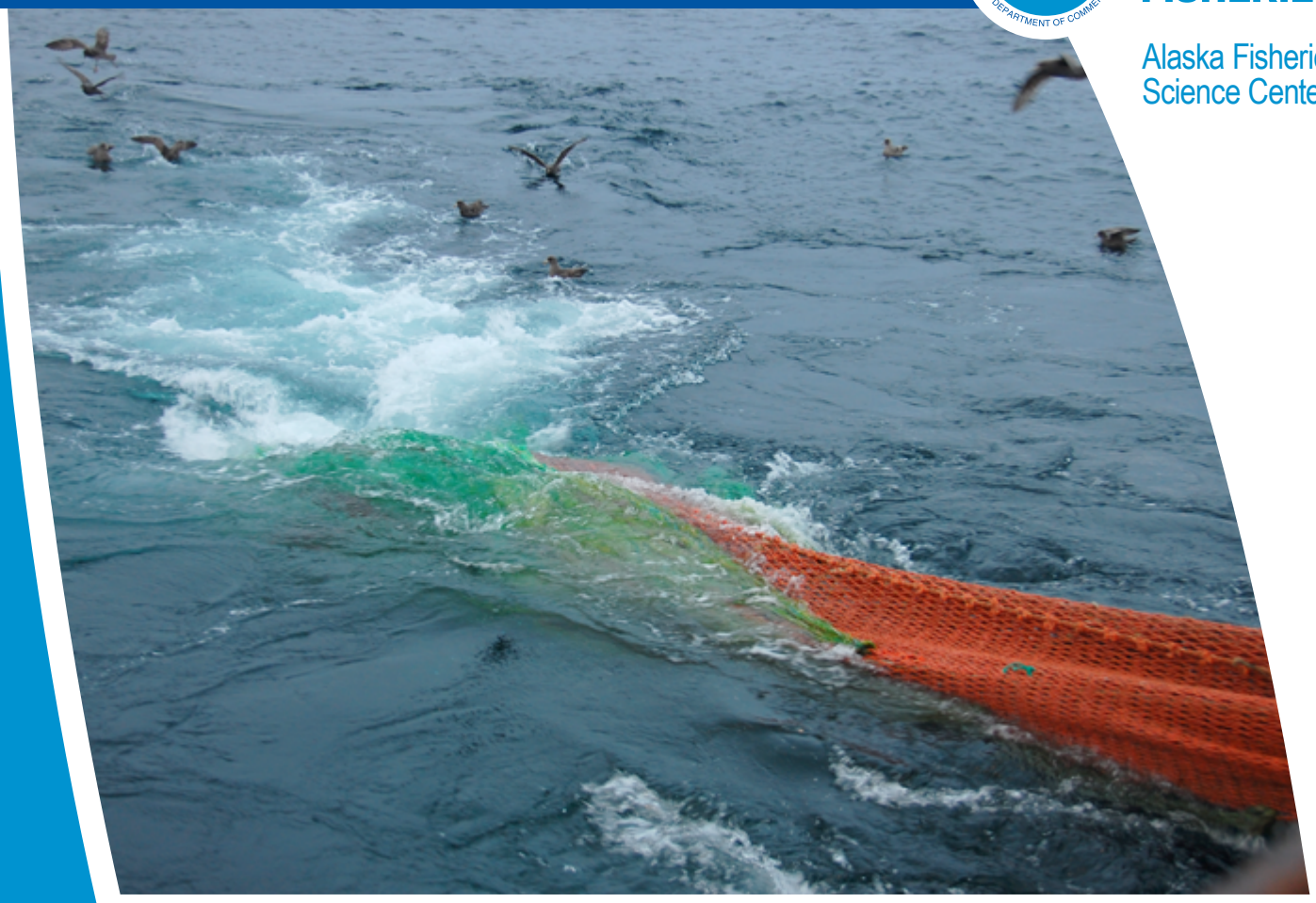
2020 IN REVIEW

RACE Resource Assessment and Conservation Engineering Division

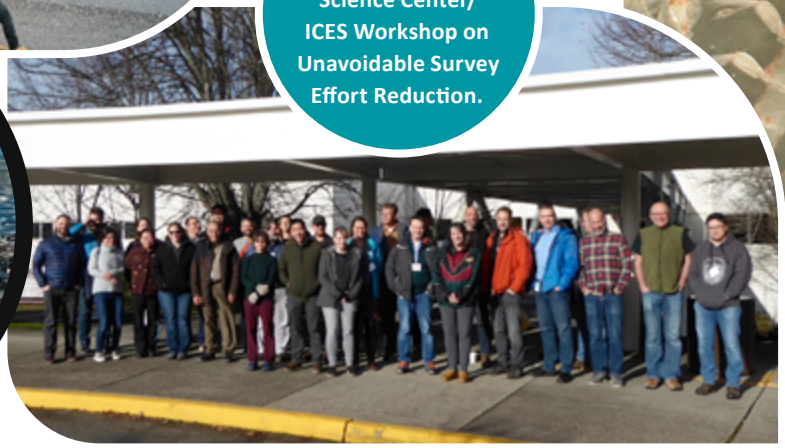
NOAA FISHERIES

Alaska Fisheries Science Center



The Resource Assessment and Conservation Engineering Division is a division of the Alaska Fisheries Science Center. The division includes scientists from various disciplines: fishery and oceanography researchers, bioacousticians, engineers, technicians, and other specialists and support staff. Our scientists conduct research surveys and oceanographic studies to measure the distribution and abundance of commercially important fish and crab stocks in the eastern Bering Sea, Aleutian Islands, and Gulf of Alaska. We also conduct various studies to learn more about the structure and function of Alaska's marine ecosystems, and what environmental and climate conditions are necessary to keep fish and crab populations healthy. Because survey data are collected regularly over many years, scientists are able to understand trends in fish and crab population abundance over time and study how marine habitats and ecosystems change. Together with the commercial fishing industry, we are also exploring technological solutions or methods to help reduce bycatch and bycatch mortality.

2020 Highlights



Attendees to the Alaska Fisheries Science Center/ ICES Workshop on Unavoidable Survey Effort Reduction.

Enhancing Early Life Stage Monitoring for Pacific Cod

The Fisheries Behavioral Ecology Program made multiple contributions that enhance our ability to monitor early life abundance and forecast recruitment (the age at which fish are large enough to be targeted by commercial fisheries). We developed a Gulf of Alaska spawning habitat index for Pacific cod. For the fourteenth year, we continued our beach seine survey of cod in their first year of life off Kodiak, Alaska to better predict fluctuations in recruitment. We expanded the application of baited camera survey techniques to develop overwinter survival and age-1 abundance indicators. We continue to conduct critical laboratory research to predict the effects of climate, changing temperatures, and ocean acidification on important Alaska finfishes, particularly impacts during their early developmental stages.

