VISITING EXPERT COMMITTEE ASSESSMENT OF THE

University of Alaska Fairbanks College of Fisheries and Ocean Sciences

APRIL 2018

UAF
COLLEGE OF FISHERIES AND OCEAN SCIENCES
University of Alaska Fairbanks

Visiting Expert Committee (VEC) Members

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Seward Marine Center, Seward, Alaska, September 27, 2017. From left: VEC members John Farrell, Steve Murawski, Larry Mayer, and Roberta Marinelli, and CFOS Dean Bradley Moran. *Photo credit: Jennifer Elhard*

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The research vessel *Sikuliaq* sails through Arctic waters in 2016.
Photo credit: Kim Kenny

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Brittany Jones carries a sediment core after a multi-core deployment aboard R/V *Sikuliaq*. *Photo credit: Brendan Smith*

Executive Summary

Despite the current financial challenges facing the State of Alaska and its flagship University of Alaska Fairbanks (UAF), the Visiting Expert Committee (VEC) concludes that the College of Fisheries and Ocean Sciences (CFOS) remains fundamentally strong and is well positioned to take advantage of new and emerging opportunities.

Significant advancements initiated by the College's new Dean that are being implemented by staff and faculty are positive developments. These include restructuring the former School to a College, successfully operating the 261-foot Global Class, ice-capable oceanographic research vessel *Sikuliaq*, and establishing a thoughtful and aspirational CFOS Decadal Plan. To build on these advancements, and to ensure continued strength of CFOS, the VEC calls attention to five "lynchpin" issues described in this report that warrant serious consideration and strategic investment:

1 **Faculty support.** First and foremost, the College is about teaching and scholarship. The College must add new tenure-track faculty and research faculty. Initial steps have been taken, and follow-through, including support (e.g., salary, start-up funds), will be essential.

2 **R/V *Sikuliaq* support.** To achieve the 2017 CFOS Decadal Plan goal of grant-supported CFOS faculty and student use of 20% of the ship's time, the College will first need to invest in faculty and research, both of which will help to establish a strong sea-going program. UAF/CFOS must also support infrastructure at the Seward Marine Center, the cost of which could be shared with external partners operating in Seward. Operation of *Sikuliaq* will be re-competed in 2023; in order to continue the Cooperative Agreement with the National Science Foundation (NSF), UAF/CFOS must continue to demonstrate that it offers the most capable services and the best value to the federal government.

3 **Student support.** CFOS should continue to focus on academic outcomes and look to provide additional teaching assistantships and other opportunities for student support. Coursework and curricula that are fit-to-purpose continue to be valuable, particularly in light of the high demand in Alaska for a workforce knowledgeable in marine and freshwater natural resources.

4 **Cultural evolution and community.** As an organization, CFOS can develop greater institutional strength and *esprit de corps* through implementation of seminar series, career-day events, and continued improvement of website and social media presence. These steps are critical to address the "tyranny of distance" associated with separate campuses. The College is also encouraged to continue efforts to engage and collaborate with Alaska Sea Grant.

5 **Structural integration.** The transition from a School to a College was a positive and well-justified step, as was keeping CFOS headquartered in Fairbanks, given the many academic and research synergies. Senior leadership in CFOS, UAF, and indeed in University of Alaska (UA) system-wide, should continue to consider how CFOS engages and interacts with other elements of the University and as additional opportunities arise where a reorganization or restructuring would add value to the overall enterprise.

Preface

The Dean charged a Visiting Expert Committee (VEC) with assessing the health and needs of the University of Alaska Fairbanks (UAF) College of Fisheries and Ocean Sciences (CFOS) (see Appendix I). The charge included an evaluation of research productivity, academic programs, and service-related missions of CFOS by assessing performance and by conducting on-site visits (see Appendix II) to CFOS's major facilities in Juneau, Anchorage, Seward, and Fairbanks, Alaska. This report provides a comprehensive description of the VEC's findings and recommendations in each of the five strategic priorities identified in the 2017 CFOS Decadal Plan: academics, research, service, partnerships and philanthropy, and infrastructure.

Eric Collins, Kyle Dilliplaine, and Brian Ulaski use a corer to collect sea ice samples in the Chukchi Borderland region. *Photo source: Caitlin Bailey*

Introduction

UAF/CFOS is the primary academic unit that conducts fisheries, marine biology, and allied ocean sciences research, education, and public service in the State of Alaska. It is one of the largest combined research and academic units in the University system in terms of personnel and budget.

While the transition from the former "School" to the "College" of Fisheries and Ocean Sciences was relatively recent (2016), essential elements of the academic program have existed for more than five decades. Alaska's economy is primarily based on exploiting its vast natural resource base (fisheries, energy, mining, forestry). As such, a vibrant program of marine research, training, and service activities is essential for workforce development, and to inform resource managers and the public on issues related to ocean science, fisheries and energy development.

