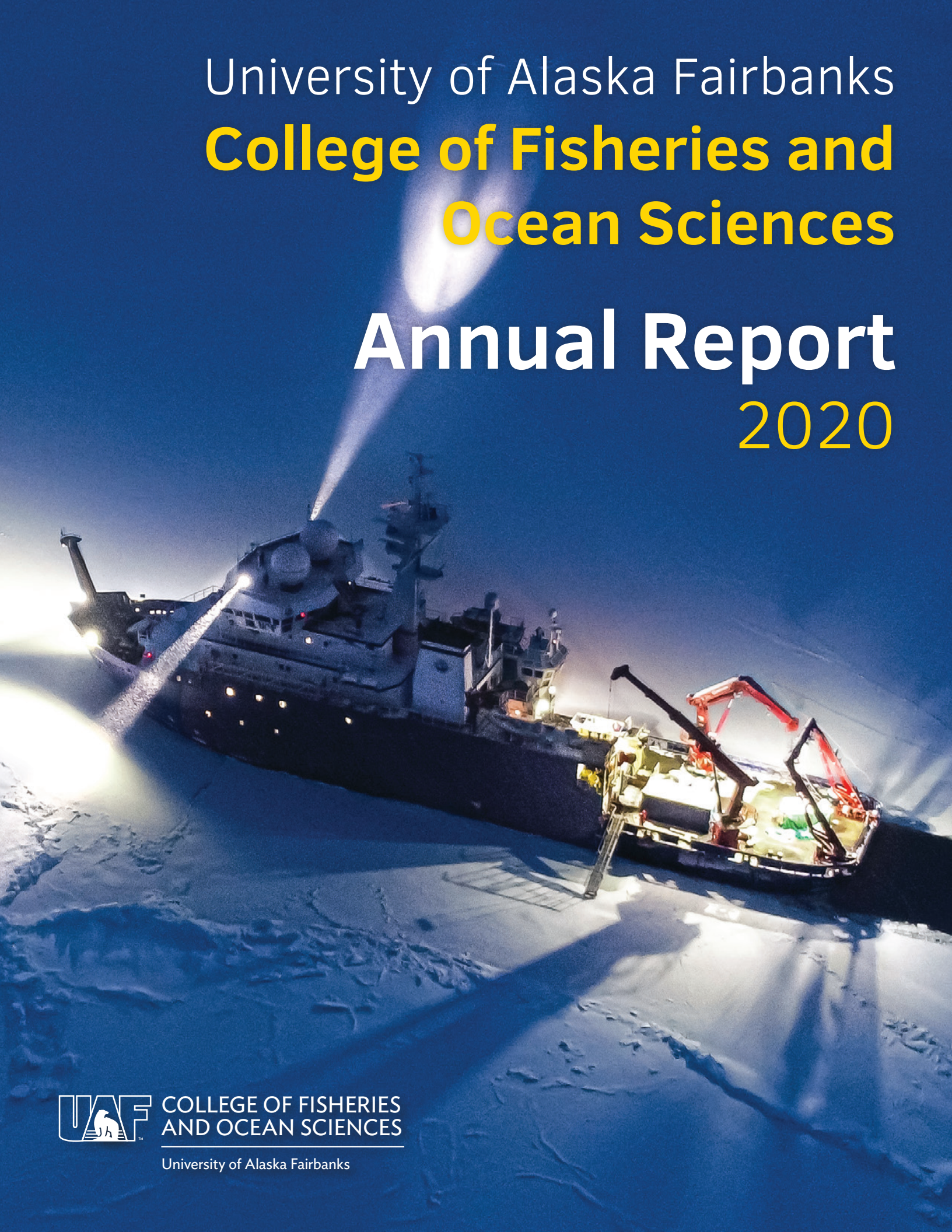


University of Alaska Fairbanks
**College of Fisheries and
Ocean Sciences**

Annual Report
2020



COLLEGE OF FISHERIES
AND OCEAN SCIENCES

University of Alaska Fairbanks

Message from the Dean

The image of *Sikuliaq* taken in the dead of the Arctic winter, surrounded by darkness, sea ice and a degree of uncertainty, charting a safe path forward, is a metaphor for the challenge we all face in navigating through the global COVID-19 pandemic. In this context, despite the pandemic, I am pleased to convey that the College of Fisheries and Ocean Sciences (CFOS) continued its important mission this past year to advance understanding of critical scientific issues and challenges facing Alaska's vast inland, coastal and ocean ecosystems.

Among the highlights this past year, we strengthened our outstanding faculty with the hire of Schery Umanzor in the Department of Marine Biology and Jessica Glass in the Department of Fisheries, and we were honored with a prestigious University of Alaska President's Professorship appointment. We continued to see an increase in our undergraduate and graduate student enrollment. The abrupt transition to distance delivery of our curriculum necessitated by the pandemic, while challenging,

has been relatively seamless given that many of our classes were already delivered online. In turn, this has led to a renewed effort by our faculty to deliver courses by asynchronous modality, which will extend our instructional reach within and beyond Alaska. Our diverse research projects are thriving and we are improving our shoreside facilities in Seward in support of *Sikuliaq*, *Nanuq* and major seagoing research programs.

Since the formation of the college in 2016, a key goal has been to provide an efficient and cost-effective structure to support our students, staff, faculty and programs. In this regard, this past year saw a number of staff hires that will help bolster student recruiting, streamline financial and procurement services, and ensure continuity in our business operations. I am very proud of all our staff and their dedication to the college.

With growing academic programs, new faculty and staff hires, robust stakeholder support and more than 1,000 alumni, students, staff, researchers and faculty



in our CFOS community, we are at the forefront of innovative instruction and research programs that benefit Alaska and the nation.

With this annual report, I invite you to learn more about the exciting work in fisheries, marine biology and oceanography being conducted by our exceptional students, staff and faculty.

*S. Bradley Moran, Dean
College of Fisheries and Ocean
Sciences*

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New Faculty

Will Burt and graduate student Josie Haag collect water samples to measure naturally occurring radioactive isotopes. Photo by Will Burt.



Since the formation of CFOS in 2016, seven faculty members have been hired with expertise in fisheries, marine biology and oceanography. These individuals add to our top-notch cadre of faculty and strengthen the breadth and depth of our high-quality academic programs and diverse research activities.

William Burt



Assistant Professor Will Burt and his family moved to Fairbanks in fall 2019 to join the Department of Oceanography. Burt, who hails from Canada, is a marine biogeochemist whose research intersects biological, chemical and geological oceanography.

“I chose to join CFOS because of the amazing opportunities I would have here to conduct high-quality research while also delivering meaningful teaching and mentorship to students,” he said.

Burt was aboard R/V *Sikuliaq* this year using optical equipment to monitor patterns and changes in phytoplankton biomass and productivity across the Northern Gulf of Alaska. He is also using naturally occurring radioactive isotopes to understand how groundwater and land-derived material interacts with Alaskan coastal waters.

Curry Cunningham



Curry Cunningham joined CFOS in 2019 as an assistant professor in the Department of Fisheries and is leading a new National Oceanic and Atmospheric Administration (NOAA) Quantitative Ecology and Socioeconomics Training (QUEST) program based in CFOS. A quantitative ecologist, Cunningham utilizes applied statistics and simulation modeling to address questions about fisheries management, eco-evolutionary feedback, predator-prey interactions and what drives variation in the recruitment and survival of aquatic species.