Leading the Workshop on Unavoidable Survey Effort Reduction

Groundfish Assessment Program scientists helped organize and hosted an International Council for the Exploration of the Sea (ICES) international workshop held in Seattle to begin to create tools for survey scientists around the world to assess the impacts of survey design and loss of survey effort on the estimates they deliver to assessment scientists. Scientists used novel methods to statistically compare catches of walleye pollock, Pacific cod, and Alaska plaice from Bering Sea survey data sets collected by Russia and the United States. They were able to demonstrate changes in the availability of fish in the eastern Bering Sea as fish move back and forth across the maritime boundary between the two countries. The Program also discovered and described one new species of fish from the Beaufort Sea and three new species from the Aleutian Islands.

Accomplishing a High Arctic Survey to Continue 20-Year Time Series

The Recruitment Processes Program successfully co-organized a research survey in the Chukchi Sea. We collected biological and oceanographic data including chlorophyll, zooplankton, and ichthyoplankton to continue a near 20-year time series for the High Arctic. We collaborated to collect and use physical oceanographic data from serviced long-term oceanographic moorings. As the Program continues to collect data it shares new discoveries such as the abundance, distribution, and growth of early life history stages of important species such as Arctic cod and saffron cod, how to model the dispersal of these species using biophysical transport models, and how currents and growth affect the distribution of zooplankton (food for small fishes).