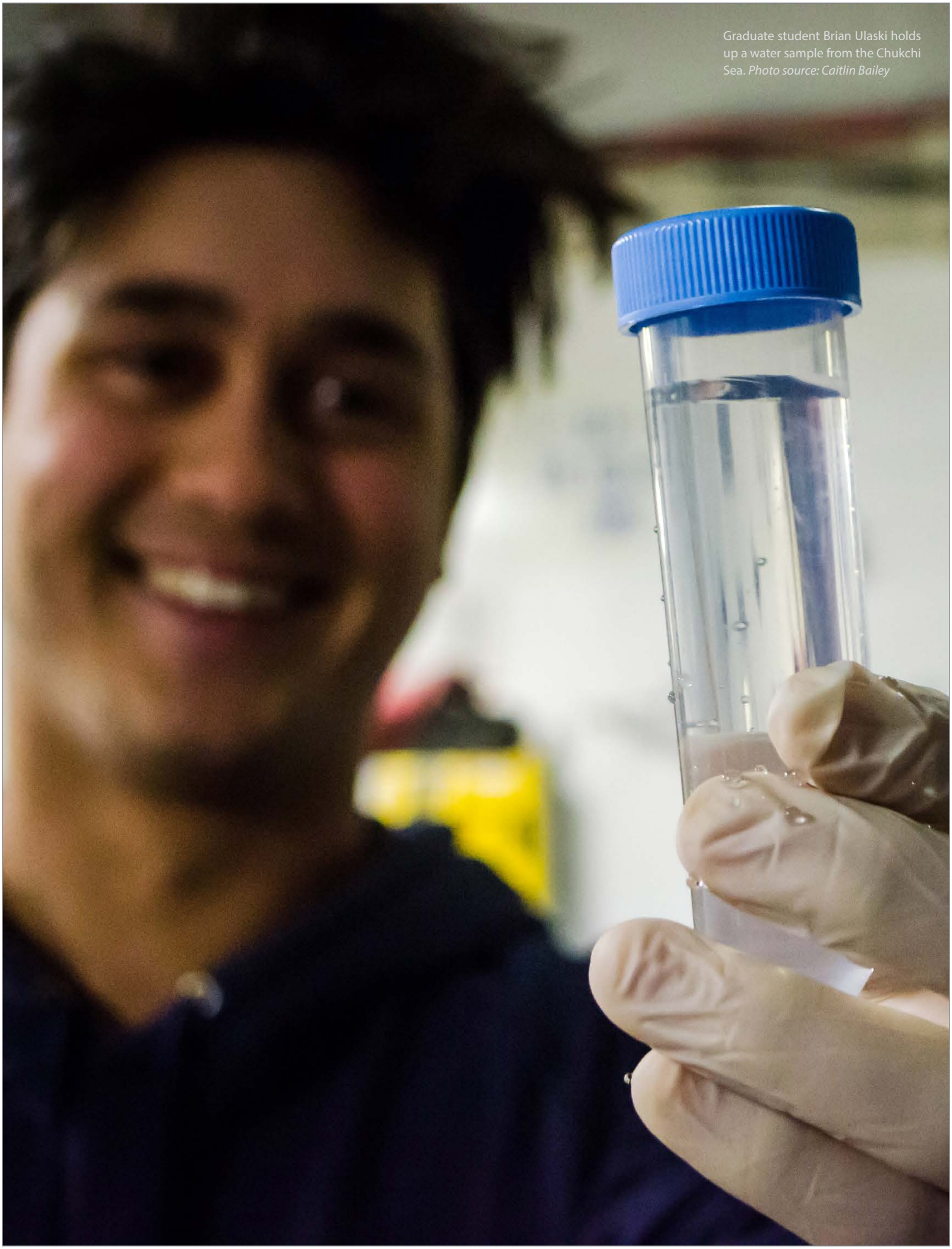
Responding to the mandate for strong university-based programs related to ocean use and protection, CFOS and its predecessor elements have an admirable and well-deserved national and international reputation for excellence in teaching and research. The highly productive faculty are successful in competing for extramural research funding and publishing scientific results in prestigious journals. CFOS also enjoys a unique niche in the global context of Arctic research, given the high-latitude location of the College and the collective expertise of the faculty, staff, and students.

Working with senior leadership at UAF, the Dean of CFOS, S. Bradley Moran, assembled a Visiting Expert Committee (VEC) and tasked it to "…*provide a critical assessment of the College's academic, research, and public service activities, philanthropy, and major infrastructure*…" and to make recommendations commensurate with meeting the long-term objectives and goals of the 2017 CFOS Decadal Plan (https://www.uaf.edu/cfos/about-us/cfos-publications).

The VEC was encouraged to pay particular attention to the new administrative structure (i.e., transition from a School to a College); its functionality; its impact on research programs; support for undergraduate and graduate degree programs, facilities and operations, and communications and public engagement; and interactions with other UAF/UA entities and external partners.

This report summarizes the committee's findings and recommendations in each of the five strategic priorities identified in the 2017 CFOS Decadal Plan: academics, research, service, partnerships and philanthropy, and infrastructure. This assessment represents the consensus evaluation and recommendations by the VEC (see Appendix III for biographies of the VEC members), and serves as a resource for faculty and staff, as well as guidance for senior leadership at UAF.

Lena Point Facility, Juneau, September 26, 2017. UAF Professor Ginny Eckert, who also serves as Associate Director for Research for Alaska Sea Grant, shows where hatchery-cultured red king crabs are raised. From left to right: Steve Murawski, Ginny Eckert, Brad Moran, Roberta Marinelli, and Larry Mayer. *Photo credit: John Farrell*



Graduate student Brian Ulaski holds up a water sample from the Chukchi Sea. *Photo source: Caitlin Bailey*

Background

How the Visiting Expert Committee Learned About CFOS

Introductory information on CFOS was provided to the VEC prior to the site visits in Juneau, Seward, Anchorage, and Fairbanks. The VEC received a copy of the 2017 CFOS Decadal Plan (https://issuu.com/uafcfos/docs/cfos_decadal_plan_final) and other printed material that describe college activities and program. The VEC also was informed about UA President Jim Johnsen's Strategic Pathways (https://www.alaska.edu/pathways), which is an ongoing effort to optimize the statewide system to achieve the state's goals for higher education in Alaska.

In a conference call on September 7, 2017, members of the Dean's Executive Committee provided the VEC with an overview of the College structure, the research and academic programs, and information about strategic partners, such as Alaska Sea Grant. Over the course of three days (September 26-28, 2017), the VEC visited CFOS locations including Juneau, Seward, Anchorage and Fairbanks, holding discussions with senior leadership, faculty, administrative and technical staff, undergraduates, graduate students, postdoctoral scholars, technicians and engineers (Appendix II). Subsequent to the visit, the VEC received solicited and unsolicited documents and other information from faculty and staff, which were helpful in formulating the VEC's findings and recommendations.

Uniqueness of Alaska

Alaska is the nation's largest and most sparsely populated state (roughly 1.1 Alaskans per square mile), known for its diverse terrain, its lengthy and rugged coastline, and its economic reliance on natural resources (including oil and gas, fisheries), the federal government, and other industries and services (including tourism).

CFOS is challenged by the unique physical geography of Alaska, by its remoteness from the lower 48 states, and by the vast distance between population centers within the state. CFOS has faculty, staff, and students in 12 locations across Alaska, from Fairbanks to Nome, to Unalaska, to Ketchikan. These conditions warrant special consideration and accommodation given the irreplaceable contributions CFOS makes to teaching, research, and public engagement.

