



AQUATIC & FISHERY SCIENCES NEWS

SCHOOL OF AQUATIC & FISHERY SCIENCES | COLLEGE OF THE ENVIRONMENT | UNIVERSITY OF WASHINGTON

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Win 2019

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From the Director

Dear Friends,

It is now only a few weeks away from 2 April 2019, the 100th birthday of the School. The planning for our combined 100-Year Celebration and 2019 Bevan Series Symposium is almost complete. Over two-and-a-half days (16–18 April 2019), we will hear talks from faculty (past and present), alums, students, and friends during five sessions focused on the biology and ecology of marine species, aquaculture, fisheries management, climate and the environment, and finally, the future of SAFS. A big thank you to the organizing committee led by Bill Karp (MS, 1975; PhD, 1982) and David Armstrong for assembling what I think will be a very entertaining and enlightening symposium.

The SAFS centennial Boots in the Mud Fund is receiving gifts. Many thanks to everyone who has already given to this fund. Many of us contribute to the School already, but this fund is unique—it will support future generations of students to have firsthand research experiences in locations such as the field camps in Alaska. To encourage support for this effort, the School will match the first \$100,000 in gifts. I hope you will consider a contribution. SAFS Research Professor George Hunt was one of the first to make a contribution to this fund. He believes that it is essential for students to experience in nature the organisms that they study, as well as to learn



André Punt

—continued on page 2

SAFS Centennial Celebration is almost here!



To ensure that we are able to keep you informed of plans, including how to view the upcoming Bevan Symposium presentations during our Centennial Celebration, please visit our website at fish.uw.edu and click on the “learn more” button in the Centennial banner.

Photo credits, above, left to right: Jackie Carter, Jeremy Monroe, Amanda Phillips, Jonathan Moore

From the Director

—continued from first page

about the methods for obtaining the data that they eventually use in their models.

The number of our SAFS centennial stories continues to grow. At the time of writing, we have more than 80 stories, covering almost 70 years of the School's history. We are compiling these stories into a commemorative handout for the April 2019 symposium. Many thanks to everyone who has contributed. I have enjoyed each and every one, and learned a tremendous amount about the School and its impressive history. In their stories, alumni and former faculty and staff remember their time at SAFS and how it impacted them as they moved forward in their careers. These interesting and diverse stories are available at <https://fish.uw.edu/news-events/category/centennial/>.

It is not all about the 100-year celebration at SAFS. This issue of our newsletter includes a profile on our newest faculty member, Andrew Berdahl (pages 6–7). Andrew joined us from the Sante Fe Institute, where he was an Omidyar Fellow. Andrew is a true polymath, who uses complex mathematical models to understand collective navigation, and he also conducts field experiments, including research at our Alaska field camps.

The SAFS newsletter often profiles faculty, students, and staff. However, our post-doctoral fellows are also an important part of the School. They are often not at SAFS for long because “post-docing” is an intermediate step between graduate school and a first “real” job. However, during their time here, they work on research projects, and the success of many of our research programs depends on our amazing post-docs. Also, some of our post-docs eventually return to SAFS as faculty (four at present, myself included). Learn about five of our current post-docs on pages 3–5.

One article in this newsletter is about Kerry Naish, who has just returned from her first sabbatical. She spent most of her sabbatical in Chile, where she learned about the latest developments in conservation genetics and how they could be applied in the Pacific Northwest. Read about Kerry's discoveries and adventures, including what she learned about Chilean aquaculture and culture, on pages 8–9.

As always, I look forward to seeing you at workshops, symposia, seminars, and social events over the next months, and of course, at the combined SAFS 100-Year Celebration and 2019 Bevan Series Symposium this month!

