON IN THE SOUTHEASTERN BERING SEA

Lisa Eisner of ABL presented a poster at the 2004 winter meeting of the American Society of Limnology and Oceanography, on juvenile salmon distributions, water mass characteristics, and phytoplankton biomass in the southeastern Bering Sea. Surface fish trawls and oceanographic data were collected during fall 2003 as part of the BASIS program. Distributions of juvenile salmon and their primary prey (young-of-year pollock) were compared to temperature and salinity, and phytoplankton biomass (total and percentages within each size class) across frontal boundaries.

Different salmon species have different distributions, possibly due to variations in migration patterns or preferred prey species. Juvenile sockeye

salmon, the most abundant salmonid in the southeastern Bering Sea, are located in the 2-layer system in the middle shelf and their distributions overlap young-of-year pollock distributions for a large part of the study area. In contrast, juvenile chinook salmon have the highest abundance within the low salinity nearshore waters in the coastal realm. This ongoing work provides information on interactions between physical and biological oceanographic parameters and juvenile salmon abundances and adds to our understanding of the climatic influences on marine ecosystems in the eastern Bering Sea.

By Lisa Eisner

Groundfish Assessment Program

SOUTHEAST ALASKA STELLER SEA LION PREY STUDY, DEMERSAL PREY SURVEY

During late February 2004, the second of three demersal prey studies was completed as part of a larger study to assess the seasonal prey field of Southeast Alaska Steller sea lions. The survey was conducted by ABL scientists J. J. Vollenweider and Dave Csepp under chief investigator Mike Sigler. The survey used the chartered fishing vessel *San Juan* and consisted of 15 longline sets, each composed of 3 skates with 100 hooks/skate. Sets were stratified across an area within a 20-km radius of the Brothers Islands in Frederick Sound, about 90 km south of Juneau. Frederick Sound is inhabited by a year-round population of roughly 1,200 sea lions that frequently haul out at the Brothers Islands.

Total catch biomass of fish was 5,250 kg, 750 kg less than in the previous survey from September 2003. Species composition of the winter catches included 19 species, similar to composition (23 species) from the fall survey. During both time periods, catches were dominated by Pacific halibut (~50%) on a relative weight basis. Between the two sampling periods, the relative importance of sablefish and Pacific cod changed, with sablefish increasing from 9% to 27% of the catch and Pacific cod decreasing from 20% to 11% of the catch. Arrowtooth flounder decreased from 9% to 1% of the catch, while spiny dogfish increased from less than 1% to 5% of the catch. Sandpaper skates remained at 3% of the catch during both time periods. Other species of interest caught in amounts less than 1% of the total catch included several species of rockfish, other skate species, Pacific sleeper shark, sole, sculpins, and spotted ratfish.

In addition to estimating species-specific biomass near the sea lion haulouts, catches were subsampled for nutritional analyses. Species selected were among the dominant prey species consumed by local sea lions, as determined by seasonal scat analyses in a related study conducted by ABL contract biologist J. Womble. One hundred eight fish samples were retained and frozen, including sets of Pacific halibut, Pacific cod, sablefish, sandpaper skates, arrowtooth flounder, and rougheye rockfish.

By Johanna Vollenweider

SOUTHEAST ALASKA STELLER SEA LION PREY STUDY, PELAGIC PREY SURVEYS

Four cruises were conducted during the first quarter of 2004 to sample pelagic prey of Steller sea lions. These cruises were completed as part of a study to assess the seasonal prey field of Southeast Alaska Steller sea lions near two haul-out areas for these animals: Lynn Canal (northern Southeast Alaska) and Frederick Sound (central Southeast Alaska). The first cruise was an acoustic survey of Frederick Sound in January using the marine vessel *Alaska Adventurer*, with Dave Csepp (ABL) and Dave Gummeson (University of British Columbia). The second cruise was a midwater trawl of Lynn Canal and Frederick Sound in January-February 2004 from the research vessel *Medeia*, with ABL scientists Mike Sigler, Dave Csepp, and J. J. Vollenweider. The third cruise was an acoustic survey of Frederick Sound in March from the *Alaska Adventurer*, with Mike Sigler. The fourth cruise was a midwater trawl of Lynn Canal and Frederick Sound in March using the *Medeia*, with J. J. Vollenweider and Dave Csepp.

In addition to estimating species-specific biomass near the haulouts, midwater trawl catches were subsampled for nutritional analyses. The March 2004 cruises mark the last of 12 quarterly sampling periods of Frederick Sound for the 3-year Southeast Alaska Steller Sea Lion Prey Study. The study will conclude in May 2004 following the last monthly acoustic cruises (of 36) of Lynn Canal.

By Michael Sigler

SOUTHEAST ALASKA ESTUARINE HABITAT SURVEYS

Work to define essential fish habitat (EFH) in Alaska's coastal areas continued in 2004. The data generated by this work, although limited to northern Southeast Alaska, have been incorporated into a geographical information system (GIS) database that is already in use for EFH consultations.

Mitch Lorenz presented the results of ABL estuarine fish distribution and habitat classification surveys at the Coastal Experts Workshop in Juneau during February 2004. The workshop goal was to coordinate various efforts to classify and map coastal resources. Representatives of federal and state agencies and private interests attended, with constituent issues ranging from biodiversity protection to coastal development.

Data from the ABL surveys on fish distribution mapping in relation to current estuarine mapping protocols were presented, along with an improved mapping protocol. To date, 34 (more than one-third) of all Alaska species managed by the National Marine Fisheries Service (NMFS) have been documented in estuarine survey areas, and more than half of these species are abundant in estuaries. The presentation also noted high temporal and spatial variability of estuarine fish distribution and outlined the resulting shortfalls of current EFH mapping. Finally, methods to groundtruth an improved habitat classification protocol were discussed. Additional estuarine habitat surveys are planned for the 2004 field season.

By Mitch Lorenz

Marine Salmon Interactions Program

ADULT PINK SALMON FORECASTING SHOWS PROMISE USING EARLY MARINE PARAMETERS IN SOUTHEAST ALASKA

Pink salmon are the most abundant salmon species in Alaska and have historically shown remarkable interannual fluctuations in adult returns. From the 1900s to 2003, annual pink salmon harvests have fluctuated between about 10 million and 150 million fish. Pink salmon are also a highly valued resource, with exvessel commercial values ranging from $20 million to $40 million annually over the period from 1976 to 2003. Accurate forecasts of salmon returns are important because they enable surplus fish production to be matched with fish harvesting and processing capabilities. This leads to a greater economic return of the resource to the harvesters, while allowing wild salmon escapement goals to be met and sufficient adult returns at hatcheries.

In Southeast Alaska, pink salmon production is mainly based on wild stocks, and record harvests (more than 72 million in 1999) have occurred within the last decade. Understanding factors that influence marine survival of pink salmon (and other salmon species) is a primary focus of ABL's Southeast Alaska Coastal Monitoring (SECM) project. Over the past 7 years, SECM has collected a time series of data incorporating biophysical parameters and indexes of juvenile salmon abundance in neritic habitats of the northern region of Southeast Alaska. This research has been conducted annually at monthly intervals during May to August, from 1997 to 2003.