As a former Bristol Bay commercial fisherman, Cunningham has a deep appreciation for the sustainable management of Alaska’s fisheries resources and environment. His current projects range from integrating data from marine fisheries surveys using spatiotemporal models, to exploring machine-learning methods to improve ecological forecasting, to quantifying the impacts of climate change on Alaskan salmon.

“Alaska is facing a time of rapid environmental change with significant potential impacts on its ecosystems and fisheries,” Cunningham said. “My position with CFOS allows me to conduct research that benefits the future of our state’s fish and fisheries, and the ecosystems, communities and livelihoods that depend on them.”

Franz Mueter *President's Professor of Quantitative Fisheries and Ecosystems*

This spring, University of Alaska President Jim Johnsen appointed CFOS Professor Franz Mueter the President's Professor of Quantitative Fisheries and Ecosystems. This prestigious appointment reflects Mueter's broad expertise in high-latitude marine ecosystems and the living marine resources they support.

A CFOS faculty member since 2008, Mueter focuses on the influence of climate variability and change on the dynamics of fish populations, and on the interactions between environmental drivers and harvesting in marine systems. He is particularly interested in the rapidly changing transition zone between subarctic and Arctic waters in the Bering Strait region, and the consequences of these rapid changes to coastal communities and fisheries management.

"I fell in love with Alaska for its wide open spaces and its abundance of natural resources, whose importance to Alaskans and to the world make the work I do meaningful," Mueter said. "Working at CFOS has allowed me to pursue my interests in collaboration with an amazingly broad range of researchers studying everything from the geology of the ocean floor to the human dimensions of fisheries."



Seth Danielson



Seth Danielson is a physical oceanographer whose research focuses on the circulation and thermohaline variations over continental shelves in the Alaska region. After earning his PhD in oceanography in 2012 and working his way up to research associate professor at CFOS, Danielson was hired in 2018 after a national search as associate professor in the Department of Oceanography.

Danielson is involved in numerous projects throughout Alaska and the Canadian Arctic, including hydrographic time series, the Northern Gulf of Alaska Long Term Ecological Research (NGA LTER) program, and research in Southeast Alaska fjords and the Bering and Chukchi Seas. His projects utilize land-based high-frequency radars, underwater autonomous gliders, and towed undulating measurement systems. Danielson is regarded for his clawhammer banjo playing, often while aboard research vessels.

Danielson wants to be in Alaska because, "Latitude makes the difference!" He said, "Alaska is ground zero for the Arctic amplification of climate warming, so there are societally important issues that I can directly address with my research and teaching."

Jessica Glass



As the most recent faculty appointment, Jessica Glass will begin work as an assistant professor in the Department of Fisheries in May 2021, after relocating to Fairbanks from Grahamstown, South Africa. Her expertise is in evolutionary biology, specifically phylogenomics and population genomics of marine fishes. Her position is partly supported by the National Science Foundation (NSF) Established Program to Stimulate Competitive Research (EPSCoR) Fire and Ice project, and she will be joining the Coastal Margins team engaged in interdisciplinary research on climate change.

"I am thrilled to be returning to Alaska to join the CFOS fisheries faculty," said Glass. "One of the biggest draws is the broad array of research and initiatives at CFOS that address interesting, novel biological questions but also applied questions that directly affect fisheries policy and management. The extent of collaboration between CFOS faculty and students and nongovernmental organizations, government agencies, Alaska Native communities, and other local stakeholders is incredible."

Kristen Gorman



Kristen Gorman is an assistant research professor in the Department of Marine Biology. She moved to Fairbanks from Cordova in late 2018, and enjoys living and working in her new inland location. “CFOS has a tremendously diverse and productive research program, led by modest and friendly faculty. The down-to-earth research excellence of CFOS makes the college a spectacular place to work,” she said.

Gorman is an animal ecologist who is interested in the factors that shape the fitness and population dynamics of marine predators, specifically fishes and birds. Her projects include using geolocator tags to reveal the winter distribution and nonbreeding marine habitat use of Tufted Puffins in the Gulf of Alaska, how body size and other health metrics predict the spawning migration and population performance of Copper River sockeye salmon, and using geochemical analysis to learn about the ocean ecology of Copper River sockeye and the natal rearing grounds of pink salmon in the Arctic.

Gwenn Hennon



Gwenn Hennon, assistant professor in the Department of Oceanography, joined CFOS in 2019 and is also part of the NSF Alaska EPSCoR program. Her primary research interest is understanding how phytoplankton will be impacted by climate change. Originally from Juneau, she notes that, “There is no place like Alaska to study climate change. We are on the front line here and it’s vital to study the whole system from physics to human impacts. That’s why I’m glad to be at CFOS, where we take an interdisciplinary and holistic approach.”

Hennon specializes in using flow cytometry and environmental genomics to uncover changes in the physiology and diversity of marine microbes. She is working with the EPSCoR Fire and Ice team to understand how changing glacial cover impacts life in coastal margins of Alaska. Her other research projects include studying how phytoplankton from the subtropics are impacted by ocean acidification, and how sea-ice algae in the Arctic may be impacted by oil spills.

Schery Umanzor



With support from a Chancellor’s Award designed to spur Alaska’s mariculture research, Schery Umanzor joined the Department of Marine Biology in 2020 as a research assistant professor. Her work focuses on optimizing kelp cultivation starting from the hatchery. She is also interested in the interaction of kelp farms and their surroundings, and the ecosystem services derived from those interactions.

Umanzor said, “In many ways, Alaska reminds me of my home country of Costa Rica. I want to work alongside the end users of my research, focusing on developing projects to address people’s needs.”

She is currently part of three ARPA-E MARINER research projects: seaweed hatchery and selective breeding technologies; scalable coastal and offshore macroalgal farming; and assessing kelp nutrient bioextraction capacity in aquaculture farms in the US. Given the important role CFOS plays in Alaska’s burgeoning blue economy, Umanzor’s work will help foster marine entrepreneurialism and economic diversification in the state and beyond.

Academics



Kortney Birch in Kasitsna Bay during a scientific diving course. Photo by Kylee Branning.

CFOS academic programs continue to grow and diversify as we extend the reach of the college and provide new opportunities for our students. At the onset of the coronavirus pandemic, our faculty and students made a relatively smooth transition to online instruction. Moving forward, we will offer approximately 90 percent of CFOS courses online. This past year, we bolstered our marketing and recruitment efforts and created an asynchronous format for numerous courses in support of our undergraduate and graduate academic programs and students.

New Programs and Curriculum Changes

We are developing new undergraduate courses on a wide range of topics, including scientific analysis and writing, marine mammals of the world, seabird biology, phytoplankton and marine microbes, marine macroalgae, marine ecology, and shipboard techniques. A college-wide working group was established this year to re-envision our Bachelor of Science in Fisheries and Marine Sciences (including

a name change from “Ocean Sciences” to “Marine Sciences”) and offer four concentration options: Fisheries Science, Marine Biology, Oceanography, and a no-concentration option. We are working on new student recruitment and marketing for our Bachelor of Arts in Fisheries, and increasing access for students across Alaska, especially in rural communities.