—André Punt, *Director*

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Join the celebration
100 SAFS
1919-2019
UNIVERSITY OF WASHINGTON

APRIL 16-18, 2019

Photo credits: top row, l to r: Jackie Carter; University of Washington Libraries Special Collections, neg. #115344, Cobb Collection; Samantha Scherer; University of Washington Libraries Special Collections, neg. #15346, Cobb Collection; Martin Grassley; H. Gilmour

Post-doctoral Fellows in SAFS

SAFS is well-known for our undergraduate and graduate students, who now populate research agencies, universities, and management bodies around the nation and the world. However, the research output from SAFS is also supported by our post-doctoral fellows (“post-docs”) who join us for a few years before moving on in their careers. Sometimes, their future jobs may even be faculty positions at SAFS. Current faculty members Jim Anderson (1981–1982), Gordon Holtgrieve (2010–2013), Julia Parrish (1992–1994), and André Punt (1992–1994) were all post-docs who eventually joined the faculty. In this article, meet five current post-doctoral fellows, who represent the range of disciplines in SAFS.

Sean Brennan

I moved to Seattle after earning my BS in biology from the University of Utah and a PhD from the University of Alaska, Fairbanks. My PhD involved using strontium isotopes to reconstruct migratory patterns of Pacific salmon in Alaska.

I now work with Daniel Schindler in the Alaska Salmon Program, developing biogeochemical tools and models to examine how the behavioral ecology of animals influences their productivity over time. My models use biogeochemical tracers, such as stable and radiogenic isotope ratios, in biological tissues to understand how these tracers change across land- and riverscapes. This work expands my PhD research focus to Western Alaska’s largest river basins: the Yukon, Kuskokwim, and Nushagak.

By measuring strontium isotopes in the otoliths of salmon, I am able to quantify how juvenile salmon distribute their growth across diverse freshwater habitats prior to migrating to the ocean.

My goal after my post-doc is to continue to develop a career in research and teaching,

focused on furthering our understanding of ecosystem dynamics and natural resource management.

Tanya Brown

I am a molecular biologist who recently joined Jacqueline Padilla-Gamiño’s lab to study coral bleaching and reproduction. I am exploring how corals respond to bleaching and how bleaching in one generation affects future generations of corals. Before coming to SAFS, I was at the Hawaii Institute of Marine Biology, where I ran trials with corals.

My research interests are primarily in disease and immunobiology of cnidarians (reef-building corals and sea anemones). My MSc at SUNY Buffalo examined gene expression of anthox (a Hox-like gene found in cnidarians) and ammonium transport in a pharmaceutically important gorgonian. My PhD at Florida International University addressed how the immune systems of cnidarians respond to disease and pathogen challenges.

When my post-doc is complete, I plan to continue research on cnidarian immunology and branch out into

—continued on page 4

I to r:
Sean Brennan,
Tanya Brown

Photo credits, I to r:
Courtesy of
Sean Brennan,
Dan DiNicola



Post-doctoral Fellows

—continued from page 3

how reproduction can influence immune competence; eventually, I plan to become a professor. In my spare time, I enjoy hiking, SCUBA diving, and photography. In Hawaii, I started taking hula lessons, which I hope to continue here in Seattle!

Yurong He

I am a social scientist who joined the Coastal Observation and Seabird Survey Team (COASST) in March 2017 to research the “citizen” side of COASST’s citizen science program. My research focuses primarily on how participants are motivated to join and remain active in environmental citizen science programs, how they perceive marine environmental issues, what they learn from training workshops and survey experiences, how they collaborate and communicate with COASST scientists and staff, and what their data collection and sharing practices are.

I have a BA and MA in Psychology, and worked on multiple-user experience research projects at Baidu and Microsoft Research Asia before I got my PhD at the College of Information Studies at the University of Maryland, College Park. During my PhD, I studied collaborative data sharing practices (mainly focused on citizen science biodiversity data) across research and public communities supported by information technologies.

At COASST, I am excited to contribute to one of the top environmental citizen science projects in the world and to be a part of an awesome team of natural scientists, staff, and undergraduate interns who work with thousands of participants every day to make a difference to the marine environment.

In my free time, I love hiking in beautiful mountains, exploring local independent coffee shops, cooking delicious food with my family and friends, playing drums and Cajon, reading the Bible, serving local church and communities, or just watching TV shows and funny YouTube videos at home like a coach potato.