Annual indexing of juvenile pink salmon under SECM shows promise as a forecasting tool for adult pink salmon harvests in Southeast Alaska. We examined the correlation of annual harvests with data from the juvenile marine period and found a significant correlation ($r=0.94$, $P<0.01$) of juvenile pink salmon abundance in July (based on trawl catch-per-unit-effort (CPUE)). We found no significant association of harvest with measures of temperature, salinity, zooplankton standing crop, or pink salmon growth. The relationship between the index of abundance of juvenile salmon in neritic habitats and the corresponding year class of adult pink salmon supports the hypothesis that year-class strength of pink salmon is established early on in the marine environment.

We used two methods to develop a general linear model for forecasting the 2004 return of pink salmon from these data: 1) stepwise regression, considering all variables, and a decision criteria of $P < 0.1$ for a variable to enter or remain in the model; and 2) the Akaike Information Criterion, comparing models with CPUE and growth parameters only. For both methods, the only independent variable in the model for forecasting harvest was CPUE. We then used the 2003 juvenile CPUE data to forecast a harvest of 46 million pink salmon in Southeast Alaska in 2004, with an 80% confidence range of 41 million to 52 million. The Alaska Department of Fish and Game (ADF&G) forecast for 2004, based on an exponential smoothing model of historical harvests and forecasts, was 50 million, with an 80% confidence range of 24 million to 76 million.

The 2004 harvests will test the use of juvenile salmon sampling as an index of pink salmon year-class strength. In the context of linking marine biophysical factors to salmon production and survival, our SECM data point to the importance of establishing annual time series data over a long enough period to identify critical periods for a particular species (i.e., pink salmon juveniles May–July). One goal of the SECM project is to identify these periods for all salmon species during their juvenile life history phase. Understanding how resources are

partitioned during these critical periods for an individual salmon species between hatchery and wild stocks, and among ecologically related species, is key to answering questions about the marine carrying capacity of salmon and the implications of climate change on these species.

By Joseph Orsi and Alex Wertheimer

ANNUAL AUKE CREEK COOPERATIVE RESEARCH AND PLANNING MEETING

The Auke Lake system in Juneau supports endemic populations of pink, chum, sockeye, and coho salmon, cutthroat and steelhead trout, and Dolly Varden, with continuous data collected on some populations since the early 1960s. In 1983, an interagency cooperative agreement relating to the Auke Creek fish-counting weir was established between NMFS, the University of Alaska Fairbanks (UAF), and ADF&G. An interagency meeting of participating interagency personnel is held annually, and 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 (*http://www.afsc.noaa.gov/abl/)*.

The 2004 Auke Creek interagency meeting was held in March and was split into morning and afternoon sessions. The morning session focused on biological research projects: summaries and operational plans were presented on projects for 2004 at Auke Creek weir. There are currently 19 projects scheduled at Auke Creek for the 2004 season. In general, NMFS will continue long-term data collections on all species, with emphasis on the marine survival and freshwater production of pink, coho, and sockeye salmon. The ADF&G will continue with their long-term research programs on Dolly Varden, cutthroat trout, and coho salmon; UAF will resume the outbreeding depression study on pink salmon in 2004 and is actively recruiting a graduate student for the project.

Of note was Leon Shaul's report (ADF&G) on Southeast Alaska coho salmon index stocks. Marine survival is decreasing in all areas except at Auke Creek; however, smolt production from fresh water is decreasing at Auke Creek, which is one of the ADF&G index coho stocks. Rick Focht of the Macaulay Hatchery, Douglas Island Pink and Chum Corporation, presented a summary of the 2003 return of chinook released in Auke Bay near Auke Creek, and discussed plans for the release of chinook juveniles in Auke Bay in 2004. The afternoon session discussed multi-agency cooperative agreements relating to work at the NMFS weir and experimental fish hatchery at Auke Creek. The current cooperative agreement expires at the end of the 2005 field season; all cooperators expressed a strong interest in continuing cooperative salmonid research at Auke Creek.

By Jerry Taylor

AUKE CREEK FISH COUNTING WEIR OPERATIONS BEGINS FOR 2004

The key to salmonid research projects at Auke Creek is the fish counting weir. The weir is a permanent structure capable 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.

The weir was installed in the downstream capture mode on 2 March 2004. Stream flow was moderate, and the weir was operating by late afternoon. Continued rainfall and snow melting during the first weeks of operation maintained streamflow at moderate levels. Often there are major icing problems on the weir during March, but higher than average water and air temperatures prevented that this year. Auke Lake remained ice covered throughout March, with water temperatures 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. Through March, 22,950 pink salmon fry were counted at the weir. Daily counts this year throughout March were greater than the historical daily averages. This was the fourth highest number of pink salmon fry leaving Auke Creek in March. The average number of pink salmon fry leaving Auke Lake in March is 8,714, and 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 22 April, and the earliest midpoint of emigration was 1 April 1998. Only 904 chum salmon fry were captured in March, less than average for Auke Creek. Six Dolly Varden and one cutthroat trout were captured. Numbers of all fish typically increase during April.

By Jerry Taylor

Habitat Investigations Program

ABL STAFF MENTOR ALASKA HIGH SCHOOL STUDENTS

In March 2004, ABL staff participated as judges, mentors, and members of the organizing committee for the 2004 Southeast Alaska Regional Science Fair in Juneau. The science fair promotes project-based learning for grades 9 through 12 and brings together high school science students from throughout Southeast Alaska to compete for scholarships and cash prizes. Each of the 98 students was required to find a local scientist to act as mentor for the project. The mentors guide students in design, execution, statistical analysis, and presentation of projects.

Ten ABL staff mentored a total of 16 projects, and an additional 18 staff judged the entries. In addition, three staff members served on the organizing committee for the fair. The top five projects (four mentored by ABL scientists) advanced to the Intel International Science and Engineering Fair. The Intel Fair is the world's largest pre-college science competition and provides an opportunity for the world's best young scientists to showcase cutting-edge science projects. Every year, 1,200 students selected from 500 regional science fairs held in 40 countries compete for $3 million in scholarships, tuition grants, computers, cash prizes, and a trip to Stockholm for the Nobel Prize ceremony. In 2002, an ABL-mentored project won first place in Environmental Sciences at the International Fair for a project examining the use of physiological responses in mussels for assessing sewage pollution.

Another ABL outreach activity in Alaska is providing scientific advice to oceanography students in the National Ocean Sciences Bowl. Since 1999, a team from Juneau has won the Alaska Ocean Sciences competition every year they have competed. This competition requires students to investigate a specific topic in oceanography and then compete in quizzes. This year's topic was the effects of contaminants in Alaska's marine ecosystem. The winning team worked with Scott Johnson and Adam Moles of ABL on disposal of mine tailings in the marine environment. A second Juneau team worked with Ron Heintz of ABL on persistent organic pollutants in the Arctic.

By Bonita Nelson

NATIONAL MARINE MAMMAL LABORATORY (NMML)

California Current Program

SAN MIGUEL ISLAND RESEARCH

Research activities conducted at San Miguel Island from January through March 2004 focused primarily on the evaluation of California sea lion pups from the 2003 cohort. Personnel from the National Marine Mammal Laboratory (NMML), Southwest Fisheries Science Center, and Channel Islands National Park evaluated 26 branded and 30 nonbranded pups on 29-30 January. Pups in the Adam's Cove area of the island were herded and held in a temporary enclosure to facilitate evaluation. Evaluation of pups included recording 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, and fecal swabs were analyzed for the presence of hookworm eggs. In addition, the research crew also conducted re-sight surveys of branded California sea lions in Adam's Cove and along the south coast when time permitted. In March 2004, personnel from NMML and the University of Washington deployed remote release instrument platforms on four adult female California seal lions to test data collection and the release mechanism.