With regard to graduate programs, we developed a new graduate traineeship program, Tamamta, that focuses on Indigenous knowledge in fisheries and ocean sciences. The program is generously supported by NSF. The Master of Marine Studies degree program is being revised to include a series of asynchronous graduate-level courses beginning in fall 2021. In support of the Blue MBA program through the School of Management, we will offer three courses in asynchronous format: Fisheries Management, Human Dimensions of Environmental Systems, and The Oceans and Global Change. The Blue MBA is the only such program in the nation available entirely by asynchronous delivery.

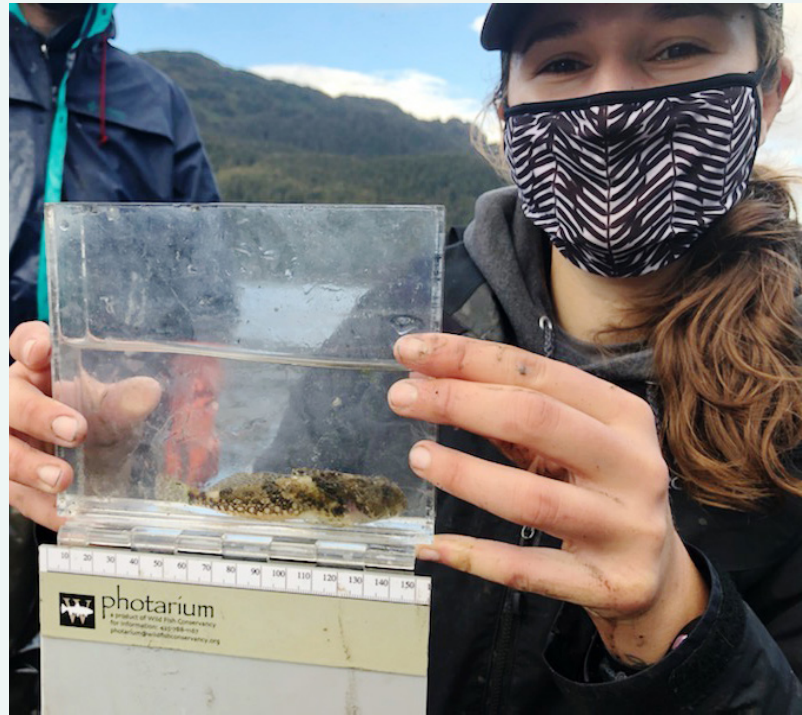
Internships and Awards

Undergraduate students Kate Ariola, Feyne Elmore, Elizabeth Hinkey, Thomas House, Sadie Oswald, Sunny Sanchez-Butler and Ron Sheldon completed internships at different labs, agencies and organizations this past year, working on a variety of fisheries and ocean science projects. We are proud that numerous undergraduate and graduate CFOS students garnered recognition and research support for their outstanding work.

Undergraduate Awards

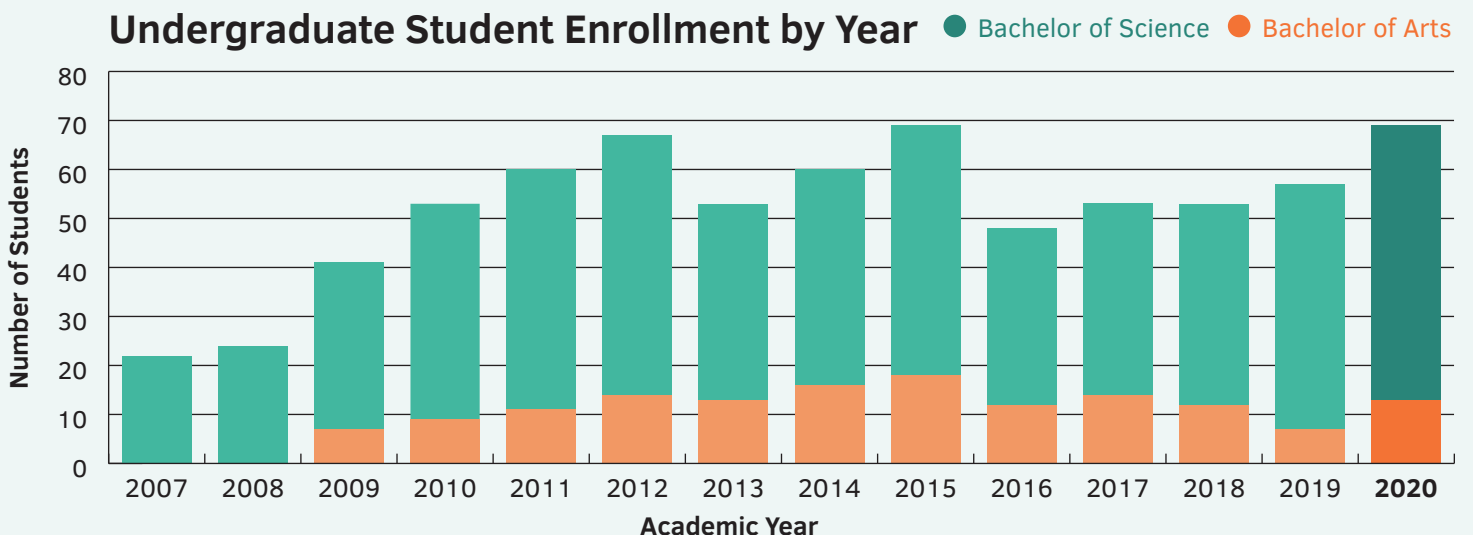
Undergraduate Research and Scholarly Activity Project Awards	Feyne Elmore, Emily Williamson and Monroe Morris
Undergraduate Research and Scholarly Activity Travel Award	Tibor Dorsaz

Outstanding Student Academic Awards	
Freshman	Kyleigh McArthur
Sophomore	Jennifer Tusten
Junior	Brian Zhang
Senior	Monroe Morris
Student & Leadership awards	Noah Khalsa



▲ Lindsey Stadler uses a Photarium to look at a padded sculpin. Photo by Brenda Konar.