Julieta Martinelli

I received my PhD from Macquarie University in Sydney, Australia, after earning a BS in Biology at Universidad Nacional de Córdoba in Argentina. I came to SAFS after a post-doc in PaleoLab at Centro de Estudios Avanzados en Zonas Áridas in Chile, where I worked with Marcelo Rivadeneira, determining how artisanal fishing affected mollusc communities over time. This project combined diving censuses with data from fossil terraces up to 300,000 years old to compare past shellfish communities to contemporary ones and determine the role of anthropogenic factors explaining changes in community structure and composition.

I study changes in benthic marine communities over ecological, historical, and geological time periods, using approaches from conservation paleobiology and historical ecology. My project at SAFS seeks to determine the ecological and environmental setting in which Olympia oysters (“Olys”) thrived in the past. Olys are the only oysters native to the eastern North Pacific, and they were severely affected by over-exploitation in the mid-1800s. I will use historical ecology to determine what Olympia oyster communities were like prior to overexploitation. This baseline information will inform targets for restoration efforts in Washington State carried out by the Puget Sound Restoration Fund, NOAA,

I to r:
Yurong He,
Megsie Siple,
Julieta Martinelli

Photo credits, I to r:
Courtesy of
Yurong He,
Julieta Martinelli,
Megsie Siple



Where in the world do our post-docs come from?



and the Washington Department of Fish and Wildlife.

I am also studying the identity and distribution of mudworm parasites on Pacific oysters, and the presence of microplastic contaminants on Pacific oysters in Puget Sound in collaboration with SAFS faculty members Chelsea Wood and Jacqueline Padilla-Gamiño.

In my free time, I enjoy painting, yoga, diving, and exploring the Pacific Northwest.

Megsie (Margaret) Siple

My research involves studying feedbacks between human activities (such as species introductions, fishing, and consumer choices) and natural resources. I am most interested in new ways that ecological information can be incorporated into models used for management, and how people should prioritize which information to include. I received my PhD in 2017, studying the ecology and population dynamics of forage species (primarily Pacific herring) and how management might respond to uncertainty about population dynamics and spatial processes, with Tim Essington as my adviser.

Before coming to SAFS, I got my MS degree in

Marine Science from the University of Hawaii at Manoa, where I studied how benthic invertebrates respond to the removal of invasive plant species. Much of this research was done in and around a native Hawaiian fishpond. My experience with community-based fishery management and traditional management practices in Hawaii inspired me to pursue my PhD in fisheries.

I joined the Ocean Modeling Forum at SAFS in January 2018, working as a member of the Marine Mammal Bycatch Working Group. I am now developing tools to assess bycatch of marine mammal populations. I have started to create an app that stakeholders can use to perform their own marine mammal risk assessments in the face of limited data. After my post-doc here, I have a James S. McDonnell Foundation post-doctoral fellowship to study the economic value of adding food web information to assessment models. During and after my post-docs, I want to conduct applied research that will improve fisheries management.

Outside of the academe, I play the oboe with Orchestra Seattle and the UW Philharmonic Orchestra. ■

Andrew Berdahl Joins SAFS Faculty

Andrew Berdahl joined SAFS this fall as a member of our quantitative faculty. Before coming to the UW, Andrew was an Omidyar Fellow at the Sante Fe Institute and before that a PhD student in the labs of both Simon Levin and Iain Couzin at Princeton. His research interests are very diverse, and he is as comfortable in the field and lab as he is with models and equations, as you will learn below.



AP: What attracted you to mathematical ecology?

AB: I grew up in a fairly remote area in northern Canada and was fascinated with aquatic environments and their inhabitants from a young age. I ended up going to university for physics, which I loved, and still do, but during my MS, I found myself increasingly playing hooky to go explore rivers and bother fish. Around that time, a fantastic talk by Simon Levin opened my eyes to the world of mathematical ecology. Here I could apply my quantitative training to the systems I found most interesting, allowing me to combine both of these passions. I began to read more and more in this area and decided to jump in with both feet for my PhD.

AP: What was the focus of your PhD?