By Jeff Laake

Cetacean Assessment & Ecology Program

OPPORTUNISTIC SIGHTINGS OF BELUGA WHALES IN COOK INLET

Opportunistic sightings of belugas whales in Cook Inlet, Alaska, have been reported to the NMML since 1977. Initially, sightings were reported through the Platforms of Opportunity program. However, in 1999 the NMFS Alaska Regional Office set up a network to improve the public's awareness of belugas and encourage reports of sighting information. The beluga data were then entered into a dedicated database designed and maintained by the NMML. The high visibility and distinctive nature of belugas made them well suited for the opportunistic sightings project.

Sighting reports have come from a variety of sources ranging from observations by the Alaska Department of Fish and Game (ADF&G) during

systematic aerial surveys for birds to casual observations by tourists on the beach or people fishing in small boats. Location data range from precise locations (e.g., GPS-determined latitude and longitude) to approximate distances from major landmarks. In addition to location data, most reports include date, time, approximate number of whales, and notable whale behavior. Although the beluga sightings in the database are considered to be fairly reliable, there are no records of search effort; thus, the database does not provide information on where whales were absent. Currently there are 802 sighting records in the database (Table 1). Table 1 summarizes the sightings in the database by year and includes the average, minimum, and maximum group size.

By Christy Sims and Dave Rugh

Polar Ecosystems Program

HARBOR SEAL SURVEYS AND TIME-LAPSE CAMERA TESTS IN COOK INLET

The NMML Polar Ecosystems Program (PEP) conducted seasonal aerial surveys of harbor seals in southern Cook Inlet (south of Nikiski) and the Barren Islands during June, August, and October 2003 (see previous issues of the *Quarterly Report*). These surveys were conducted as part of a study of harbor seals in Cook Inlet under an Interagency Agreement between the Department of Interior's Minerals Management Service (MMS) and NMFS. Photographs from the three surveys were digitized, and seals were counted in the digital images. Visual estimates of seals were recorded at sites where an accurate count could be acquired without a photograph, i.e., when small numbers of seals were present and easily distinguished from the haul-out substrate. A total of 1,124 images and 527 visual estimates were obtained during the June survey; 593 images and 651 visual estimates were obtained during the August survey; and 261 images and 921 visual estimates were obtained during the October survey.

Preliminary analysis indicates that as many as 7,021 seals were seen hauled out during one survey day in June. This maximal count occurred on the last day of the June survey (18 June 2003) and may have been influenced by an increase in the number of pups present as the pupping season progressed during the survey. In August, as many as 7,475 seals were seen hauled out during one survey day. The counts in October were much lower, with a maximal count of 1,995 seals on one day. This dramatic decline probably relates to a change in the seals' behavior, with a decrease in haul-out time following pupping (May–June) and molting (August–September) seasons and a related increase in foraging and swimming time in winter. This preliminary summary includes only animals that were hauled out during the survey and does not correct for the proportion of seals that were at sea. Harbor seal haul-out behavior is affected by environmental conditions (e.g., weather and tidal state), time of day, and date (seals exhibit seasonal haul-out patterns related to breeding, pupping, molting, etc.). Future analyses will adjust for the effects of these environmental and temporal covariates on the number of seals hauled out.

Table 1. Summary of beluga whale sightings in Cook Inlet, Alaska, from opportunistic reports.

Year	Number of Sightings	Avg Group Size	Min Group Size	Max Group Size
1977	10	4.1	1	18
1978	59	16.7	1	150
1979	72	12.5	1	97
1980	1	400.0	400	400
1982	43	27.0	1	250
1983	23	22.4	1	173
1987	1	37.0	37	37
1991	4	108.7	45	190
1992	3	88.3	1	255
1993	5	17.2	6	30
1997	10	15.0	1	36
1998	2	55.0	35	75
1999	89	21.6	1	300
2000	273	19.1	1	350
2001	189	25.4	1	150
2002	18	68.6	1	200

In February, we inspected four time-lapse camera systems that had been deployed on a small islet near Aurora Lagoon in Kachemak Bay (26 km ENE of Homer, Alaska), a site commonly used by harbor seals. The four camera systems were deployed and began collecting imagery on 21 October 2003. The systems were programmed to capture one digital image every hour for 8 hours surrounding local solar noon each day (9 images per day) and were designed to function unattended for up to 6 months. Although all four cameras recorded images, each system exhibited brief interruptions in the scheduled image collection, and all stopped collecting images by 28 December 2003 (maximum operational duration of 69 days). Some images were obscured by snow or ice on the camera-housing window. A total of 1,147 useable images were captured by camera systems during this first test deployment. Currently, we are continuing to develop this new research technology by investigating ways to reduce snow cover on the housing windows and to eliminate or minimize the impact of brief interruptions to each system's operation.

By Mike Simpkins, Peter Boveng, and Robert Montgomery

CONTINUED STUDIES ON VESSEL DISTURBANCE OF HARBOR SEALS IN DISENCHANTMENT BAY, ALASKA

The Polar Ecosystems Program will continue studies examining the potential effects of cruiseship traffic on harbor seals hauled out on floating ice. Studies were first initiated in 2002 when shipboard observations and aerial surveys of harbor seals were undertaken in Disenchantment Bay, near Yakutat, Alaska. These studies were conducted under a cooperative agreement between the Yakutat Tlingit Tribe, the North West CruiseShip Association, and NMFS. Analyses of behavioral data have thus far shown that seals vacate ice floes with increasing frequency as cruise ships approach within 500 m. Aerial surveys suggested that the vast majority of harbor seals haul out in the western half of the bay in areas with ice cover greater than 50%. However, it is possible that ice conditions were anomalous during the latter surveys in 2002 due to the Hubbard Glacier advancing and blocking the normal tidal exchange with Russell Fjord. This unusual event combined with an unexpected decline in seal abundance during pupping (abundance peaks during pupping elsewhere) pointed to a need for a replicate of the aerial surveys. Surveys in 2004 will begin just prior to the seal pupping period (late April) and continue through mid-July. Cruiseships are scheduled to first enter Disenchantment Bay on 11 May.

Though the aerial transects will match those from the 2002 survey, new techniques will be employed to enhance the quality of imagery from which both seals and ice cover are quantified. Higher resolution imagery will allow for more detailed analyses, such as distinguishing size classes of animals (i.e., adults, juveniles, and pups). Such enhancements will be made possible by using a computer-controlled digital camera that will stream images to the hard drive at regular intervals. We also expect to eliminate technical problems (e.g., condensation and vibration) by using a DHC-2 Beaver plane equipped with a belly camera hatch as opposed to the wing-mounted video camera employed in 2002. By having the camera system housed entirely within the plane, both digital still and video imagery can be collected simultaneously as a fail-safe backup and to allow for comparisons. Data on the locations of cruiseships will be collected using remote-operated cameras currently being installed by the Yakutat Tlingit Tribe as a means to monitor vessel traffic in Disenchantment Bay. In addition to these changes, surveys of harbor seals will be expanded to Icy Bay, a nearby glacial fjord that cruiseships have–until now–only rarely visited. Icy Bay surveys will serve as a control and, thus, provide for valuable comparisons with Disenchantment Bay particularly relating to seasonal fluctuations in abundance.