Undergraduate Student Enrollment by Year



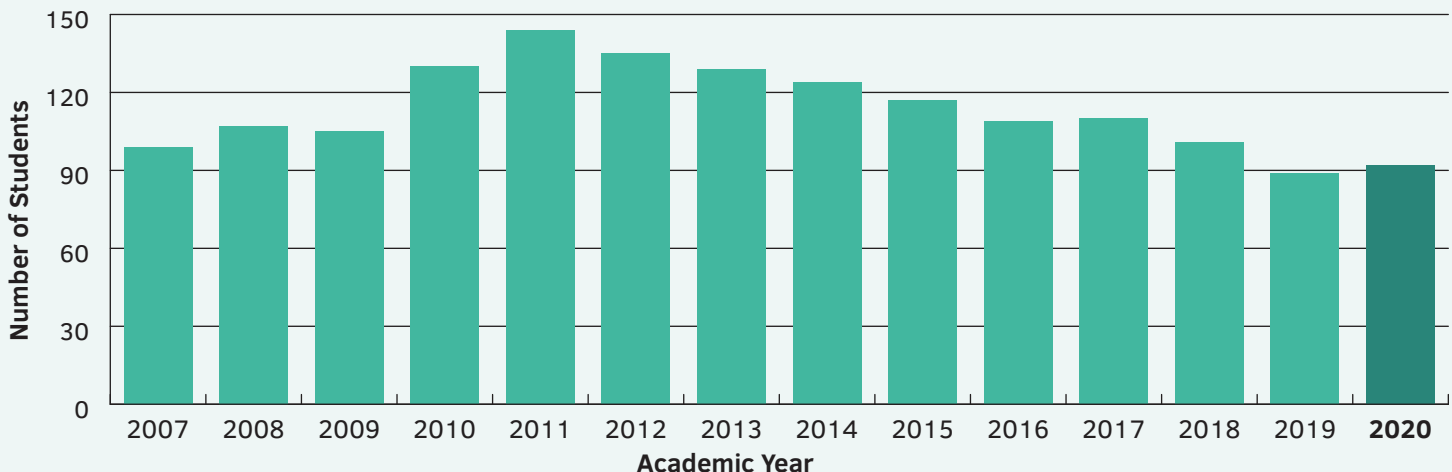


▲ *Jim Schloemer collects samples in Tutka Bay as part of the EPSCoR Fire and Ice project. Photo by Brenda Konar.*

Graduate Awards

Science, Mathematics and Research for Transformation Scholarship	Channing Bolt
Oil Spill Recovery Institute Fellowship	Liza Hasan
Knauss Fellowship	Ann Zinkann
National Defense Science and Engineering Graduate Fellowship Award	Hannah Myers
Doyle Scholarship	Veronica Padula
Alaska Sea Grant Research Fellowships	Brian Ulaski, Erika King, Jamie Musbach, Anne Raymond and Jesse Gordon
Coastal Marine Institute Student Awards	Liza Hasan, Brian Ulaski and Jenell Larsen
Northern Gulf of Alaska Applied Research Award	Donald Arthur, Katja Berghaus, Molly Payne and Brian Ulaski
Rasmuson Fisheries Research Center Fellowship	Katja Berghaus, Matthew Callahan, Becca Cates, Kelly Cates, Austin Flanigan, Mary Spanos, Kevin Siwicke and Marina Washburn
North Pacific Research Board Research Award	Nina Lundstrom and Brittany Jones
Established Program to Stimulate Competitive Research Award	Amy Dowling, James Schloemer and Carolyn Hamman

Graduate Student Enrollment by Year



Shannon Hardy and Jessica Black ►
cut Łuk Choo (Chinook salmon)
on the Yukon River. Photo by
Michael Hardy.

New Fisheries and Marine Sciences Program Focuses on Indigenous Knowledge



Tamamta, which means “all of us” in the Sugpiaq and Yup’ik languages of the Indigenous peoples of Alaska’s southcentral coast, is the name of a new graduate traineeship program that will broaden and diversify fisheries and marine sciences education through greater inclusion of Indigenous peoples and knowledge.

NSF has awarded UAF \$3 million in funding through its National Research Traineeship program. Funding is also being provided by NSF’s Navigating the New Arctic program.

The goal of *Tamamta* is to elevate Indigenous knowledge and pedagogies as intact systems that can be offered alongside Western marine science. “*Tamamta* addresses an important problem in Alaska—the exclusion and erasure of Indigenous peoples and their knowledge systems,” said CFOS Professor Courtney Carothers, the project’s lead.

Four to five cohorts of Indigenous and non-Indigenous CFOS graduate students will be funded over the next five years. The First Alaskans Institute, the Yukon River Inter-Tribal Fish Commission, the Alaska Department of Fish and Game, and NOAA are examples of partner organizations where students will have opportunities to receive on-the-job training and conduct research. Because nearly 80 percent of CFOS fisheries graduates go on to work in state, federal and tribal resource management, *Tamamta* students will be positioned to be part of the next generation of Alaska’s fisheries scientists and managers.

Recruitment of graduate students has already begun and the program will be in full swing next year. The program will also offer activities and training open to the university community and partner agencies.

Emil Usibelli Distinguished Research Award

This past year, Professor of Marine Biology Katrin Iken received one of the university’s most prestigious recognitions—the Emil Usibelli Distinguished Research Award. Iken’s research specialty is working on marine seafloor food webs and communities, and she is actively involved in numerous projects that range from the Arctic to the Antarctic. She is also known for being a strong advocate for her students and helping them gain research experience.



Research



▲ *Postdoctoral fellow Krista Oke (standing) and Teresa Fish record information on age, sex, length and mode of death for sockeye salmon on the Iliamna River, as canine research assistant Scout performs a site check. Photo by Curry Cunningham.*

Over the past year, CFOS strengthened its research portfolio with hypothesis-driven studies, long-term monitoring series and large integrative projects. Much of our research focuses on the Arctic and North Pacific regions, but also extends well beyond Alaskan waters. In spite of the COVID-19 pandemic, our faculty and students were able to conduct essential research by following stringent preparation and safety plans, thereby allowing CFOS to continue to address pressing issues in fisheries, marine biology and oceanography.

Ongoing major programs include the NSF EPSCoR Fire and Ice project; NSF Long-term Ecological Research programs based in the Northern Gulf of Alaska (NGA LTER) and Beaufort Sea lagoon ecosystems (BLE LTER); the Arctic Shelf Growth, Advection,

Respiration and Deposition (ASGARD) program; the Arctic Integrated Ecosystem Survey (Arctic IES); and the Gulf Watch Alaska (GWA) long-term monitoring program.

As in prior years, CFOS research has been supported by state and federal agencies and partner organizations. For example, over the past year, the college administered new research projects supported by the Alaska Ocean Observing System (\$365,181), the North Pacific Research Board (\$796,098), the Pollock Conservation Cooperative Research Center (\$346,365), the Rasmuson Fisheries Research Center (\$250,000), the Bureau of Ocean and Energy Management-funded Coastal Marine Institute (\$1,014,037), and many additional awards from state and federal agencies.

CFOS Active Grants as of June 30, 2020

• Total active grants: **189** • Total current research funding (awarded): **\$182 million**



▲ *The ice acts as a natural freezer for fishermen harvesting Arctic lampreys on the Yukon River. Photo courtesy of Kwikpak Fisheries.*

Tracking Arctic Lampreys, the Yukon River’s Elusive “Eels”

Trent Sutton, graduate student Mary Spanos, alumna Katie Shink, and researchers from the Alaska Department of Fish and Game are testing whether radio telemetry can be used with Arctic lamprey.

These curious creatures are the northernmost species of lamprey in the world, and many Alaskans call them “eels,” even though they are not even closely related to eels. In fall and early winter, lampreys enter the Yukon River from the Bering Sea and migrate to upriver tributaries to spawn. People along the lower river catch these fish through holes in the ice and eat them or sell them commercially.

Lamprey runs are unpredictable and little is known about where they go. Researchers

and fisheries managers need a way to track lampreys to maintain sustainable harvests and to understand how they are affected by climate-induced changes in river conditions.