Zooplankton lipids and their component fatty acid biomarkers provide information about the nutritional status of organisms as well as inform pathways of carbon flow from primary production to higher trophic levels.

Our Newport facility provides unique opportunity to study fish growth and development in simulated Arctic cold water environments.

Tracking Red King Crab to Assess Bycatch Reduction Measures

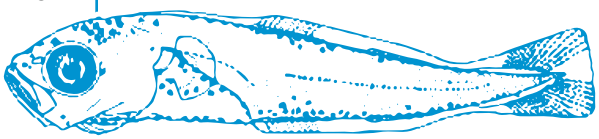
The Shellfish Assessment Program worked with the fishing industry, and state and private sector partners to put out acoustic tags on Bering sea red king crab and then used saildrones to learn more about crab movements during winter months when data are limited. We're specifically tracking mature male crab greater than 120 mm carapace (shell) length. Only large male king crab are harvested in Alaska and there are a lot of unanswered questions on the movement of these crabs. The Program also created a novel set of bodily measurements so scientists could more easily distinguish between immature and mature male Tanner crabs. They described the role of climate in recent northerly shifts in Bering Sea snow crab, the effects of ocean acidification on young of the year golden king crab growth and survival, and spatial and temporal variation in reproductive cycles (annual versus biennial spawners) of Bering Sea snow crab.

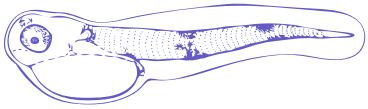
Expansion of Marine Lipid Ecology Lab Capabilities

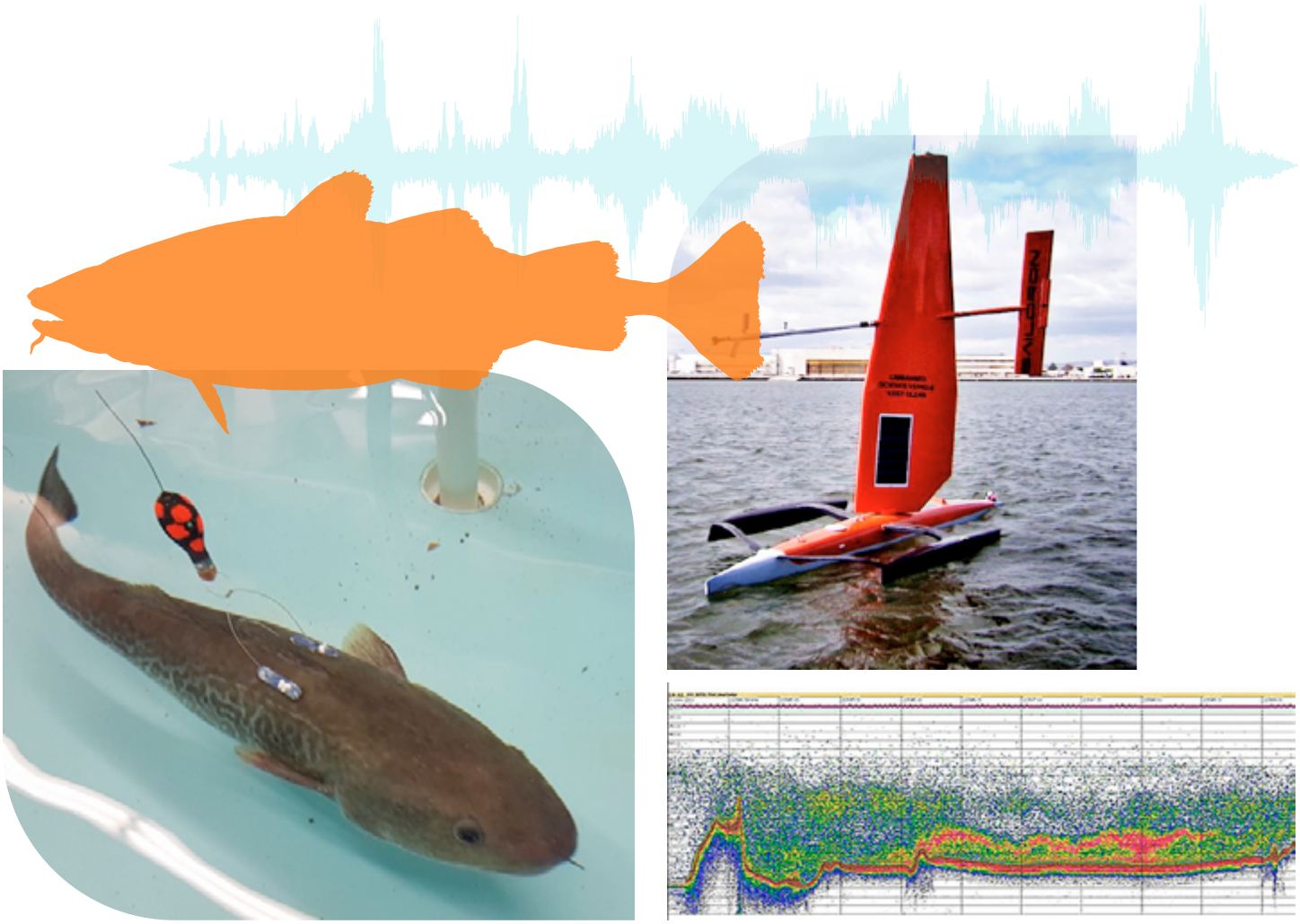
The Fisheries Behavioral Ecology Program added expertise in marine lipid chemistry to better understand marine food webs and animal condition. We hired a principal investigator and lab coordinator, and continue to collaborate with the Oregon State University-NOAA Cooperative Institute for Marine Resources Studies. We purchased new analytical equipment (an Iatroscan) and are collaborating with scientists at our Auke Bay Laboratories and RACE's Kodiak Laboratory on a range of studies to better understand fish and crab growth and survival. We developed new techniques to analyze fatty acids in fish.