By John Jansen and Shawn Dahle

RESOURCE ASSESSMENT & CONSERVATION ENGINEERING (RACE) DIVISION

Shellfish Assessment Program

FISHERIES RESOURCE PATHOBIOLOGY TEAM: BITTER CRAB SYNDROME IN NORTH PACIFIC *CHIONOECETES* SPP.: A BRIEF HISTORY AND THE NEED FOR A MOLECULAR APPROACH

Two commercially important crab species in Alaskan waters are the snow crab, *Chionoecetes opilio,* in the Bering Sea, and the Tanner crab, *C. bairdi,* in Southeast Alaska. Historically, these two crab fisheries have been very valuable. Since 1992, the snow crab fishery has been the largest crab fishery in

Alaska with respect to commercial landings (Fig. 1) and the most valuable with respect to exvessel value.

A major decline in the abundance of legal-size snow crabs has been observed in the last 3 years. Although a major Tanner crab fishery still exists in Southeast Alaska, the fishery has been closed in the eastern Bering Sea (EBS) since 1996 due to low abundance. The EBS population trends are surprising considering that NMFS survey data have suggested the existence of strong upcoming prerecruit classes.

Poor recruitment and recovery of *C. opilio* and *C. bairdi*, respectively, suggest that other factors may be influencing their abundance and distribution patterns. One of these factors may be bitter crab syndrome (BCS). BCS was originally thought to only infect crabs larger than 70-mm carapace width at relatively low prevalence. This hypothesis was based upon crab pot fishery and survey data that excluded crabs less than 70-mm carapace width. However, data from NMFS trawl surveys that capture small crabs suggest that BCS affects crabs of all sizes and age classes, with a higher prevalence in small crabs: up to 10.5% in snow crab and 47% in Tanner crab (Figs. 2 and 3). These data suggest that BCS may play a major role in the recruitment of snow crab and recovery of Tanner crab by removing small crabs from the population before recruitment into the fishery.

BCS can be considered an emerging worldwide disease of marine decapods. Since 1987, there has been an increase in the numbers of species affected by the causative agent, a parasitic dinoflagellate of the genus *Hematodinium*. For example, *Hematodinium* infections range between 0.9%-59.7% in Norway lobsters, while in some embayments of Southeast Alaska, infection rates of up to 95% have been reported in Tanner crab populations.

BCS is characterized by radical changes in host hemolymph, lethargic behavior, and altered texture and flavor of cooked meat. Upon cooking, heavily diseased crabs possess a chalky texture and bitter, aspirin-like flavor. Although affected crabs are not a public health concern, the altered flavor and texture renders the meat completely unmarketable. High host mortalities are associated with *Hematodinium* sp. infections in some species; for example, BCS infection is nearly 100% fatal in Tanner crab of Southeast Alaska.

Detection of BCS can be accomplished by a number of methods: the simplest, but least accurate

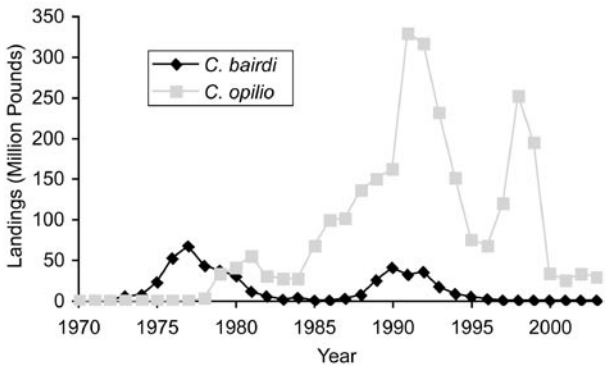

Figure 1. Historical *Chionoecetes* sp. commercial landings in the eastern Bering Sea.

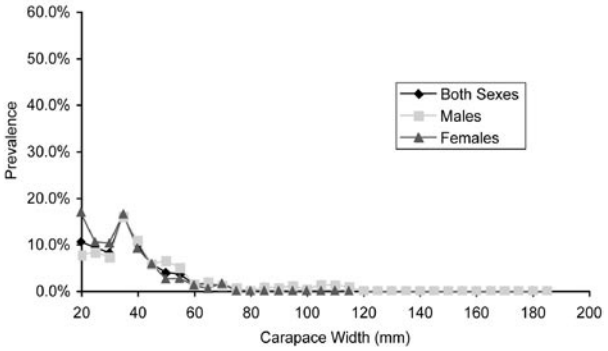

Figure 2. Prevalence of BCS in male and female snow crab in relation to crab size in the eastern Bering Sea (1988-98).

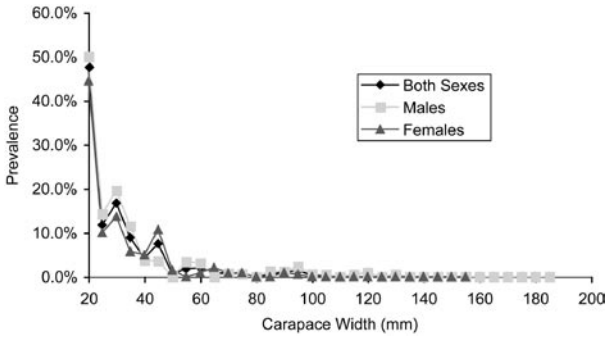

Figure 3. Prevalence of BCS in male and female Tanner crab in relation to crab size in the eastern Bering Sea (1988-98).

is by visual observation. Heavily infected crabs possess opaque shells and milky hemolymph, whereas healthy crabs possess slightly translucent shells and hemolymph that is clear or slightly cloudy. As a result, light infections may not be apparent to the visual observer, thus resulting in underestimates of disease prevalence. A more accurate but time-intensive method of detection uses a drop of hemolymph to make a smear which is stained in the laboratory to

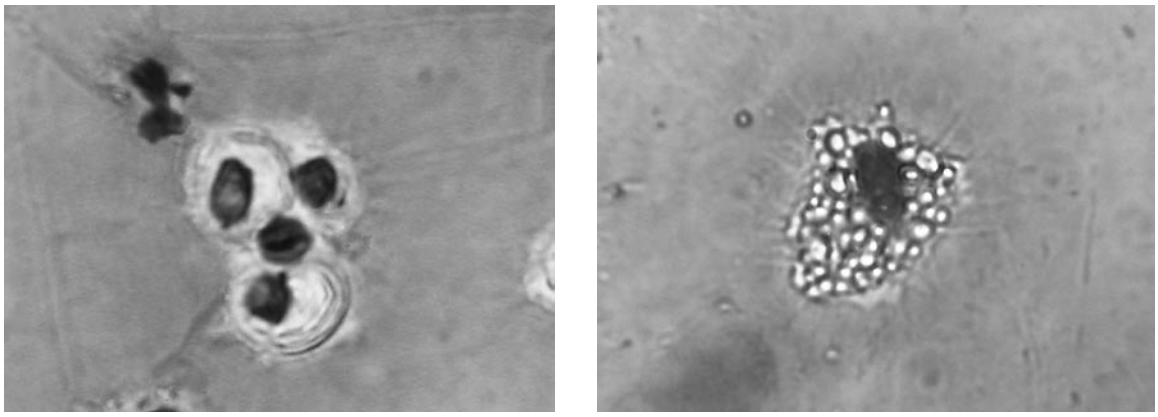

Figure 4. Cells from hemolymph smears stained with Giemsa stain modified (Sigma) at 250X magnification. Left: crab hemocytes. Right: *Hematodinium* sp (center cell).

identify parasitic cells (Fig. 4). However, this method can also lead to underestimates of prevalence due to the small amount of hemolymph examined and morphological similarities between host hemocytes and parasitic cells. Clearly, there is a need for an improved method to detect BCS.