The first batch of lampreys shipped to Sutton’s lab in Fairbanks fared well with their surgically implanted radio tags. This winter, these researchers will perform radio tag surgeries on new lampreys and proceed to the next phase of the project: lamprey swim trials! Based on these results, Sutton and his team will be able to recommend a specific size of radio tag needed to track the migration timing, movement and distribution of lampreys.

New Tools Track Freshwater Fish in Changing Climate

“Freshwater aquatic ecosystem data are relatively scarce in Alaska compared to the Lower 48, and these systems are rapidly changing,” said Jeff Falke, who was involved in creating three publicly available resources regarding freshwater fish.

The Fish and Climate Change Database, or FiCli, is the first comprehensive database of scientific literature on the impacts of climate change on inland fish worldwide. The database also shows the trade-offs with different management actions and identifies where more research is needed.

The Hydrologic Classification of Gulf of Alaska Watersheds uses 35 years of modeled runoff data to categorize 4,000 freshwater rivers and streams in southern coastal Alaska. “Streamflow is a master variable that controls everything in a river’s ecosystem, from the icefields to the ocean,” said Chris Sergeant, a graduate student involved in the project. This tool is the first comprehensive description of streamflow patterns for southern coastal Alaska, which will help users connect observations from one watershed to another when extreme events, such as droughts and flooding, occur more frequently.

Falke and Sergeant are currently working with the US Forest Service to develop a salmon life-cycle model that predicts how changes in water temperature and flow will affect salmon at different freshwater life stages. The user-friendly interface is meant to create conversations about how climate change might impact salmon populations in small ecosystems in southeast Alaska.

▼ *Mature adult sockeye salmon returning to freshwater to spawn. Photo by Andrew Hendry.*



▲ *Flying into Tanada Lake in the Upper Copper River watershed. Photo by Kristen Gorman.*

Salmon across Alaska Are Getting Smaller, Impacting People and Ecosystems

Postdoctoral fellow Krista Oke and faculty members Peter Westley and Curry Cunningham were involved in a study proving that salmon species across Alaska are returning to spawn at a smaller size than they did historically.

A working group of academics, tribal advocates and state and federal biologists analyzed 12.5 million samples collected by the Alaska Department of Fish and Game between 1957 and 2018. “We wanted to take a step back and look across the whole state, across different species, and get a feel for what was going on with salmon size at a broad scale,” said Oke.

The results of a synthesis of age and length data showed body-size declines for Chinook, chum, coho and sockeye salmon. The magnitude of declines varied among regions and species, and the rate of decline has accelerated since 2010 for all four species. “For the first time, we understand that these declines in body size are very much driven by fish tending to be younger,” Westley said. Climate and competition for food at sea are important factors; however, those impacts on salmon vary among species and location.

This study is unique in that it translates changes in salmon size into something more tangible—losses in egg production, nutrient transport, fisheries value, and sustenance for Alaskans.

The group is hopeful that this work will help direct future research. “Protecting freshwater habitats alone is insufficient to avoid changes such as we observed,” said Westley.



▲ *Sea urchins dine on a reef in the Aleutian Islands. Photo by J. Tomoleoni/U.S. Geological Survey.*

Without Otter Predation, Sea Urchins Decimate Aleutian Reefs

Uncontrolled by sea otter predation, sea urchins are devouring the massive limestone reefs surrounding the Aleutian Islands. This process is being exacerbated by climate-driven changes in the marine environment, according to a study coauthored by Brenda Konar and CFOS alum Ben Weitzman, among others.

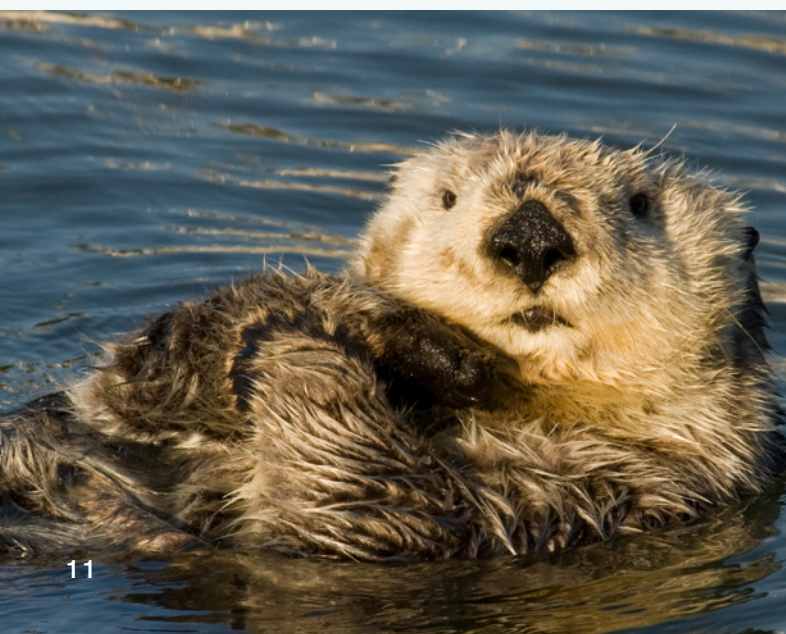
Konar began diving in the Aleutians in the 1990s, just as the Aleutian sea otter population began to crash from killer whale predation. With otters gone, the urchin population boomed in both body size and density. “There are now carpets of sea urchins—some locations have roughly 400 urchins

per square meter. Kelp forests are essentially gone in the central and western Aleutians,” she said.

After decimating the kelp, the urchins started eating *Clathromorphum nereostratum*, the algae that creates the reefs. In some locations, reefs thousands of years old are crumbling from urchins burrowing through the calcium carbonate structures.

The study revealed that reef erosion caused by sea urchins has waxed and waned with sea otter populations over time, revealing that predators, or lack thereof, are critical factors in determining the vulnerability of Aleutian island reefs. The researchers also found that ocean acidification and related effects have weakened the algae’s protective skeleton, making it vulnerable to urchin grazing—coincident with sea urchin abundance increasing.

The discovery that a loss of predation can enhance the impact of climate change suggests that restoring sea otters could help preserve the Aleutian reefs. According to Weitzman, “Predators like otters reduce the size and abundance of urchins and serve to help protect these reefs—even in the face of climate change.”



◀ *Sea otters are the primary natural predators of sea urchins in the Aleutian Islands. Photo by J. Tomoleoni/USGS.*



◀ *Rachel Potter and Hank Statscewich conduct maintenance on a remote power system built at UAF for Point Barrow's HF radar. Photo by Qaiyaan Leavitt at UIC Science.*

Since 2009, the CFOS HF radar team—Rachel Potter, Hank Statscewich and Jordi Maisch—have been installing and maintaining HF radar systems in communities located along Alaska's northern coastline. Due to this year's travel restrictions resulting from COVID-19, the team relied on local residents to assist with instrument setup and operation.

HF radar systems are the only land-based sensors that are able to cover large areas of the ocean surface in detail. The radar antennas emit radio-wave signals that bounce off water waves, and the data are turned into images of water flow direction and speed. The information is uploaded to CFOS ocean currents websites and sent to a national database funded by the Integrated Ocean Observing System and the National Oceanic Data Center, where it is made available to the US Coast Guard, NOAA Office of Response and Restoration, and the National Weather Service.