AB: During my PhD, I studied collective movement (e.g., schooling and flocking). I was keen to apply concepts from statistical mechanics to understand how fish schools worked. Perhaps the emergent properties of the groups could be calculated from simple interactions between individual group members, just as the bulk properties of matter can be derived from the interactions between its countless microscopic constituents. I focused mainly on collective search and navigation—whereby individuals in groups are better able to find their way than their singleton counterparts. Initially, I dug into the mechanistic underpinnings of collective navigation and found that groups can act as a distributed sensor array able to integrate information and calculate environmental gradients. Toward the end of

Andrew following the Dolphin-Union caribou herd onto the sea ice off of Victoria Island, Nunavut. Photo credit: Andrew Berdahl

School of juvenile
coho salmon



Photo credit: iStock/ Hailshadow



Photo: UW College of the Environment

my PhD, I also became very interested in the ecological and evolutionary implications of collective motion and explored how group travel can influence gene flow and population dynamics.

AP: What are your current research interests?

AB: Everything! I just came from a post-doc at the Santa Fe Institute, which brings together researchers from all across the board in a wonderful merging of ideas without any confines from traditional disciplines. Current projects range from gumballs to forest fires! However, my main focus is movement ecology and bringing a social/collective perspective to that body of work. I am helping to develop drone-based techniques—both to record the paths of animals moving in their natural environments and also to quantify features of those environments. In this way, we can study (collective) animal movement in their natural habitats, rather than restricted to the lab.

I am hoping that my transition to SAFS will be a catalyst for a pivot point for me as I branch out in some new directions. I am most excited to bring genetic techniques and a broader ecosystem perspective into my research.

AP: What drew you to SAFS?

AB: As I transitioned from physics to ecology, I sent off quite a few emails with (probably naive) questions to people who I thought were doing interesting things. Although not by design, the bulk of these were to folks at SAFS, and when I stepped back and realized this, I became very intrigued. I'm thrilled to actually be part of this community—now I can ask my naive questions in person. SAFS is world-class, and there is also so much exciting research being

done all over campus and at various institutions around the city. Also, it didn't hurt that Seattle is in a beautiful part of the world.

AP: What is the next big thing for you / the field?

AB: New technologies are allowing us to capture animal movement and quantify the environments in which they are moving in insane levels of detail. This mirrors methodological breakthroughs across all sort of fields. What I think is most exciting though is stepping across boundaries between those disciplines and bringing all of the data together, which will allow us to ask more ambitious questions and revisit old ones more carefully. For me personally, aside from all this, I am looking forward to bringing more field work into my life, and in particular, I am really excited to get involved with the Alaska Salmon Program.

AP: What could we learn about you that isn't in your CV?

AB: I'll let you guess. Three of the following four are true:

- 1) I discovered the first emeralds in Canada.
- 2) I was robbed by pirates off the coast of Sri Lanka (don't worry—they didn't get the emeralds).
- 3) I was *Time Magazine's* co-person of the year (2006).
- 4) I once beat Daniel Schindler at arm wrestling. ■

Where was Kerry Naish in 2018?

Kerry Naish has been a SAFS faculty member since 2002. Her research group investigates proactive approaches to conserving genetic diversity in aquatic species. Much of the group's work focuses on salmonids and includes characterization of population structure and adaptation, reducing the effects of hatchery fish on wild fish, and informing disease management of indigenous pathogens across the landscape. Kerry recently took her first sabbatical, and I wanted to find out how it went.



Photo credit: Marine Brieuc

Kerry Naish

AP: What did you do during your sabbatical, and why?

KN: Our tools have expanded dramatically with the advent of rapid and relatively low-cost DNA sequencing. We've been using these tools to address conservation questions to great effect. That said, our data sets are getting larger and larger, and I wanted to learn how we might effectively apply these advances to conservation management. The agricultural sector has been leading the way in data analysis and interpretation, mainly because there are many researchers working on very well-characterized populations, where relationships between individuals are known and environments are controlled. I wanted to learn what this sector was doing and where they were going, and gain new skills at the same time.

AP: Given your interests, where did you choose to spend your sabbatical?