Importantly, CFOS is among only a few ocean-focused colleges in the United States that places a special emphasis on the Arctic, a region that has grown particularly important on the global geopolitical stage. The budget for CFOS, as an integral part of a state university, is closely tied to the economic well-being of the State of Alaska. The recent downturn in the oil and gas industry, due to global commodity prices, which is the primary source of funds to state government, has strained UA, UAF, and CFOS, as well as all other state entities.

Federal and state budget allocations for scientific research and education are also generally flat or declining. The result is that competition for research funds has become increasingly sharp. The continued competitiveness of CFOS and its ability to serve the state depends on strategic investment and stewardship.

Alaska as a Setting for a Major Ocean Research University

Poised at the edge of the Arctic Ocean and its surrounding subpolar seas, UAF and CFOS undertake research integral to understanding the impacts and effects of melting ice in the Arctic and its implications for the ecology, economy, and security of the region. The VEC emphasizes the critical importance and central role that the CFOS fisheries research and educational programs play in successfully managing fisheries at the state and federal level. Alaskan fisheries remain among the state's most lucrative industries. The expertise in Arctic Ocean science at UAF/CFOS is key to addressing the challenges and opportunities that changing climate will have for the region and the nation. The renewed interest in exploration and production of oil and gas resources within and offshore Alaska pose unique challenges for industry, government, and local communities. The expertise at CFOS related to energy exploration and production is critical to these seminal questions.

Research conducted in Alaska is one strategic area where significant opportunities exist. As Scott Minerd (Chief Investment Officer and a Managing Partner of Guggenheim Partners, LLC, a privately held global financial services firm with more than $125B of assets under management) opined in the *Alaska Dispatch News* (Minerd, 2012):

*Research is the key to Alaska's bright economic future. R&D spending [*by the State of Alaska*] as a percent of the state's total economic output is almost zero – 0.7 percent compared to an average of 2.6 percent for the U.S. overall. Now is the time to encourage, develop and invest…establishing the technical expertise and manpower that will be crucial to the state's economic future.*

While much of the research conducted in Alaska supports regulatory and management agency work (both state and federal), there exists an important and heretofore mainly unfilled niche to support research and development of ocean instrumentation, and capabilities to meet the needs both in Alaska and globally. Because of the unique challenges posed by changing Arctic conditions, filling this niche by supporting R&D efforts of academia (including spin-off businesses) and the private research community represents an important opportunity that should be acted upon.

Relative to the issue of polar regions as emerging strategic opportunities, the recently deployed 261-foot Global Class, ice-capable, oceanographic research vessel *Sikuliaq*, owned by NSF and operated by CFOS (from Seward) positions CFOS as a first-tier oceanographic institution. This status represents a significant opportunity for CFOS to play a leadership role in the future development of Arctic research; however, there is a critical need for CFOS and Alaska to adequately use and support the vessel in northern waters. It is thus essential to set a course whereby CFOS-affiliated researchers use the asset as a basis for grant-sponsored research in the Arctic and subpolar regions.

Seward Marine Center, September 27, 2017. Oceanographic moorings specialist Peter Shipton briefs the committee on technological aspects of recent expeditions. *Photo credit: John Farrell*

A scientific diving class relaxes in Kasitsna Bay after a successful week in the field. *Photo source: Brenda Konar*

Alaska's Ocean Economy Depends on Marine Research, Education, and Public Engagement

The importance of the marine environment to Alaska can hardly be overemphasized. In 2015, fishery landings from state and federal waters off Alaska amounted to 6 billion pounds and $1.8 billion in ex-vessel value, making Alaska the leading state in both categories (NMFS, 2016). Of the 10 leading fishing ports in the country, six are in Alaska, including the top port in quantity of fisheries landings of Dutch Harbor. Species landed from Alaskan waters are diverse, including pollock, halibut, salmon, crabs, herring, and other species. Both the National Oceanic and Atmospheric Administration (NOAA) and the Alaska Department of Fish and Game (ADF&G) rely heavily on UAF for supporting research, advisory services, and training of current and potential staff. UAF research and advisory services are particularly oriented to research on quantitative resource assessment and projections of fishery catches for sustainable fisheries. This activity requires a high degree of training for stock assessment scientists and field-oriented research to determine the population size and dynamics of exploited species and their ecosystems. UAF faculty and students routinely conduct research and are on scientific and statistical committees informing management undertaken by NOAA and ADF&G. Likewise, students educated within UAF are in high demand by both agencies for temporary and permanent employment.

Developing other natural resources such as offshore oil and gas will require considerable scientific and engineering support, including better understanding of the effects of this development on marine ecosystems. Thus, exploration and monitoring programs conducted by UAF researchers, with support from partner institutions including federal and state agencies and the North Pacific Research Board (NPRB; http://www.nprb.org) are vital to responsible development of living and mineral resources in Alaska's waters.

Understanding the interplay of natural resource productivity, environmental change, and human drivers is thus a high priority for UAF and its partners and client institutions, and the communities of the State.

FINDINGS AND RECOMMENDATIONS BY TOPIC

Academics

FINDINGS

1 **CFOS is "Flagship quality" despite small student population.** The student population (both graduate and undergraduate) in CFOS is small compared to other academic units at UAF; however, the number of graduate students at CFOS is comparable to that in other leading oceanographic institutions in the country. As of October 2017, there were 110 registered graduate students and they are funded as follows:

a. 30 through research assistantships
b. 14 through fellowships (Rasmuson Fisheries Research Center, the Pollock Conservation Cooperative Research Center, Hilcorp Alaska LLC, and Alaska Sea Grant)
c. 7 through teaching assistantships (University of Alaska Southeast (UAS), UAF)
d. The remaining 59 students were either self-funded, employed by other departments, or employed by agencies (NOAA, Co-op/ADF&G, and others)

The quality of the academic program is high, based job placements and other information received by the VEC during the site visit and in subsequent email communications. A thorough review of the academic program was beyond the scope of the VEC. We refer the curious reader to a comprehensive program review conducted in 2016–2017, available from the CFOS Dean.

One graduate student noted, "…the big advantage of CFOS, in both teaching and research, is that the 'broader context' is emphasized as a core value or perspective, and topics such as ecosystems, ecology, and even human culture are woven together, in a well-integrated context. The faculty members care deeply about their research and teaching."