BCS is a disease of the circulatory system, meaning that the parasitic dinoflagellate can be found around all organs and tissues bathed by hemolymph. The parasite is not recognized by crab defense mechanisms and, over time, will proliferate and, either passively or actively, entirely remove hemocytes from circulation. Once a crab is infected, vegetative stages or trophonts first appear as single cells or as plasmodia. As the infection progresses, prespores are formed, frequently with multiple nuclei. In some hosts, dinospores develop and are released from the moribund host. Unfortunately, after 70 years of research, this is the extent of current knowledge of *Hematodinium* sp.-caused diseases: the method of infection is unknown, as is the role that dinospores play in the life history of the parasite. It is uncertain if host reservoirs exist, yet we do know that under natural conditions, not all Alaskan crabs are susceptible to *Hematodinium* sp. infections. The existence of free-living stages of the parasite is also unknown. As a result, to better understand parasite ecology and in an effort to better monitor the effects of BCS on affected crab populations, a more accurate and rapid diagnostic tool needs to be developed.

In an effort to begin addressing many of the above questions, the RACE Division's Fisheries Resource Pathobiology team collected 16 sediment and 11 near-bottom water samples aboard the ADF&G research vessel *Medeia* in October 2003. Samples were collected from regions of Southeast Alaska with historically high prevalences of BCS, as well as regions that rarely, if ever, encounter the disease. Also from these regions, hemolymph was collected from 48 Tanner crabs exhibiting signs of BCS infection and from 48 visually healthy Tanner crabs. Hemolymph and whole crabs were also collected from the 2003 Bering Sea and Gulf of Alaska surveys.

We used the BCS positive hemolymph samples to sequence the DNA of the homologous 18S ribosomal regions of *Hematodinium* sp. using universal primers. Next we plan to identify the variable regions between samples with the goal of developing a species-specific Polymerase Chain Reaction-based *Hematodinium* sp. probe. If this technique proves to be successful and reliable, it will be useful for a number of applications, including rapid and accurate detection of BCS. This will hopefully allow us to determine if the same species of *Hematodinium* is responsible for disease in snow crab and Tanner crab, as well as other crustaceans worldwide. The *Hematodinium*-specific probe will also help us locate life history stages outside the host that may reside in the water or sediment samples collected in 2003 that were processed by combining a series of filters and density gradient centrifugation. If other organisms act as a reservoir for *Hematodinium*, we may be able to identify them using the developed probe.

By Vanessa Lowe

Midwater Assessment & Conservation Engineering (MACE) Program

SPRING SURVEYS

Since 1980, scientists from the Midwater Assessment and Conservation Engineering (MACE)

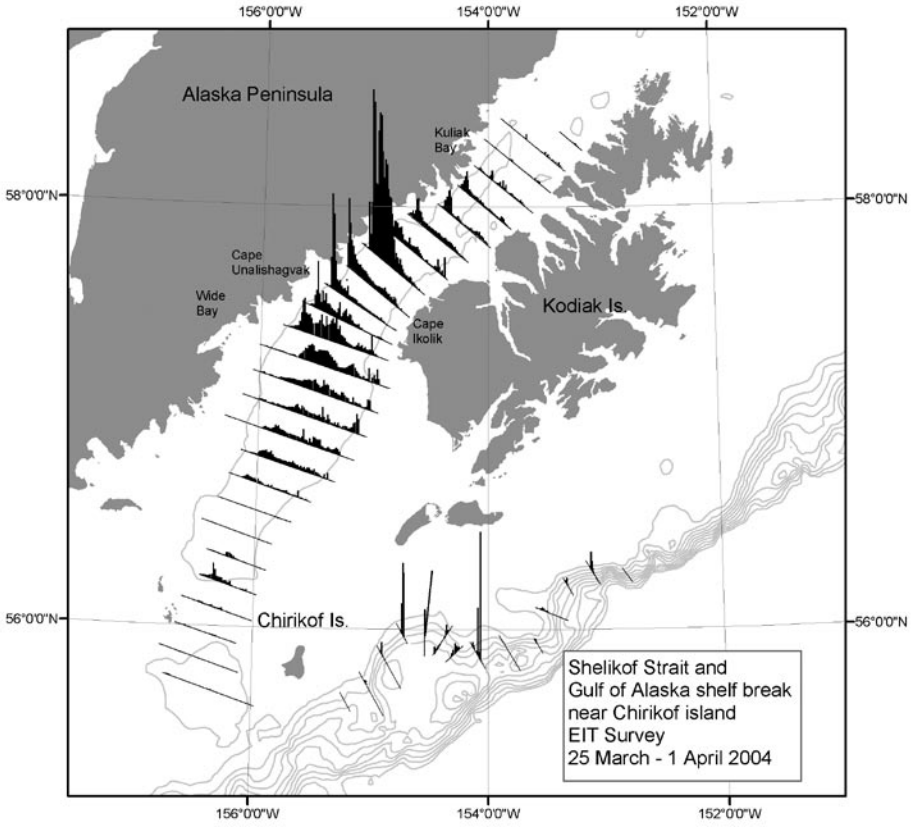

Figure 1. The distribution of combined juvenile walleye pollock and pollock-eulachon mix echosign in the Shelikof Strait and Gulf of Alaska shelf break near Chirikof Island based on data from EIT Survey, 25 March – 1 April 2004. Transect locations are indicated by lines across the mapped distribution.

Program have conducted echo integration-trawl (EIT) surveys in the Gulf of Alaska and Bering Sea to assess the distribution and abundance of walleye pollock. Spring 2004 surveys were conducted in the Shelikof Strait area and along the shelf break east of Chirikof Island (Fig. 1). Instrument calibration activities for the two acoustic systems were conducted during the winter field season: one during gear trials in Port Susan, Washington, and another in Izhut Bay, Afognak Island, Alaska. The primary objectives of the surveys were to estimate the biomass, numerical abundance, and various biological characteristics of the off-bottom component of the walleye pollock populations in these areas. A secondary cruise objective was to obtain biological information for other research projects as well as conduct several survey-related research activities.

Acoustic data were collected with a Simrad EK500 echo sounder using 38- and 120-kHz split beam transducers and with a Simrad ER60 echo sounder using 18-, 38-, 120-, and 200-kHz split beam transducers. Data were recorded using SonarData EchoLog and analyzed using the PC-based SonarData Echoview post-processing software. Data for the four frequencies were also logged using ER60 software. Results presented here are based on EK500 38-kHz data.

For the first time since the 2000 survey, significant amounts of prespawning pollock were detected on the west side of Shelikof Strait, although the abundance was lower than in the mid- to late 1990s (Fig. 1). Significant quantities of adults (mostly assumed to be age-5 pollock) were also detected just outside the mouth of the strait. Few age-1 pollock were detected in the Shelikof Strait area. Along the shelf break near Chirikof Island, most of the pollock echosign was detected in the bight between 154°W and 155°W at 275-500 m water depths over bottom depths of 350-800 m. No pollock shorter than 37 cm fork length (FL) were caught in trawl hauls conducted in this area.