KN: I elected to spend most of my time in Chile because the development of many of the whole genome datasets in salmon species was initiated by the aquaculture community, and Chile has been one of the leading countries in these efforts. Also, salmonid aquaculture is a key component of Chile's economy, and researchers there are experts in advanced development, application, and analysis of molecular approaches. I joined the laboratory of my collaborator, Professor Victor Martínez, a statistical geneticist and bioinformatician, who researches a range of issues that include disease transmission in coho and Atlantic salmon. Many of the Chilean coho salmon populations were derived from an aquaculture strain first developed by

Drs. Iwamoto, Myers, and Hershberger at the UW in the 1980s, and so we researched processes of domestication and evolution of disease resistance across the different strains.

I also chose Chile because I wanted to immerse myself in a culture with which I have had little experience, so that I could gain some insight on what it is like to navigate a system in a different language. This is an issue that many of our students and colleagues face. Although I've lived in many countries, all have been English speaking. I wanted to remind myself what it is to be a learner—and I thought moving outside my comfort zone would be very good for me! Finally, South America in general, and Chile in particular, has always captured my imagination. Who hasn't pointed on a map at the southernmost continental point of the Americas, or to the driest desert in the world, and wondered about them?

AP: What did you learn about the management and science of aquaculture in Chile?

KN: There are some key milestones that have driven policy in the development of the aquaculture sector. Concern over the vulnerability of the economy due to reliance on the mining sector led to investment in agriculture, and aquaculture in particular. A similar approach has also been taken in Norway, where funds derived from the energy sector have been partly re-invested into salmon culture. Both countries account for

the majority of salmon production worldwide. Chilean production was almost equal to that of Norway before 2009/10, when there was a major disease outbreak in Atlantic salmon in Chile. Efforts were immediately directed towards self-sufficiency in the production cycle, from broodstock management to harvest, with no transfers allowed from outside the country. Much of the research subsequent to this period has been on disease management and development of disease-resistant strains.

Efforts to diversify aquaculture have also increased, and activities are expanding both north and south. For example, I was surprised to discover that salmon culture has been established in the southernmost Magallanes region, partly as a response to changing ocean conditions. There is also significant investment in indigenous species, with the employment of genomic tools from the start. Interestingly, much of this work is land-based as a response to concerns about impacts on the environment. In the north, considerable work is being conducted on scallops, kingfish *Serioloa*, and Chilean

corvina. After working on salmon, handling a single adult kingfish was a novel experience, involving several changes of clothing despite extensive waterproofing.

AP: *Any interesting travels?*

KN: In a word, yes! I managed to fulfil my hopes of visiting much of the country and learning about Chile's history. I was able to take the famous "W" trek in Patagonia and actually see the peaks of the celebrated Torres del Paine despite characteristically stormy weather. The Atacama Desert, home to the large telescope array at ALMA, was one of the best places I've been to for star gazing. In Calama, a major mining town, we were lucky to stumble on a festival celebrated by the Andean

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A mountain pass that Darwin took as he was crossing the Andes between Mendoza, Argentina, and Santiago, Chile, in 1835. The valley leading to Mendoza is in the background. The road is now part of the Reserva Natural Villavicencio in Argentina, home to many marine plant fossils along the route. Photo credit: David Catling



Kerry Naish —continued from page 7

peoples of the region. The unexpected trips to unusual places were the “gems” of my travels—often associated with field trips, excellent company of my hosts, and seafood straight from the sea.

I joined one of our colleagues on his sabbatical, David Catling (UW Earth and Space Sciences), who has been tracing Charles Darwin’s journey on the Beagle. We travelled over the Andes from Santiago to Mendoza, exploring marine fossil beds and petrified forests that Darwin described in his journals. Finally, I took my snowboard with me and spent many winter weekends high up in the Andes. The best experience of all my travels, however, was getting to meet Chileans from very diverse backgrounds, whose universal and pure generosity, insight, and humor were very humbling.

AP: *Any final comments?*

KN: To call this sabbatical a privilege is an understatement. I’d like to warmly thank my hosts, and Victor Martínez in particular, for their extreme generosity and for a highly productive year. ■

Kingfish, *Serioloa*. Photo credit: Kerry Naish



Alumni Update

Update your record and sign up for the newsletter by email.

Our spring–summer issues are distributed online only (email, website), and the fall–winter issues continue to be published in print and online.