Danielson's goal is to combine local Indigenous traditional knowledge and new technologies such as HF radar to improve predictions of the rapid transformations taking place in the Pacific Arctic due to climate change. "We are trying to build a more complete understanding of the marine system, and that includes the currents," he said.

Real-time Maps Show Ocean Currents in the Arctic

Seth Danielson is leading a project originally conceived by CFOS professor emeritus Tom Weingartner and funded by the Alaska Ocean Observing System that uses high-frequency (HF) radar systems to measure the speed and direction of ocean currents in the Bering, Beaufort and Chukchi Seas. Every hour, images of the currents are posted online so that members of the public, agencies and other organizations can use the information for navigation, search and rescue, oil spill response and weather forecasting.

▼ *HF radar antennas installed in Wales measure ocean currents in the Bering Strait. Photo by Hank Statscewich.*



R/V *Sikuliaq*



▲ *R/V Sikuliaq* in Resurrection Bay supporting the NGA LTER project in September 2020. Photo by Hannah Myers, courtesy of the North Gulf Oceanic Society.

In her fourth year of operation, *Sikuliaq* supported nine science cruises and successfully completed the biennial NSF ship inspection and the annual US Coast Guard safety inspection.

Sikuliaq provided a platform for scientists and students to conduct research throughout the North Pacific Ocean and the Arctic. Working from the icy Beaufort Sea to the Oregon coast, her ventures

included supporting the 100th occupation of the Seward Line in the NGA LTER study area, investigating the epicenter of an earthquake in the Aleutian Islands, and measuring waves along the Arctic coast.

Over the past year, UAF faculty, staff and students were involved in 47 percent of *Sikuliaq* science days at sea, again highlighting the active seagoing research and education programs at the university.

FY20 *Sikuliaq* Statistics

20,900 nm traveled • **192** paid ship days • **153** days of science (not including mob/demob days)
72 UAF/CFOS PI days • **31** days in the Arctic (as defined by the Arctic Research and Policy Act of 1984)
8 days in the ice • **6** ice station days • **359** CTD casts • **2** XBT casts • **35** moorings deployed
58 moorings recovered • **14** ROV dives • **7** gliders deployed • **5** gliders recovered • **7** corings taken
107 buoys/floats deployed • **61** buoys/floats recovered • **121** laser sediment measurements

Conducting Science during a Pandemic

In May, *Sikuliaq* gained national attention as the first vessel in the US Academic Research Fleet permitted to engage in research activities following the development of the COVID-19 pandemic.

CFOS faculty members Ana Aguilar-Islas, Seth Danielson and Russ Hopcroft were given special permission to work in the Northern Gulf of Alaska on a scaled-down cruise while adhering to a detailed mitigation and response plan. The mitigation plan was created with guidance from the US Coast Guard, the University-National Laboratory System, the World Health Organization, the Centers for Disease Control and state health mandates.

The scientists and crew members self-quarantined for two weeks prior to boarding the vessel and monitored themselves for signs of COVID-19 before and during the cruise. A minimal science team promoted social distancing and made it easier to institute enhanced cleaning measures.

Science operations were completed and all personnel remained healthy. The successful mitigation plan was used on subsequent *Sikuliaq* cruises and shared with other research vessels to help them adapt to the pandemic. The Seward Marine Center staff, ship's crew and technicians, and science teams all contributed to ensuring *Sikuliaq* operated safely at sea during a year of unprecedented challenges.



▲ *R/V Sikuliaq* FY20 ship track.

▼ *R/V Sikuliaq* on the NGA LTER cruise in May. Photo by Seth Danielson.



Research Centers, Institutes and Facilities

Alaska Blue Economy Center

The interdisciplinary Alaska Blue Economy Center (ABEC) was formed in 2019 to help boost Alaska's blue economy by serving as a resource for research, instruction and outreach related to Alaska's aquatic resources and ecosystems. We are excited about ABEC's new partnership with the Bering Sea Fishermen's Association, a nonprofit organization that fosters greater social, financial and political capacity to access, sustainably develop, and preserve fisheries in the Arctic, Yukon, Kuskokwim and Bristol Bay regions of Alaska. Specifically, this year ABEC partnered with BSFA and stakeholders on a successful \$600,000 US Economic Development Administration Build to Scale grant that will promote ocean entrepreneurship and innovation in Alaska.

Coastal Marine Institute

In partnership with the Bureau of Ocean Energy and Management, the Coastal Marine Institute (CMI) is administered within CFOS and supports studies focused on the development of natural resources in

Alaska's coastal waters and outer continental shelf. CMI had a busy and successful year, funding twelve active projects. Five new projects were supported that span topics ranging from pink salmon to mussels to plankton to water mass tracing. CMI also continued to fund students, with two new student-led projects.

Kasitsna Bay Laboratory

The Kasitsna Bay Laboratory, a marine research and teaching facility located on Kachemak Bay, is operated in partnership with NOAA's National Centers for Coastal Ocean Science (NCCOS). The laboratory supports two large programs: Gulf Watch Alaska, which conducts long-term monitoring of marine habitats in Kachemak Bay, and the NSF EPSCoR Fire and Ice program, which—among other studies—examines how coastal communities vary in watersheds with different glacial coverage in the region. This year, CFOS faculty and students were able to conduct essential research at the Kasitsna Bay lab by adhering to strict COVID-19 protocols. Annual sampling for Gulf Watch Alaska was

completed, preventing a critical data gap as warming seawater temperatures impact nearshore ecosystems. A number of core and seed projects supported by the EPSCoR Coastal Margins program enabled collection of data over the summer season, including several graduate student projects.

Lena Point Fisheries Facility

The CFOS Department of Fisheries in Juneau is housed at the Lena Point Fisheries Facility, which is co-located with the NOAA Ted Stevens Marine Research Institute. Researchers at Lena Point continued to work with NOAA and the University of Alaska Southeast on a number of large statewide projects such as Gulf Watch Alaska and the NSF EPSCoR Fire and Ice project.

Ocean Acidification Research Center

The Ocean Acidification Research Center (OARC) conducts research into ocean acidification through long-term monitoring and modeling efforts, conducting field observations in highly sensitive areas, and



◀ *Peter Shipton and Sarah Walters aboard R/V Nanuq (pre-pandemic) help collect seawater samples at the ocean acidification mooring, GAKOA, in Resurrection Bay. Photo by Natalie Monacci.*

R/V *Nanuq*

CFOS owns and operates R/V *Nanuq*, a state-of-the-art, 40-foot research vessel designed to accommodate a wide variety of equipment in support of oceanographic and marine biology research along the north coast of the Gulf of Alaska. Commissioned in 2019, the vessel is based in Seward, where it is available to CFOS researchers and scientists from other organizations. In the first full year of operation, *Nanuq* showed her capabilities as a support vessel to R/V *Sikuliaq* by delivering parts and personnel to the ship. *Nanuq*



also completed cruises in the Gulf of Alaska with researchers using over-the-side and flow-through instrument systems to

collect a variety of ocean data. We look forward to seeing new research operations using R/V *Nanuq* in the coming year.

quantifying responses of vulnerable and commercially viable species. OARC's Alaska Ocean Acidification Mooring Network is a series of surface buoys and other systems that collect information about the duration and intensity of ocean acidification events at locations in Southeast Alaska, the Gulf of Alaska, the Bering Sea and the Arctic Ocean. OARC continues to serve the public and private sectors by providing access to data, training students and citizen scientists, and accepting seawater samples to be run at cost. This year, researchers aboard R/V *Nanuq* successfully calibrated and collected water samples at an ocean acidification mooring in Resurrection Bay. An OARC mission to study carbon parameters in the Chukchi and Beaufort Seas was conducted aboard R/V *Sikuliaq* in October.