2 **Fisheries undergraduate enrollment increased significantly over 10 years and is now one of the largest programs in the nation**. With regard to enrollment, the size of the undergraduate fisheries program nearly tripled from 2007 to 2010, largely as a result of a major initiative (~$9.5M) sponsored by the Rasmuson Foundation. Importantly, and as a credit to the program, annual enrollment has remained between 50 and 70 students after the initiative concluded. Furthermore, the retention rate of undergraduates in CFOS fisheries and ocean sciences programs is higher (80%) than any other undergraduate program at UAF.

Ambitiously, yet subject to capacity, advisory faculty, and other resources, CFOS would like to increase the number of undergraduates, specifically in the fisheries and ocean sciences program, from the current level of 53 to about 100. Expansion into mariculture may serve as a means to help achieve this goal.

3 **Fisheries graduate enrollment increased over 10 years**. Graduate enrollment in fisheries is also among the largest in the nation, averaging between 60 and 80 students per year. Enrollment was bolstered via an NSF Integrative Graduate Education and Research Training (IGERT) program award in 2010. As with the undergraduate program, the 15%–30% increase in graduate enrollment, stimulated by the IGERT, has been sustained. The average time to earn a Master of Science degree is just over three years, often because two field seasons are required.

Zac Hoyt searches for sea otters in southeast Alaska.
Photo credit: Deborah Mercy

4 **Expansion of the undergraduate fisheries program to the Bachelor of Science in Fisheries and Ocean Sciences (FOS) degree program** is popular with undergraduates, and holds promise in attracting additional students to CFOS.

5 **Graduate enrollment in oceanography is holding steady, but is lower than marine biology and fisheries**. Graduate enrollment in oceanography is lower than in other CFOS subdisciplines, with 10 to 15 students enrolled annually. Oceanography has a student-to-faculty ratio (2008–2015 data) of 1.2 ± 0.8, which compares to ratios of 2.8 ± 1.6 in marine biology (~35 students enrolled annually) and 4.6 ± 2 in fisheries (~70 students enrolled annually). Overall, the student-to-faculty ratio at CFOS is ~3 ± 2. Evaluation of the change in the ratio of students to faculty members, by subdiscipline, may provide additional insights to enrollment and student retention.

6 **"Near-peer mentoring" and "chain of learning" helps increase productivity and learning.** The VEC noted that the strong graduate program at CFOS is critical to faculty productivity and to facilitating undergraduate experiential learning. Graduate students, who may be more accessible than faculty, often supervise undergraduate research projects. This activity provides a crucial link to the research enterprise, encourages exploration and inquiry, and provides confidence that undergraduates can engage in research. It also gives graduate students experience in mentoring. This arrangement is known to attract high-quality undergraduates to state institutions and serves as an important recruitment mechanism into graduate programs. This benefits undergraduates and graduate students alike, and enhances faculty productivity.

Fairbanks campus, September 28, 2017. Associate Dean of Academics Trent Sutton (left) shows tanks of juvenile fish to Brad Moran, Larry Mayer, and Roberta Marinelli. *Photo credit: John Farrell*

7 **Approximately 80% of the faculty members advise graduate students**. The VEC noted that while there are 52 CFOS faculty, only about 40 are advising and supporting graduate students. By and large, the UAF-based Marine Advisory Program (MAP) full-time (nine-month), tenure-track, "extension" faculty members (eight, as of 12/31/17) in the Alaska Sea Grant Program do not advise graduate students and largely do not teach tuition-paying undergraduates.

8 **There are few postdoctoral researchers in fisheries and ocean sciences**. Three postdocs are currently employed in Lena Point, which is greater than in years past. Nevertheless, graduate students expressed a desire to have additional postdocs at CFOS because they serve as useful mentors.

9 **The number of teaching assistantships is lower than in other institutions and should be carefully examined**. In October, the VEC learned that just over 4% of all CFOS graduate students are supported by teaching assistantships (TAs), which is lower than the 8% historical figure provided in an older CFOS brochure. According to the Associate Dean of Academic Programs, the decrease is attributed to two factors – reduction in allocation of funds to TAs ("fund 1" from both CFOS and the Provost's Office), and an increase in the number of matriculating graduate students. Importantly, compared to other academic programs at UAF, CFOS has fewer courses with a laboratory component, and thus lower demand for TAs. Growth in the undergraduate programs should result in a greater number of TAs.

The VEC learned that some CFOS graduate students in Fairbanks receive teaching assistantships from other Colleges, enabling them to work toward their degrees in CFOS. Close cooperation between UAF and UAS was beneficial in that a few additional TAs, funded by UAS, are available to Juneau CFOS graduate students for UAS courses BIOL 115 and 116.

Importantly, the modest number of teaching assistantships makes it difficult for graduate students to gain teaching experience, which would help prepare them for careers in academia, should they wish to follow that path.

10 **Distance learning offers the opportunity to teach to a broader audience and could enhance the number of student participants in CFOS classes**. In Fairbanks, the VEC observed one distance learning class and found that the quality of the technology was poor, resulting in grainy videography of the professor and sound that was difficult to hear. In some cases, such learning is conducted solely by phone, as video capability does not exist. The examples viewed by the VEC were limited to CFOS instruction, but the technological challenges of distance learning are likely system-wide.

11 **Many students are interested in the Arctic Ocean and surrounding seas**. Despite the fact that there are no commercial fisheries north of the Bering Strait, and that maritime activity (commercial and research) in the Chukchi and Beaufort Seas and the higher Arctic Ocean remains low compared to the Bering Sea and the Gulf of Alaska, the number of undergraduates and graduate students expressing interest in the Arctic is high. Clearly their imaginations have been captured. Students are concerned by the rapid changes in the North and how they may learn more.

12 **Students and faculty in fisheries programs in Juneau and Fairbanks have different academic foci.** This observation is based in part because of distance, but also related to focus. For example, the students and faculty in Juneau seem less engaged in the broader field of oceanography than counterparts in Fairbanks. Faculty and graduate students in both locations expressed a desire for greater interaction between fisheries and ocean sciences personnel.

13 **The CFOS program provides the students with the necessary knowledge and skills required for government positions**. Most students were preparing for careers in government agencies rather than in academia. Clearly, this speaks to the number of job opportunities.