If you are still receiving printed newsletters, please consider switching to email/web. If you would like to do so or if you need to update your contact information (or both), go to the following UW Alumni Subscription Center and/or SAFS Alumni Update webpages (applies to alumni and friends):

- Update your contact information www.washington.edu/alumni/services/update-your-information
- Change newsletter subscription format depts.washington.edu/safs/alumni/update.php



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Consider a Gift inspire new ideas

Support the School of Aquatic and Fishery Sciences and the University of Washington with a gift in your will.

giving.uw.edu/planned-giving

For questions, please contact:

Office of Planned Giving

206-685-1001 giftinfo@uw.edu

Awards & Honors

Students

Degree track and faculty advisers in parentheses

Martin Arostegui (PhD, Quinn) obtained a Student Travel Award to the American Fisheries Society Coastwide Salmonid Genetics Meeting.

Andrew Chin (BS) won a Washington Sea Grant Science Communication Fellowship.

Thiago Couto (Olden) received an Early Career Grant from the National Geographic Society and a grant from the Rufford Foundation.

Daniel Hernandez (PhD, Naish) obtained the Snieszko Student Travel Award from the Fish Health Section of the American Fisheries Society.

Jonathan Hui (BS) won the Levinson Emerging Scholars Award to further his research with Luke Tornabene. He also won the best student presentation award at the Gilbert Ichthyological Society and was given an NSF REU Smithsonian fellowship.

Heather Lopes (BS) netted a scholarship from the Mary Gates Endowment for Students.

Rachel Manning (MS, Tornabene) was selected to participate in the Woods Hole Marine Biological Laboratory 2018 Workshop on Molecular Evolution.

Laura Spencer (MS, Roberts) won the best student presentation award from Pacific Coast Chapter of the National Shellfisheries Association.

Hyejoo Ro (BS) received a Mary Gates Research Scholarship.

Rebekah Stiling (MS, Olden/Holtgrieve) obtained the Trail Blazers Memorial Scholarship in honor of Jack Rollo from the Washington State Trail Blazers.

Yaamini Venkataraman (PhD, Roberts) was appointed to the Student Committee of the Western Society of Naturalists.

Staff

Laurie Ginn received the SAFS Staff Award for her unparalleled institutional knowledge, patience, and dedication to collaborate with all members of our community to solve problems.

top row, l to r: Rachel Manning, Thiago Couto, Andrew Chin

bottom row, l to r: Yaamini Venkataraman, Martin Arostegui, Laurie Ginn

Photo credits: Courtesy of award recipients



Degrees Awarded

Aut 2017–Sum 2018

Our student research encompasses numerous and diverse disciplines, including biology, ecology, fisheries management, disease, genetics, physiology, and statistics—as well as interdisciplinary subjects—in pursuit of improving our understanding of the interactions between humans, our environment, and the resources upon which we rely.

BS Degrees

Elliott Michael Allen °
 Elizabeth Allyn ° *
 Abigail Ames
 Samantha Anderson °
 Sara Amalia Bunker
 Kirsten Calvert
 Kristin Gale Cochran
 Ellie Davis
 Maya Garber-Yonts
 Kristofer Hiromoto