Pollock Conservation Cooperative Research Center

The Pollock Conservation Cooperative Research Center (PCCRC) supports research projects and graduate student fellowships that focus on pollock byproducts, pollock growth and productivity, and ship-side salmon stock identification. In 2019–2020, PCCRC supported ten ongoing and four new research projects, with all but one project being led by CFOS faculty.

Rasmuson Fisheries Research Center

The mission of the Rasmuson Fisheries Research Center is to promote excellence in research related to fisheries and to develop young fisheries scientists. The center continued to generously support CFOS graduate student research, with awards going to two new and five existing projects. The work includes research on sablefish, Arctic lamprey, Pacific halibut, Dungeness crab and lingcod.

Seward Marine Center

The Seward Marine Center (SMC) supports a variety of research, education and outreach activities by providing saltwater laboratory space, mooring facilities, office support and coastal support to CFOS faculty, staff and students as well as to visiting scientists. SMC is the homeport of the 261-foot, Global Class, ice-capable R/V *Sikuliaq* and our 40-foot coastal research vessel, R/V *Nanuq*. SMC continues to support the NGA LTER, which greatly expands the breadth of work conducted as part of the long-running Seward Line research program. This year, the staff at SMC diligently worked to facilitate quarantines in SMC housing and assisted with other COVID-19 pandemic preparations that enabled science cruises to embark safely. This past February, SMC coordinated another successful Alaska Tsunami Bowl, Alaska's regional competition for the National Ocean Sciences Bowl.

Development



▲ *Killer whales in Prince William Sound. Photo courtesy of the North Gulf Oceanic Society (NMFS permit #20341).*

For fiscal year 2020, CFOS received \$649,701 in charitable gifts. These generous gifts from new and returning donors help the college establish scholarships and fellowships and increase support for student and faculty research.

We thank you for your commitment to help UAF fulfill our mission of teaching, research and service and look forward to exploring new opportunities for philanthropic giving to CFOS.

We also wish to thank everyone who donated to CFOS programs as part of the University of Alaska System (UA) Giving Day in October. The inaugural UA giving day was a 49-hour (for the 49th state) opportunity for donors to give to specific programs and funds. Of the total \$672,617 donated to UA, UAF raised \$416,173 from 582 donors.

Major Donors

Anonymous	Douglas Island Pink & Chum	Prince William Sound Science Center
57 Degrees North	Ardella P. Follmann	Elmer and Mary Louise Rasmuson*
Alaska Ocean Seafood	Glacier Fish Company	Rasmuson Foundation
Dr. Vera Alexander	The Glostén Associates	William S. Reeburgh
American Seafoods Company	John and Jacqueline Goering*	Santa Monica Seafood
Arctic Storm	Highland Light Seafoods	Shell Exploration and Production Company
AT&T	Hilcorp Alaska	Thomas and Susan Shirley
Frances S. Baker*	Holland America Princess Alaska	Solaster Science
Bering Sea Fisheries Research Foundation	Icicle Seafoods	Starbound
Blue Evolution	Kanaway Seafoods	Trident Seafoods
Robert and Kathleen Byrd	William F. Meek*	United Catcher Boats
Shirley A. Carlson	Gordon and Betty Moore Foundation	Usibelli Coal Mine
Coastal Villages Region Fund	M. J. Murdock Charitable Trust	Frankie Wakefield*
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Crowley Marine Services	Ocean Beauty Seafoods	
E. R. Dolly Dieter	Phoenix Processors	