In the Shelikof Strait area, pollock were the most abundant species by weight in the 13 midwater trawl hauls, comprising 88% of the total catch. Pollock comprised 60% of the catch in the two bottom trawl hauls. Pollock comprised 99% of the catch in the four midwater trawl hauls conducted along the shelf break east of Chirikof Island.

For females greater than 40 cm FL in the Shelikof Strait area, 3% were immature, 13% were developing, 77% were mature prespawning, 5% were spawning, and 1% were spent. The low percentage of spawning and spent fish (6%) indicated that survey timing was appropriate. For females greater than 40 cm FL along the shelf break near Chirikof Island, 0% were immature, 65% were developing, 32% were mature prespawning, 2% were spawning, and 1% were spent. The low percentage of spawners and postspawners (3%) indicated that peak spawning had not yet occurred. The high ratio of developing to mature prespawning females is consistent with previous survey results where the majority of fish are in the 40-45 cm FL range.

By P. Tyler Yasenak

RESOURCE ECOLOGY & FISHERIES MANAGEMENT (REFM) DIVISION

Age & Growth Program

Estimated production figures for 1 January through 31 March 2004.

Species	Number Aged
Yellowfin sole	292
Arrowtooth flounder	3,359
Walleye pollock	5,216
Pacific cod	684
Sablefish	104
Atka mackerel	22
Pacific ocean perch	220
Northern rockfish	465

Total production figures were 10,362 new age readings, with an additional 1,299 test age readings. Nineteen readings of structure were determined to be unageable.

By Dan Kimura

Economic & Social Sciences Research Program

ECONOMIC DATA COLLECTION FOR CRAB FISHERIES RATIONALIZATION

The Consolidated Appropriations Act of 2004 (CAA) requires the Secretary of Commerce, by not later than 1 January 2005, to approve regulations for the Voluntary Three-Pie Cooperative Program for crab fisheries of the Bering Sea and Aleutian Islands approved by the North Pacific Fishery Management Council. That program includes the data collection program proposed by the Council to evaluate the efficacy of the crab rationalization program and to determine its relative impact on fishery participants and communities. The data program will collect revenue, employment, variable cost data, as well as any fixed cost data necessary to analyze variable costs. These data will be collected from the harvesting and processing sectors for 3 years prior to the implementation of the crab rationalization program and then annually.

Information collection is further addressed in the following requirement contained in the CAA.

> The Secretary, in consultation with the Department of Justice and the Federal Trade Commission, shall develop and implement a mandatory information collection and review process to provide any and all information necessary for the Department of Justice and the Federal Trade Commission to determine whether any illegal acts of anti-competition, anti-trust, or price collusion have occurred among persons receiving individual processing quotas under the Program.

Center economists are working with Alaska Regional Office staff to implement both the data collection program proposed by the Council and the information collection and review process referred to above. The data collection program proposed by the Council will provide some, but not all, of the information required by Department of Justice (DOJ) and the Federal Trade Commission (FTC). NMFS will assist in collecting the additional information in two ways. First, it will expand the data collection program proposed by the Council to include additional information requested by the DOJ or FTC. Second, it will implement recordkeeping and reporting requirements that will facilitate DOJ and FTC access to other types of information.

PROPOSALS FOR ECONOMIC RESEARCH AND DATA COLLECTION

Economic and Social Sciences Research Program staff prepared eight economic research proposals for commercial fisheries, one proposal for recreational

fisheries, three data collection and research proposals for fishing communities, and three data collection proposals for commercial fisheries. All 15 proposals were completed as part of the annual process to develop spending plans for funding provided by the NMFS Office of Science and Technology. These proposals identify many of the research and data collection projects that program staff will participate in during the coming year. Many of these projects will be conducted in partnership with economists and other social scientists within NMFS and at universities. The proposal titles are listed below.

Economic Research Proposals for Commercial Fisheries:

- Proposal 1. Design of Multispecies IFQ Systems
- Proposal 2. Improving Estimates of Bycatch in Multispecies Fisheries
- Proposal 3. An Empirical Investigation of Information and Rationalization: Estimating Their Impact on Bycatch Levels and Location Choice in the Bering Sea
- Proposal 4. Estimating the Economic Impact of the Steller Sea Lion Conservation Area: Developing and Applying New Methods for Evaluating Spatially Complex Area Closures
- Proposal 5. Improving and Integrating BSAI/GOA Commercial Groundfish Fisheries Data
- Proposal 6. Extension of Research on a Cap-and-trade System for Regulating Habitat Impacts of Fisheries
- Proposal 7. Improve Regional Economic Models for Select Regions Impacted by Alaska Fisheries
- Proposal 8. Developing A Dynamic Regional Economic Model for Alaska Fisheries

Economic Research Proposals for Recreational Fisheries

- Proposal 1. The Economic Value of Sport Halibut Fishing in Alaska

Data Collection and Research Proposals for Fishing Communities

- Proposal 1. Joint Project (AFSC/NWFSC)/SWFSC for Fishing Community Profiles in the Western States
- Proposal 2. AFSC MSA Fishing Community Identification
- Proposal 3. National Standard 8 and the Emigration of IFQ Shares from Small, Remote, Fishing Communities

Data Collection Proposals for Commercial Fisheries

- Proposal 1. Obtain Processing Sector Employment and Earnings Data by Residency Category and Obtain Improved Residency Data for the Harvesting Sector
- Proposal 2. Expand the Use of Electronic Logbooks to Improve the Economic Data Available for Alaska Groundfish Research and Management
- Proposal 3. Implement Mandatory Reporting Program for Economic Data from the Harvesting and Processing Sectors of the BSAI and GOA Groundfish Fisheries That Are Being Rationalized

OTHER PROGRAM ACTIVITIES

Program staff have been involved in ongoing efforts to 1) implement the National Bycatch Strategy; 2) estimate the nonconsumptive value of Steller sea lions; 3) identify and profile fishing communities; 4) develop regional economic impact models; 5) assess the economic effects of the BSAI pollock fishery cooperatives; 6) measure economic performance for commercial fisheries; 7) assess vessel and permit buyback programs; 8) implement improved electronic reporting of fisheries data; 9) establish an improved program for observer funding and deployment in the Alaska groundfish fisheries; and 10) summarize fisheries data for NMFS, NPFMC, industry, environmental organizations, and other stakeholders.

NMFS SEA GRANT FELLOWSHIP FOR MARINE RESOURCE ECONOMICS

Joshua Abbott from the University of California, Davis, was awarded one of two 2004 fellowships. Dr. Ron Felthoven will be his mentor. The goal of his dissertation research is to examine the implications of the current regulatory policy in many North Pacific/Alaskan fisheries of controlling harvest by season restrictions. The hypothesis to be tested is that season limits combined with strategic behavior and congestion externalities in the fishery may lead to significant distortions in terms of excess movement among fishing grounds and, in the long run, excess investment in fishing vessels. The other 2004 fellowship in this program was given to Leif

Anderson from the University of Washington. His mentor is Dr. Todd Lee at the Northwest Fisheries Science Center. Alan Haynie, from the University of Washington, was awarded the fellowship last year, and Ron Felthoven was a recipient of the fellowship in 2000, while he was a graduate student at the University of California, Davis.