14 **Good employment opportunities exist for fisheries graduates as well as for graduates in marine biology and oceanography**. A healthy number of employment opportunities exist in state and federal agencies, particularly for students earning fisheries degrees, at both the undergraduate and graduate level. An existing internship program for fisheries helps facilitate these opportunities.

15 **CFOS tracks the career paths of its students.**

a. With regard to fisheries graduate students, and as of October 2017, CFOS had graduated 521 students from the Fisheries graduate program. Of those, 349 (67%) have known employers. The federal government, primarily NOAA, employs 98 (83 in Alaska, and 15 elsewhere). The State of Alaska, almost exclusively the Department of Fish and Game, employs 108 graduates, excluding retirees. As such, 37% of CFOS's graduates work in state and federal agencies located in Alaska. In addition, 4% work in fisheries-related business, 3% work in universities in Alaska, 1% work in Alaska in non-fisheries capacities, and 4% are retired (mostly from National Marine Fisheries Service [NMFS] and ADF&G) and remain in Alaska. A total of 257 (49%) of CFOS's former graduate students remained in Alaska. These results indicate that CFOS is a critically important supplier of skilled labor to the Alaska-based workforce.
b. Regarding non-fisheries graduates, since 2006, 99 students have been graduated from the Marine Biology and Oceanography graduate programs. Of those, 90 (90%) have known employers. Federal (primarily NOAA and the U.S. Fish and Wildlife Service) and state (primarily ADF&G) governments employ 28 of these students (28%). Forty-six students (46%) are affiliated with UAF and other universities as graduate students, postdoctoral researchers, or technicians, and 17 students (17%) work in the private sector. A total of 58 (58%) of CFOS's former graduate students in Marine Biology and Oceanography have remained in Alaska.

16 **CFOS offers excellent, hands-on learning opportunities in the field**. Taking advantage of the many unique environments in Alaska, hands-on learning opportunities are complemented by first-rate laboratories in Juneau and Fairbanks.

17 **Attention is being paid to filling faculty slots**.

a. Between the end of FY17 and FY18 CFOS has/will retire five tenured faculty. Since 2014, CFOS has lost 12 tenured and eight research faculty, roughly one-third of total faculty, and hired only two tenure-track faculty.

b. Fisheries faculty members Gordon Kruse and Terry Quinn will retire in FY18. As both are world-renowned experts in biomathematics, quantitative fisheries, and ecosystem science, the VEC identifies an impending void in CFOS that must be filled.

   Fortunately, subsequent to our visit, the VEC was informed that these two positions will be replaced thanks to CFOS being awarded a prestigious University of Alaska President's Professorship in Quantitative Fisheries, and a NOAA Fisheries Quantitative Ecology and Socioeconomics Training (QUEST) program (https://www.st.nmfs.noaa.gov/quest) funding to help support a faculty position in fisheries, which will be the first QUEST funding ever awarded to Alaska.

   The VEC also learned that two NSF Experimental Program to Stimulate Competitive Research (EPSCoR) faculty positions will be allocated to CFOS (one in fisheries and the other in oceanography) should the EPSCoR proposal be funded.

c. Only four tenure-track fisheries faculty members are located in Fairbanks; the remainder (11) are located at Lena Point. Expertise in fisheries genetics is currently low, and additional faculty in this area may support the VEC's suggestion (see recommendations) to place greater emphasis on aquaculture and mariculture, including genetically modified fish (e.g., those produced by the company Aquabounty).

d. Students in Juneau expressed interest in an ocean policy class, and emphasized the importance of fishery economics. The VEC understands that Keith Criddle, a fisheries economist, and the Ted Stevens Distinguished Professorship of Marine Policy, addresses the human dimensions of fisheries, as does Courtney Carothers, in Anchorage, but notes that there is room for additional curricula development in marine policy, and resource management.

RECOMMENDATIONS

1 **Replenish tenure-track faculty to maintain academic programs.** As described in the findings above, such hiring is critical to sustain and increase academic enrollment, to stem the erosion of the status and reputation of the faculty, and to develop a knowledgeable workforce. It is commendable that the University is moving toward more faculty hires for CFOS.

2 **Provide students with additional courses and subjects in accordance with state needs and known training opportunities**. Students expressed interest in courses on marine policy, fisheries economics, fisheries genetics, and marine resource management. A number of students also expressed interest in further improving their ability to write scientific proposals. CFOS should consider ways to accommodate these interests.

3 **Improve distance learning technology and online course delivery**. Because CFOS students are widely distributed throughout the state, the onus is on the university to provide distance learning or e-learning that is of sufficient quality to enable modern student education. Given the rapid evolution of telecommunication and computer technologies, as well as methodologies and practices in the fields of e-learning, online courses, and distance learning, the VEC recommends additional effort to track current trends and to implement cost-effective technologies and methodologies in order to improve the quality of distance learning at CFOS, and indeed system-wide, through the University of Alaska.

4 **Senior leadership at UAF should consider further restructuring and reorganization (e.g., consolidating fisheries and oceanography specialists into CFOS), with the overall goal of improving instruction, reducing administrative costs, and better aligning research.**

A few research faculty at UAF not currently affiliated with CFOS receive compensation from academic units other than CFOS to teach courses that emphasize or contain elements of oceanography. These faculty have appointments in other research centers at UAF (e.g., International Arctic Research Center, Geophysical Institute, and the Institute of Northern Engineering [IARC/GI/INE]) and teach

classes for other colleges (e.g., the College of Natural Science and Mathematics (CNSM) and the College of Engineering and Mining (CEM). Having oceanographers in other research entities, such as the IARC and INE, may increase the challenges of delivering a fully integrated and coordinated program. At the same time, consolidation increases the opportunity for collaboration in teaching and research. UAF should ensure that unnecessary duplication does not occur and that curriculum is delivered in an efficient and streamlined manner.

Also, as a College, which must have a critical mass of faculty in four disciplines (marine biology, oceanography, atmospheric science, and fisheries science), might there be academic departments that fit better in CFOS than in their existing locations?

An example to consider is atmospheric sciences (and relevant courses in fluid dynamics and air-sea interaction), which could be moved from CNSM to CFOS. Such consolidation has been done at similar institutions, such as Oregon State University's College of Earth, Ocean, and Atmospheric Sciences, and in the University of Miami's Rosenstiel School of Marine and Atmospheric Science. Housing all related marine science research and academics within CFOS may benefit students, invigorate research, and strengthen the College at no additional cost to UA system-wide.