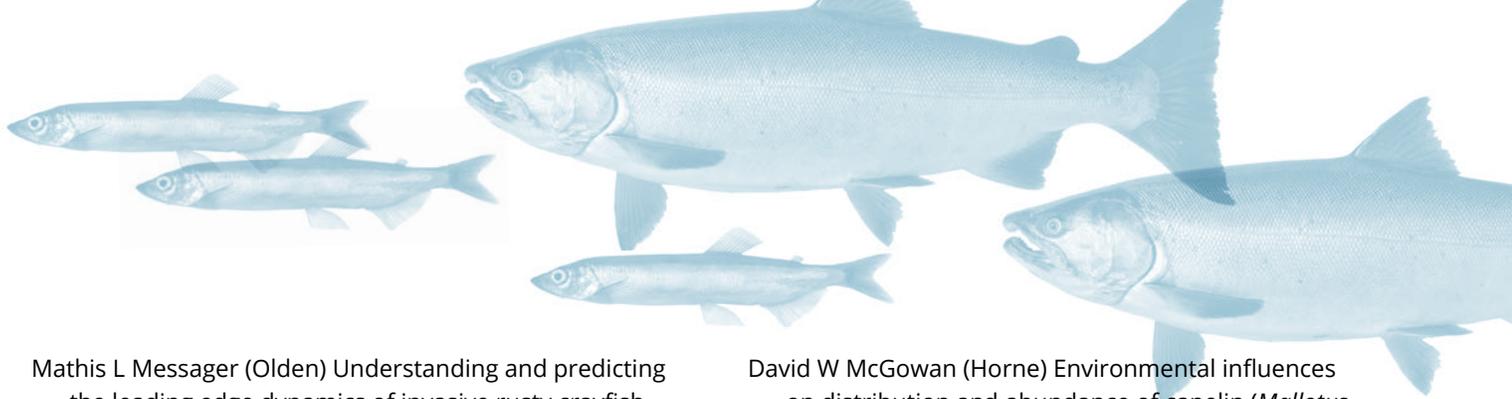
Carter Justis Johnson
 Hiromi Christine Katagiri ∞
 Jonathan H McLean
 Andrea Natsumi Odell
 Molly Payne #
 Jennifer Thaves
 Nicholas Ulacia
 Veronica Voogd
 Grace Workman
 Dara Yiu

* departmental honors
 # college honors
 ° cum laude
 ∞ magna cum laude

MS Degrees (advising professors in parentheses)

Michelle Chow (Young) The acutely lethal toxicity of urban stormwater runoff to juvenile coho salmon
 Casey P Clark (Beauchamp) Quantifying the impact of two native predators on juvenile sockeye salmon survival in Lake Washington
 Mary Fisher (Hauser) Korean stock structure and transoceanic divergence in Pacific cod (*Gadus macrocephalus*)
 Daniel J Gillon (Friedman) Examining multigenerational effects of ocean acidification on the Pacific oyster (*Crassostrea gigas*): evidence of selection or plasticity?
 Alicia Jane Godersky (Pietsch) Nearshore larval fishes of Puget Sound
 Megan Elizabeth Hintz (Roberts) Exploring native oyster shell microchemistry to characterize population connectivity in Puget Sound, WA





Mathis L Messenger (Olden) Understanding and predicting the leading edge dynamics of invasive rusty crayfish (*Orconectes rusticus*) in the John Day River

Christina Morrisett (Skalski) Assessing the utility of tributary PIT-Tag Arrays in monitoring Snake River salmonid recovery

Adrian Mcfarland Tuohy (Skalski) Post-release survival of Chinook salmon and steelhead trout from an experimental commercial fish trap in the Lower Columbia River, WA

PhD Degrees (advising professors in parentheses)

Timothy J Cline (Schindler) Challenges and opportunities for aquatic ecosystem management with uncertain global change

Kelli Faye Johnson (Punt) Multispecies methods to facilitate the transition from heuristics to statistics in ecosystem-based fisheries management

Peter Tadao Kuriyama (Branch) Multispecies management and assessment in the US West Coast groundfish fishery

David W McGowan (Horne) Environmental influences on distribution and abundance of capelin (*Mallotus villosus*) in the Gulf of Alaska

Christopher Allen Monson (Young) Examining the effects of endogenous sex steroids and the xenoestrogen contaminant 17 α -ethinyles-tradiol on previtellogenic coho salmon ovarian growth and function

Pamela E Moriarty (Essington) Quantifying predator-prey interactions: methods, challenges, and applications

Elizabeth M Phillips (Horne) The influence of the Columbia River plume on predator-prey interactions

Maite Pons Barrios (Hilborn) Stock status and management in tuna fisheries: from data-rich to data-poor

Margaret C Siple (Essington) Implications of demographic diversity for forage fish, their fisheries, and ecosystems

Michael Douglas Tillotson (Quinn) At the intersection of fisheries and climate change: emergent challenges for Pacific salmon management in a warming world

Charles D Waters (Naish) Effectiveness of managed gene flow to reduce genetic and phenotypic change associated with captive breeding of Chinook salmon

SAFS Graduation 2018

Opposite page: BS degree recipients

Below: MS and PhD degree recipients



Gifts January–December 2018



SAFS alumni, faculty, and friends have a long history of generous giving. They continued this tradition during 2018, providing critical financial support for our students, faculty, and programs. We acknowledge and thank you for your sustained support.