Developing Ecosystem Metrics and Forecasts

Despite a significant reduction in field work in 2020, the Recruitment Processes Program and Recruitment Processes Alliance developed nearly a half dozen ecosystem metrics projected from historical data. These included spawning habitat, phenological shifts (the relationship between environmental conditions and an organism's biological response), zooplankton abundance, fish larvae, and prey quality. These metrics provided data to the North Pacific Fishery Management Council for use in setting 2021 fisheries quotas.







Tagging Pacific Cod in the Eastern Bering Sea

The Groundfish Assessment Program successfully tracked movements of Pacific cod in the northern Bering Sea for the first time using satellite-tracked tags that are released from the fish at pre-programmed time intervals. The research was also the first collaborative effort between NOAA Fisheries scientists, St. Lawrence Island fishermen, and Norton Sound Economic Development Corporation scientists. Data were recovered from 33 of the 38 tagged cod released. Our results from this initial tagging project showed that many fish migrate south to their spawning grounds, ahead of the ice in winter, and not all of those fish stayed in U.S. territorial waters. Some, but not all, of the tagged fish returned to northern Bering Sea feeding grounds the following summer. This initial project showed the potential for using satellite-tracked tags to track Pacific cod movement. In the future, we plan to tag many more fish in the northern Bering Sea and use this technique in other locations such as the Gulf of Alaska to examine potential movement of cod between the western Gulf and the southeastern Bering Sea.

Successfully Conducting Annual Pollock Surveys

The Midwater Assessment and Conservation Engineering Program accomplished three winter acoustic-trawl surveys and one summer acoustic survey despite challenges posed by the pandemic. Our successful completion of these surveys ensured timely delivery of data for resource management decisions by the North Pacific Fishery Management Council in the fall. Data for the summer survey were entirely collected by autonomous surface vessels, a first in NOAA. This accomplishment culminated multiple years of research and rigorous comparisons between acoustic data collected by fisheries survey vessels and autonomous vehicles. The Program also successfully retrieved four moorings with upward-looking acoustic sensors deployed to estimate the numbers of pollock that move back and forth across the maritime border with the Russian Federation.

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