Another example of how UAF differs, is that, in many other universities, programs in fisheries, wildlife, and natural resource management closely integrated, whereas at UAF these programs are currently housed in three separate colleges/schools. Co-locating these three programs may improve the collaboration among students and faculty.

5 **Hold an annual career day**. The VEC thinks it would be worth the relatively small amount of time, effort, and expense to build upon the annual "career day" effort, dubbed "COSMOS," that is held in both Fairbanks and Juneau for the benefit of both undergraduates and graduate students. While some students may be confident in their field of study, they may be uncertain about their career path options. Greater resources and efforts applied to a career day program would expose students to employment opportunities beyond those in academia, which are usually front and center to most graduate students.

6 **Improve the CFOS website (the academics page and otherwise)**. Several students (particularly those from outside of Alaska) commented on the inadequacies of the website, and the need to significantly expand content, increase functionality, and improve aesthetics. The VEC was told that faculty cannot independently manage the content on their own pages. UAF should consider changing the content management system so that there is additional flexibility without losing a unified website "look and feel."

7 **Build on the new FOS seminar series**. The VEC commends that CFOS recently established a combined fisheries and ocean sciences seminar series that includes scientists within the college and those from outside, secured through opportunistic invitation. Most high-performing academic marine science institutions host a scientific seminar or lecture series, which accomplish a number of objectives, including enhancing scientific collaborations and communications within and outside of the organization.

8 **Encourage (and possibly require) graduate students to take a broader range of oceanographic courses.** The VEC heard arguments and counter-arguments on whether all marine science and fisheries graduate students should be obliged to take core courses in oceanography, such as marine geology and geophysics, physical oceanography, biological oceanography, chemical oceanography, and perhaps a marine biology or fisheries course. Such "core courses" are typically required for ocean science graduate students at other US oceanographic institutions.

The VEC would favor a program that encourages, or requires, a broad background in oceanography and inland waters, particularly because a systemic understanding of aquatic systems benefits all practitioners. A broader perspective also encourages critical thinking and helps students avoid the pitfalls of narrow thinking.

9 **Provide additional support for recruiting students**. This support will help achieve enrollment goals to maintain the high quality of students. Such support might exist as a dedicated recruitment effort at a broader level in UAF. Partial travel support for exceptionally promising candidates is another option.

Research

FINDINGS

1 **Research grants and contracts are the financial lifeblood of CFOS**. Of the total CFOS budget ($54M) in FY17, excluding philanthropy, $41.6M (77%) was provided by grants and contracts, and another $2.5M flowed from indirect cost recovery (ICR). The state of Alaska provided $6.4M (12%) and tuition provided $0.68M (<2%). In other words, in addition to R/V *Sikuliaq*, the lion's share of funding comes from faculty members who compete successfully for grants and contracts from extramural funding sources.

While readily apparent from examining the College's finances, this fact is sometimes overlooked by the general public, the State Legislature, and others in UA system-wide. As such, any strategic investment in CFOS must keep this fact in mind. For example, an investment in research faculty, who successfully receive grant funding, will not only cover their own salary and benefits and the students or postdocs they support, but it will also generate ICR.

2 **Spread of oceanographic expertise across UAF is not optimal**. The VEC heard concern from a number of faculty that despite the restructuring from the former School to a College of fisheries and ocean sciences, oceanographic expertise (e.g., tenured and research faculty) remain housed in a variety of units external to CFOS, such as in Colleges (e.g., CEM, CNSM) and research centers and institutes (e.g., the IARC, INE, and GI). Faculty suggested that housing all related marine science research and academics within CFOS would benefit students, invigorate research, and strengthen the oceanography department at no cost to UAF.

3 **Faculty numbers have decreased**. Since fiscal year 2014, and through the first half of 2018, CFOS lost a significant number of faculty, including tenured, tenure-track, and research personnel. Since 2014, and including MAP faculty, a total of 20 faculty (12 tenured and eight research faculty) have departed, and only six have been hired, for a net loss of 12.

Oceanography technician Brita Irving adjusts an autonomous underwater vehicle in Resurrection Bay outside Seward. *Photo credit: Peter Winsor*

4 **Oceanography at CFOS is at risk**. As in other CFOS departments (e.g., fisheries), the number of oceanography scientists has declined. The college must replenish both tenure-track and research oceanography faculty in order to maintain its prowess in academic and research programs, including significant generation of indirect cost recovery.

With respect to tenured and tenure-track faculty, the oceanography department currently has:

a. 1.5 chemical oceanographers
b. 1.5 marine geologists
c. 2 biological oceanographers
d. 4 (soon to be 3) physical oceanographers
e. 0 marine organic chemists
f. 0 nutrient dynamics oceanographers
g. 0 experts in phytoplankton and/or primary production
h. 0 experts in sedimentary processes

In prior years, UAF had four to five faculty members in each of these disciplines.

The number of research faculty in oceanography and marine biology has also declined. Research faculty not only expand the breadth and depth of CFOS disciplines and expertise, they are particularly cost-effective because they largely support themselves, graduate students, postdocs, and technical staff through grant funding, which also generates significant facilities and administrative revenue as well as ICR (which outpaces academic program revenue by nearly a factor of four). These faculty enhance the academic program, which is a primary responsibility of the tenure-track faculty, by teaching courses and serving on MS and PhD committees.

5 **There is an expertise gap related to genetics.** CFOS faculty in Lena Point noted the loss of the sole geneticist in Juneau, and the increasingly important need for genomics expertise to support stock identification studies central to fish, invertebrate, and marine mammal studies.

6 **New Long-Term Ecological Research (LTER) have been awarded**. In March 2017, NSF designated the Northern Gulf of Alaska (NGA) as an LTER site with CFOS as the lead, and will provide grant funding for future science in the area. CFOS is also a partner with the University of Texas on another new LTER in the Arctic (Beaufort Lagoon Ecosystems, BLE). These are two of three new LTER sites in the nation that will bring new research and academic opportunities to the College.