By Joe Terry

Status of Stocks & Multispecies Assessment Program

FISHERY INTERACTION TEAM PRESENTATION AT OCEAN RESEARCH CONFERENCE

Susanne McDermott and Libby Logerwell, members of the Fishery Interaction Team subtask, gave oral presentations at the 2004 Ocean Research Conference held in Honolulu, Hawaii, during 15-20 February. The conference was sponsored by the American Society of Limnology and Oceanography and The Ocean Society, and their presentations were given in a session on "Oceanography and Ecology of the Aleutian Archipelago."

Libby Logerwell gave a presentation entitled, "Geographic patterns in the demersal ichthyofauna of the Aleutian Islands shelf" coauthored by Kerim Aydin, Steve Barbeaux, Eric Brown, Liz Conners, Sandra Lowe, Jay Orr, Ivonne Ortiz, Rebecca Reuter, and Paul Spencer. Geographic patterns in the Aleutian Islands ichthyofauna from the individual to the community level of organization were presented. At the highest level of organization (the community), patterns and trends in species occurrence and community composition were shown. At the population level, some species showed depth and longitudinal trends in distribution and abundance while others showed patchy distributions. At the individual level, geographic patterns in demersal fish diet and growth were observed. These geographic patterns were consistent with patterns in the region's physical and biological properties described by other presenters in the session. For instance, many characteristics of demersal fish changed at Samalga Pass. Other presenters described changes in climate variability, physical oceanography, zooplankton species composition, seabird diet, and marine mammal distribution at Samalga Pass. The authors' results also suggest that there may be other transition zones in the western Aleutian Islands that have not yet been identified oceanographically, such as Adak Strait, Amchitka Pass, and Buldir Island. In addition to step-changes at the passes, there were longitudinal trends in demersal fish characteristics, such as growth, that point to continuous environmental variation along the length of the Aleutian Islands chain. Finally, some species were more patchily distributed than others, and high catches of these patchily distributed species may indicate areas of increased production due to mixing and/or upwelling.

Susanne McDermott presented "Estimating movement and abundance of Atka mackerel (*Pleurogrammus monopterygius)* with tag release data," coauthored by Lowell Fritz and Vivian Haist. This presentation described results from a mark-recapture experiment conducted in Seguam Pass, inside and outside a trawl exclusion zone. The purpose of the experiment was to estimate local Atka mackerel abundance around a Steller sea lion rookery. In 1999, 1,375 tagged fish were released. A biomass of 76,679 metric tons (t) was estimated outside the trawl exclusion zone. In 2000, 8,773 tagged fish were released. An integrated tagging model estimated the biomass to be 117,900 t inside and 82,057 t outside the trawl exclusion zone. Probability of fish moving from outside to inside the zone was small (0.0056) and from inside to outside was potentially large (0.81), but was associated with high uncertainty (the 95% confidence interval ranged from 0 to 1.00). Preliminary results for the tag and release events in 2002 showed that there was a potential influx of young fish that happened after fish were tagged and showed up during the recovery event. An immigration factor was calculated by adjusting length frequency distributions of tagged fish and fish examined for tags. This immigration factor was then used to adjust the numbers of fish examined for tags and resulted in adjusted population abundance estimates. Population sizes were within the range, but slightly higher than the 2000 results in Seguam Pass with similar movement rates. Population sizes for Tanaga Pass were estimated at 100,000 t inside and 67,000 t outside the trawl exclusion zones. Movement rates were 0.11 from the inside to the outside and 0.6 from the outside to the inside, but again were associated with high uncertainty. The results indicated that tagging as a means of abundance and movement estimation seems to work well for Atka mackerel. The results also showed that Atka mackerel do not appear to move outside of their localized aggregations (<20 km). This lack of movement might result in local adaptations to differences in ocean conditions along

the Aleutian Islands chain, such as those documented by other presenters in the session.

The other presentations in the session described research on prehistoric human populations, climate variability, physical oceanography, primary productivity, zooplankton distribution, seabird foraging ecology, marine mammal distribution (including endangered Steller sea lions), and pollock egg and larval characteristics. Much of the work presented in this session will be published in a special issue of *Fisheries Oceanography* focusing on the Aleutian Islands region.

By Libby Logerwell

A NEW ASSESSMENT TECHNIQUE FOR SHORTRAKER AND ROUGHEYE ROCKFISH

A new stock assessment model for Bering Sea and Aleutian Islands (BSAI) rougheye and shortraker rockfish was used in 2003. In previous stock assessments, biomass of rougheye and shortraker rockfish was estimated by simple averaging of recent survey biomass estimates. The new assessment procedure uses a Kalman filter to fit a surplus production model to the survey and catch data. The Kalman filter provides a statistically rigorous methodology that considers process errors (underlying natural variability), observation errors (errors in our estimates of the true state of nature, such as the biomass of fish), and covariances between observations. For BSAI shortraker and rougheye rockfish, catches have been reported for the two-species complex, although an estimate of catch by species can be made by extrapolating species-specific catches from fishery observer data to the total aggregated catch. However, sampling variability in the observer catch proportions would be expected to affect the variance of the resulting catch estimates, and consideration of statistical errors in the observer data adds considerably to the assumed observation errors in catch for BSAI rougheye and shortraker rockfish. Additionally, the new assessment model allows for estimation of parameters with biological and management importance, such as population growth rate. The new assessment methodology was presented to the North Pacific Fishery Management Council's BSAI Plan Team in September 2003 and was applied to BSAI shortraker and rougheye rockfish in November 2003.

By Paul Spencer

Resource Ecology & Ecosystem Modeling Program

FISH STOMACH COLLECTION AND LAB ANALYSIS

Laboratory analysis was performed on 5,840 groundfish stomachs specimens collected from the eastern Bering Sea and 172 stomachs from the Aleutian Islands. No stomachs were collected or returned from the Bering Sea, Gulf of Alaska, or Aleutian Islands during this quarter.

By Troy Buckley

MODELS OF GULF OF ALASKA OCEANIC FOOD WEBS

The ocean basin of the Gulf of Alaska is an important habitat for the growth of Pacific salmon (*Oncorhynchus* spp.). Several North American and Asian salmon stocks put on up to 90% of their body weight through feeding in this region. In recent years, there has been concern about the effects of long-term climate change on Pacific salmon growth, as both cold water temperatures and prey supply are critical to salmon obtaining sufficient body size for their return migrations. Further, competition for food might limit salmon body size during periods of high salmon abundance, as in the Gulf of Alaska throughout the 1980s and 1990s.

In an international collaboration through the North Pacific Marine Science Organization (PICES), AFSC researcher Kerim Aydin was the lead author of a food web model of the oceanic Alaskan Gyre, which quantified the annual prey and predator budgets for several species of salmon such as pink salmon, *O. gorbuscha* (Fig. 1). The modeling was expanded to a detailed seasonal exploration of factors influencing pink salmon growth, by coupling a bioenergetics model of individual pink salmon growth and seasonal feeding behavior based on data provided by the University of Washington High Seas Salmon Program to both the food web model and a seasonal nutrient-phytoplankton-zooplankton model built by AFSC researcher Bern Megrey through a similar collaboration

The results suggest that the measured rates of pink salmon growth, especially their accelerated spring and summer growth prior to spawning, are not explained solely by seasonal zooplankton blooms (bottom-up control). While the zooplankton bloom is important, two additional factors are necessary to explain growth differences: 1) salmon switching their diet from zooplankton to more nutritious