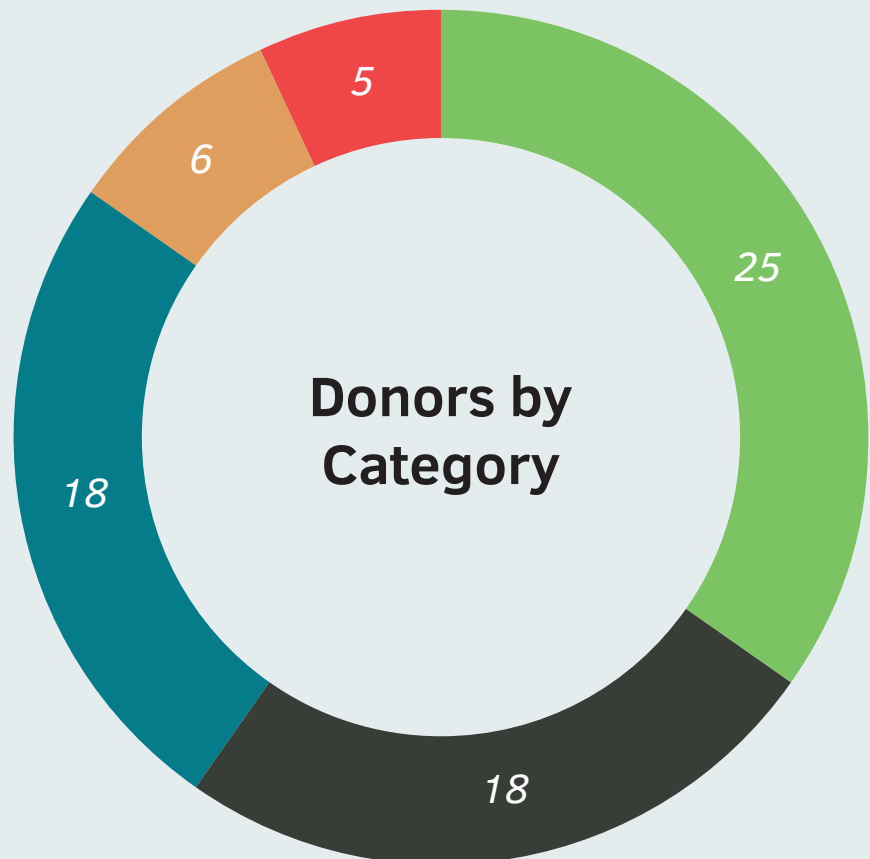
**Deceased*

FY20 CFOS Fundraising

Total giving: **\$649,701**

Total number of donors: **72**

- Friend ●
- Corporation ●
- Alumni ●
- Other Organizations ●
- Foundation ●



Budget and Finance

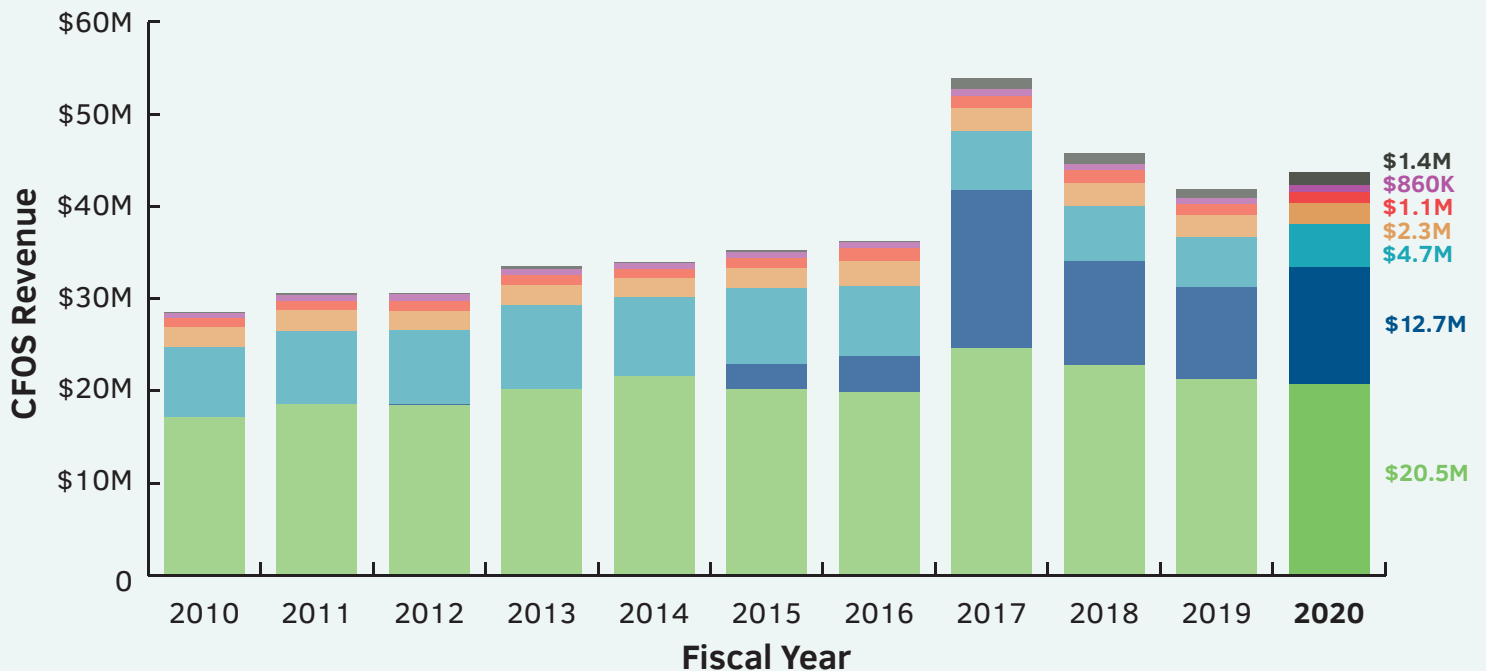


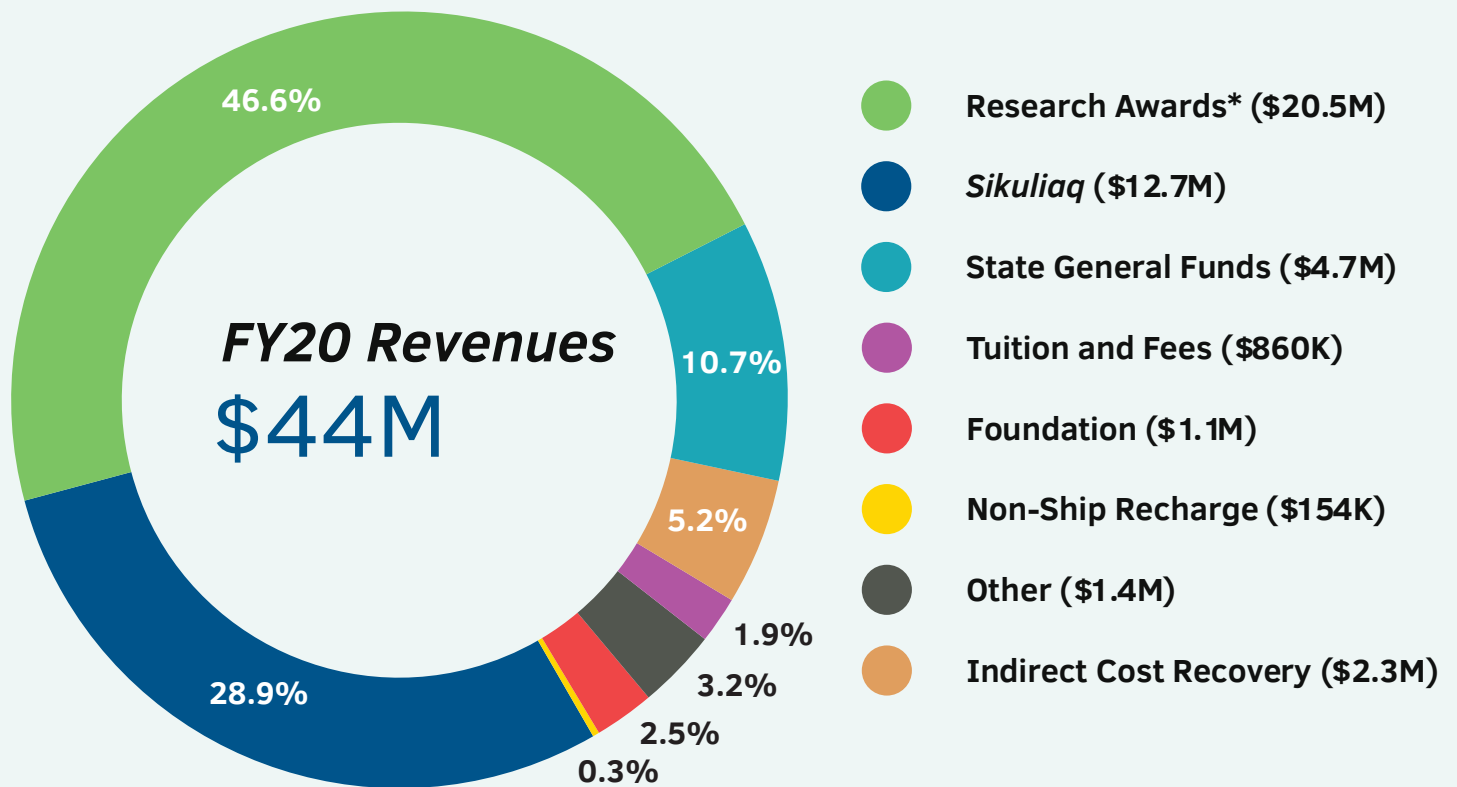
▲ An adult male coho salmon swimming in freshwater. Photo by Jonathan Moore.

CFOS Revenue Trend

*Non-Ship Recharge and American Reinvestment and Recovery Act funding (2011–2016) excluded.

- Research Awards*
- Sikuliaq
- State General Funds
- Indirect Cost Recovery
- Foundation
- Tuition & Fees
- Other Revenue





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R/V *Sikuliaq* in the Arctic Ocean. Photo by John Guillote. Published in December 2020. UA is an AA/EO employer and educational institution and prohibits illegal discrimination against any individual: www.alaska.edu/nondiscrimination.

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