7 **Potential exists to increase multidisciplinary studies of fisheries and oceanography**. The VEC recognized an increasing need to evaluate fish populations within the context of changes in oceanography and climatology (e.g., phenology changes) and the need to incorporate ecosystem-based approaches to management. Currently, only one faculty person is actively engaged in marine fisheries-climate research (Franz Mueter) at Juneau. While there has been a historic emphasis on basic stock assessment, the importance of focusing on non-target species, climate impacts, and ecosystem variations is imperative.

8 **UAF does not have an organized aquaculture/mariculture program**, despite the fact that growth in global fisheries is entirely sustained by aquaculture, which also contributed to the nearly $35B in fishery imports into the US (NMFS, 2016). Investment in additional mariculture expertise at CFOS would be consistent with recommendations in the 2018 report from the Alaska Governor's Mariculture Task Force.

RECOMMENDATIONS

1 **Hire tenure-track faculty**. The VEC encourages investments in tenure-track faculty, particularly those with an emphasis on seagoing scientists who will write grants to use R/V *Sikuliaq*.

Fortunately, shortly after the VEC's visit in late September, Provost Susan Henrichs approved a proposal from Dean Moran of a "block hire" of up to five tenure-track sea-going faculty in CFOS. The first two positions were advertised on 11/30/17 (https://web.sfos.uaf.edu/wordpress/news/?p=3651), and it is anticipated that the remaining open positions will be advertised in fiscal year 2019.

In addition to this block hire, there will be an additional two hires in fisheries (The University of Alaska President's Professorship in Quantitative Fisheries, and a NOAA Quest program faculty position), for a total of seven faculty members. The VEC applauds this decision, and expects UAF to seize other opportunities to hire tenure-track or research faculty, should they materialize, such as with a successful EPSCoR proposal (integrating coastal ecosystems and climate change).

2 **Hire research faculty**. The VEC recommends that senior leadership find options to increase the research identity of CFOS by providing incentives to entice soft-money research faculty to join the College and conduct research through affiliation with the Institute of Marine Science, the central research organization in CFOS. Greater support for such faculty would contribute to the overall intellectual productivity of the college, and would also provide academic opportunities, and funding (both direct funding and indirect cost recovery). As noted above in the findings section, the cost/benefit ratio of research faculty is particularly high because they largely support themselves financially.

3 **Incentivize faculty and research faculty**.
For example:

a. Provide partial salary support (e.g., increase from the current one to two months) for research faculty
b. Return a portion of the College's ICR to principal investigators, as is the current practice in the UAF Institute of Northern Engineering
c. Create a "challenge fund" "or incentive fund" for research, or to promote innovative curricular programs and research projects
d. Provide mini-grants to assist in preparing grant proposals
e. Provide funds for equipment and matching funds for grants
f. (Subject to union approval), encourage research faculty to teach, primarily for the opportunity to gain experience
g. Give greater credit to faculty in their review process for supporting graduate students

4 **Delegate control of resources**. As the Provost's approval for a 5-person block hire is contingent on CFOS having the fiscal resources to fund these positions, and as strategic opportunities arise to hire research faculty, the VEC recommends that Dean Moran be afforded the necessary flexibility to redirect resources as changes in positions occur, such as retirements, and as budgets and expenditures evolve.

5 **Continued support and use of R/V *Sikuliaq* is critical**. CFOS is the obvious, national home of this Global Class, ice-capable vessel. The State of Alaska, and the University of Alaska, writ large, should continue to invest time and resources (including for staff) to ensure the home port remains in Seward, with UAF. Continued State support (e.g., the State's $500K contribution per year via a Cooperative Agreement with NSF) to keep this vessel in Alaska will be critical; without it, a competing oceanographic institution may be able to wrest it away during the next competitive proposal process for vessel operation by convincing the vessel owner, NSF, that greater support will be provided by another state or private institution. Specific examples of support could also include additional support of ship time and improvement of the Seward facilities.

6 **Follow through on the plan to move some of the glider program to the Seward Marine Center**. This relocation activity will serve the LTER program, and may provide supplemental support for Saildrones, autonomous surface vehicles, which are becoming an increasingly popular oceanographic research tool.

7 **Pursue promising opportunities for CFOS in aquaculture, including mariculture.** Looking towards the future, and in light of growing pressures (e.g., overexploitation, ocean acidification and climate change) on wild fish stocks, the VEC encourages CFOS to build on its existing expertise by considering greater emphasis on aquaculture and mariculture research (e.g., ways to overcome sea lice), including genetically modified fish (e.g., Aquabounty's salmon).

Alaska is rightly proud of its well-managed wild fisheries, and they will likely continue to be highly productive, at least in the near term. The fisheries are not entirely wild, however, as they are supported by hatcheries. Further, changes in the ocean's ecosystem, induced by global climate change and including increased acidification, may impact the wild stocks in ways not yet predictable.

The argument that mariculture will compete against the wild catch, thereby diminishing market share, has been addressed by the counterargument that the rising global demand for seafood (and protein in general) is so great that there is sufficient room for both wild and mariculture fisheries. Alaska has thousands of miles of coastline that contain marine areas and conditions that are ideal for mariculture.

Service

NB: Most of the VEC's engagement with CFOS faculty, students, and staff focused on academics, research, and infrastructure rather than service (at the University, professional, and public levels). The VEC did not consider or assess faculty services such as reviewing papers and proposals, committee work, conference organization, or journal editing. Instead, the VEC was afforded the opportunity to learn more about the service elements of Alaska Sea Grant and the Marine Advisory Program (which is based at UAF/CFOS and is "…a university-based statewide program designed to help Alaskans with the practical use and conservation of the state's marine and freshwater resources"), and the broader participation in them by CFOS faculty and staff.

FINDINGS

1 **CFOS faculty provide valuable service to councils, boards, and committees**. Service includes, for example, participation on the North Pacific Fisheries Management Council, NPRB, and NOAA's NMFS. Such expertise helps with fishery conservation, management, and management strategy evaluation, as well as in developing a comprehensive and high quality science program to provide a better understanding of the North Pacific, Bering Sea, and Arctic Ocean ecosystems and their fisheries.