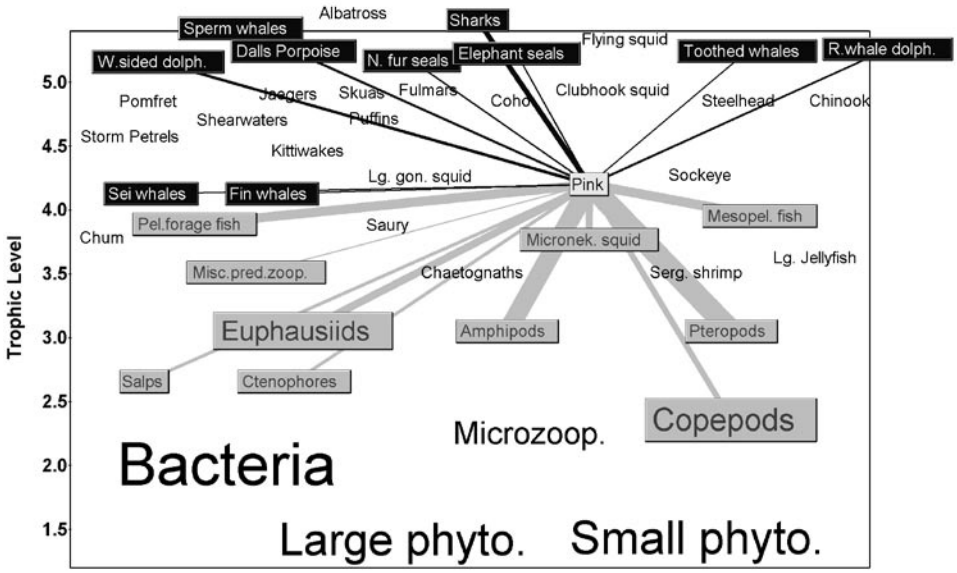

Figure 1. Food web of the oceanic Alaska Gyre, emphasizing pink salmon. Prey of pink salmon are shown in grey; predators of pink salmon are shown in black. Line widths are proportional to the volume of flow (tons/year).

squid as they grow; and 2) a decreasing energetic cost of foraging for salmon in the spring and summer. A possible reason for this second factor is the concentration of prey in surface waters, which occurs as heat input stratifies the pelagic water column in the summer, requiring salmon to search less water to find the same amount of food.

The next steps are to test these models with inputs of historical changes in bloom timing, water temperature, prey supply, and increases in salmon population numbers that have occurred along with measured climate changes. The hope is that such models will go beyond simple correlations in predicting the effects of future climate on salmon populations.

By Kerim Aydin

PICES WORKING GROUP MEETING

Jennifer Boldt and Anne Hollowed participated in a 2-day workshop held 9-10 February 2004 in Victoria, British Columbia, as part of a PICES working group under the NMFS Science Board that will provide advice to the United States with respect to potential implications of recent regime shifts in the North Pacific for fisheries. The purpose of this meeting was to establish an approach to answering the questions put forth by the United States, the general outline of the report, and an outline for a June workshop. Further work will be conducted through correspondence, leading to a draft report to be presented and discussed at a workshop in late June 2004 in Seattle, Washington. The group plans to have a written report by summer 2004, for review by PICES, with submission to the United States in fall 2004.

By Jennifer Boldt

FISH FOOD HABITS ANALYSIS TOOLS

Geoff Lang presented "North Pacific Groundfish Diet Data: An Overview of the Resource Ecology and Ecosystems Management's Diet Information System (DIS) and Diet Analysis Tool (DAT)'" at the Western Groundfish Conference, 9-13 February 2004, in Victoria, British Columbia. The poster presented information regarding the stomach content analysis data from approximately 250,000 North Pacific groundfish. Complete database details can be found on the AFSC website at *http://www.afsc.noaa.gov/refm/reem/data/Default.htm*. Details of the Resource Ecology and Ecosystem Modeling (REEM) Diet Analysis Tool were also presented. This MS ACCESS application currently provides many of the diet analysis techniques used by REEM staff in a user friendly, point-and-click environment with results that formerly required utilization of software packages such as SPSS and S-Plus. The Diet Analysis Tool output includes a mapping function, descriptive diet tables and predator-prey scatterplots based on the user's selection criteria.

By Geoff Lang

NEW COLLABORATIVE PROJECT

Pat Livingston and Geoff Lang met with Dale Kiefer of Science Systems Applications to discuss a collaborative effort to develop a web-based GIS data visualization of REEM's North Pacific groundfish diet data. The visualization software allows users to overlay and visualize spatial relationships among several sources such as physical and biological data. Potential data sources for this project include REEM's groundfish diet database, RACE survey data (catch, surface temperature, temperature/depth profiles), PMEL oceanographic data (chlorophyll, ice cover, currents). These data would primarily be used internally for exploratory analysis and to spur internal scientific collaboration. However, summarized data could be made more widely available via the web as part of the Ocean Biogeographic Information System (OBIS) commissioned by the Census of Marine Life.

By Geoff Lang

U.S. North Pacific Groundfish Observer Program

EXPANSION OF ELECTRONIC MESSAGE SYSTEM

The requirement for vessels to provide hardware and install software to support observer at-sea reporting (ATLAS system) and communication was extended to all 100% observed catcher vessels and 30% observed shore plants this year. The ATLAS system is now available to observers on all vessels over 124 ft in length and all shore plants that process over 499 t of groundfish per month. This expansion could not have been possible without the dedicated efforts of many people in the Observer Program.

DATA CONTRACTORS CLOSES

One of the first observer provider companies, Data Contractors, went out of business early this year citing increased insurance costs as the primary reason for closure. Data Contractors, located in Anchorage, Alaska, had been deploying observers since the inception of the domestic North Pacific Groundfish Observer Program in 1990.

NORTH PACIFIC FISHERY MANAGEMENT COUNCIL

The North Pacific Fishery Management Council (Council) continued developing an analysis for a fishery management plan (FMP) amendment to restructure the funding and deployment systems in the Observer Program. Under the FMP amendment, a new fee-based mechanism would be established which would be based on a percentage of the exvessel value of catch. These collected fees combined with possible federal dollars would allow NMFS to contract directly for observer services. The FMP amendment also includes a new deployment structure, which when implemented would do away with the current 0%, 30% and 100% observer coverage categories, and vessels and shore plants would be required to carry observers when they were provided by NMFS. NMFS would determine when and where to deploy observers based on data collection and monitoring needs.

The alternatives within the analysis of the FMP amendment consist of various combinations of vessels and shoreside processors in both the Gulf of Alaska and Bering Sea/Aleutian Islands. The Council's Observer Advisory Committee (OAC) is currently wrestling with many issues surrounding the alternatives. Discussions at the OAC meeting in March 2004 centered on the problems associated with simultaneous operation of two separate observer funding and deployment systems (old and new); and the so far unknown costs associated with observer compensation and overtime pay under federal contracts. Council review of the initial draft analysis has been scheduled for October 2004.

By Bob Maier

Cooperative Research with Russia

The Russian research laboratory in Vladivostok, TINRO, collected and transferred 1,500 salmon fin clips collected from 995 sockeye and 505 chinook specimens from the western Bering Sea to the Alaska Fisheries Science Center in January 2004. The specimens were collected during the 2003 Bering-Aleutian Salmon International Survey (BASIS) cruise in the Russian Exclusive Economic Zone of the western Bering Sea. The fin clips were preserved in 90% alcohol for genetic studies to differentiate stocks. The genetic analyses will be carried out by the ADF&G and the Center's Auke Bay Laboratory.

By Loh-Lee Low