\$10,000 and Up

Aleutian Spray Fisheries, Inc.
Arctic Storm, Inc.
At-Sea Processors Association
Bering Sea Fisheries Research Foundation
Bristol Bay Regional Seafood Development Association
Chignik Regional Aquaculture
Coastal and Estuarine Research Federation
Conservation, Research and Educational Opportunities International
Estate of Evelyn S. Egtvedt
Freezer Longline Coalition
Groundfish Forum
Hall Charitable Lead Trust
Ms. Adele Maruo & Mr. John Lowrance
Mr. Douglas & Mrs. Joyce McCallum
Ocean Beauty Seafoods, Inc.
Pacific Seafood Process Association
Peter Pan Seafoods, Inc.
The Pew Charitable Trusts
Dr. André & Ms. Michelle Punt
Mr. Vahid & Mrs. Noonooch Sapir
The Dean Witter Foundation
United Catcher Boats

From \$1,000 to \$9,999

Ms. Janet & Dr. David Armstrong
Boeing
Dr. Ray & Ms. Ulrike Hilborn
Drs. George & Peggy Hunt

Dr. Orlay Johnson & Ms. Shirley Kronheim
National Geographic Society
Mr. Thomas Ohaus & Ms. Linda Kristofic
Dr. Julia Parrish
Dr. Thomas Quinn & Ms. Sandra O'Neill
Rufford Small Grants Foundation
Mr. Allen Shimada & Ms. Suzanne Shwetz
Dr. Barbee Tucker-Pigott
Drs. S. Rao & Usha Varanasi
Dr. Donald & Ms. Sharon Weitkamp
Dr. John & Ms. Margaret Williams
Drs. James Winton & Linda Park
Mr. Mark Zimmermann & Ms. Beth Hacker

Up to \$999

Dr. James & Ms. Maryline Adams
Dr. Aven & Ms. Shirley Andersen
Ms. Cassandra Anderson
Professor Christopher Anderson
Mr. David Anderson
Mr. Gregory Anderson & Ms. Patsy Dickinson
Mr. Steven Atran
Dr. Elizabeth Babcock
Mr. Albert Banner
Mr. William & Ms. Rosemarie Bemis
Ms. Roslyn Benkle
Ms. Christine Betchley
Mr. Richard Bohn

Mr. Christopher Brown
Ms. Phyllis Brown
Ms. Kathy Casson
Ms. Sarah Converse & Mr. Matthew Bowman
Saka Coy
Ms. Ruth Craig & Mr. Michael Sydow
Mr. David & Ms. Judy Croonquist
Mr. Christopher & Ms. Pat Curtin
Dr. Michael Dahlberg
Mr. Steven Desimone
Dr. Elisabeth Duffy
Mr. Gary & Ms. Joyce Duker
Ms. Sharon & Mr. Dennis Early
Mr. Quentin Edson
Mr. Richard Elliott & Dr. Diane Elliott
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Mr. Julien Eren
Nancy Essington
Ms. Summer Evert
Mr. Lawrence Field & Ms. Deborah Dwyer
Mr. Rich Finger
Ms. Andrea Fowler
Dr. Sarah Gaichas
Mr. Eric Gardner
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Dr. Richard & Ms. Beverly Gregory
Dr. Don Gunderson
Mr. Scott Harris
Mr. Jay Hastings & Dr. Christine Susumi

I to r: Decorated warbonnet (*Chirolophis decoratus*) taken at Adam Summers' lab at Friday Harbor, Delaney Lawson on Herring collection trip, Viperfish pulled from a bottom trawl off the coast of Washington

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I to r: Female sockeye salmon on Hansen Creek, Alaska; taken during a research dive; Curious juvenile walrus found in the Chukchi Sea.

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