2 **Communication and outreach from the CFOS Dean, Public Information Officer, and other staff is robust.** Internal communications include: (a) the biweekly "C-Notes" electronic newsletter (http://www.uaf.edu/cfos/about-us/deans-office/communications), that shares news of activities and accomplishments, information about R/V *Sikuliaq*, examples of CFOS's work as reported in the media, publications, and other accomplishments of the College community; (b) the 2017 CFOS Decadal Plan; (c) a CFOS Annual Report; (d) active social media accounts (Facebook, Twitter, Instagram), and; (e) hiring a new Public Information Officer (PIO) who also works as the new *Sikuliaq* Science Liaison and has 0.5 FTE support from NSF.

3 **Alaska Sea Grant and the Marine Advisory Program (MAP) constitute a major component of CFOS outreach efforts**. Sea Grant's work and that of MAP in Alaska includes service as a conduit between the University of Alaska and the public, conducting applied research with a wide variety of sponsors and stakeholders, supporting entrepreneurship and economic diversification, training and workforce development (e.g., for the fishing and seafood industry), advancing ocean literacy for the general public and K-12 students, and providing scientific expertise on external boards and committees. While housed in CFOS, Sea Grant and MAP have interests and activities beyond the College, in accordance with its mission and other funding source, NOAA.

There are approximately 23 full- and part-time Alaska Sea Grant and MAP personnel. Most are located in Anchorage and in population centers along the south coast of Alaska (Gulf of Alaska), ranging from Nome to Ketchikan and Fairbanks to Unalaska. Geographically, the western and northern coastal regions of the state are underserved, with only one representative currently located in Nome.

Fairbanks campus, September 28, 2017. Associate Professor Peter Winsor (white shirt) explains how his laboratory of equipment, including remotely operated vehicles, are used to study physical and chemical oceanography. *Photo credit: John Farrell*

4 **Alaska Sea Grant priorities and programmatic alignment should be considered in light of CFOS priorities.** Alaska Sea Grant priorities, and thus service efforts, are broadly established by NOAA's National Sea Grant Program, and are accordingly customized to meet Alaska's needs. However, given the substantial (nearly equal) financial contribution from the State of Alaska to the Sea Grant program through CFOS, it is important for Alaska Sea Grant's priorities and efforts align with those in the CFOS Decadal Plan and the UA President's "Strategic Pathways" initiative (http://www.alaska.edu/pathways). The VEC noted that Alaska Sea Grant priorities were somewhat independent of the goals of CFOS, or the University of Alaska.

For example, in the summer of 2017, Alaska Sea Grant completed an "Alaska Sea Grant College Program Strategic Plan 2018-2021." The VEC was provided a copy of this plan subsequent to our visit. The plan is designed to "…*align with National Sea Grant focus areas*…" but the plan makes no mention of the 2017 CFOS Decadal Plan (nor "Strategic Pathways"), despite the fact that Alaska Sea Grant is housed within CFOS.

Whereas the CFOS Decadal Plan includes Alaska Sea Grant and MAP as an integral element of the College, particularly with regard to service, the Alaska Sea Grant strategic plan does not reference its relationship to and integration with CFOS. This is a missed opportunity.

5 **MAP staffing has decreased**. Over the past few years, MAP has lost five faculty members and specialists. Of the remaining MAP agents, all but two are funded with resources provided by the State of Alaska. As of 12/31/17, nine people in Alaska Sea Grant and MAP are tenure-track "extension" faculty members. Eight are MAP faculty, or "agents," and the ninth is the Alaska Sea Grant Director. All receive nine months of salary support from the State of Alaska. They are physically located in Anchorage (2), Cordova, Dillingham, Ketchikan, Kodiak (2), Nome, and Petersburg.

6 **Supply, demand, and geographic distribution of MAP agents should be reconsidered**. The demand for MAP agents far outstrips the supply, given the large size of the State and the low density of residents outside of the few urban centers. If additional resources were secured for MAP agents, or if resources were redirected, the Sea Grant Director would seek to place an agent in the Yukon-Kuskokwim (YK) Delta region. This is an area of great need, given the presence of 56 villages, including coastal residents with some of the lowest income levels in the state.

7 **State funding for MAP is significant and its contributions to Alaska are visible and well received**. According to the National Sea Grant Office (personal communication with Joshua Brown), the level of support by the State of Alaska for the extension program in Alaska (MAP) has historically been higher than the average level of support afforded to other advisory, extension, or service programs in the other 32 Sea Grant programs in the nation. As of the time of this report, approximately $1.3M in state funding is allocated to Alaska Sea Grant/MAP for salary support, and this is approximately 25% of CFOS's annual appropriation. To provide a sense of scale, NOAA, through the National Sea Grant program currently provides about $1.6M annually to Alaska Sea Grant. Given the recent fiscal challenges faced by the State, however, the State's level of support for Sea Grant is now declining.

8 **Alaska Sea Grant personnel changes are imminent.** Paula Cullenberg will step down as Director of Alaska Sea Grant, and retire from UAF, effective at the end of March 2018. MAP faculty Terry Johnson retired at the end of calendar year 2017. These retirements will reduce the number of tenure track faculty in Alaska Sea Grant from nine to seven. The Dean plans to work with the next Alaska Sea Grant Director to develop a strategy to ensure MAP's public engagement continues within the confines of the current declining state budget.

9 **Alaska Sea Grant has a strong connection to the State Legislature and private sector**. Through discussions with Sea Grant personnel, the VEC perceived that Alaska Sea Grant has established deep and lasting relationships with the Alaska State Legislature and private sector, particularly entities involved in coastal and marine issues. These relationships are an effective means of informing the legislature and the private sector of the good work and activities of not only Sea Grant, but also CFOS and other entities in the University of Alaska that focus on coastal marine issues.

RECOMMENDATIONS

1 **Review the allocation of state funding to Alaska Sea Grant**. Given the size of CFOS, Alaska Sea Grant and MAP could be considered to be disproportionally large compared to other departments (e.g. consuming ~25% of the state appropriation to CFOS). In light of the recent fiscal challenges facing CFOS, the VEC recommends a review of the balance of state resources allocated to tripartite (fisheries, marine biology, oceanography) versus bipartite (MAP) faculty lines.

2 **Review the number and geographic distribution of MAP agents**. This review will ensure that placement of MAP agents best aligns with the strategic vision of the Sea Grant strategic plan and the CFOS Decadal Plan. CFOS should consider filling the currently unfilled position in Bethel, or elsewhere in the Yukon Kuskokwim Delta region.

3 **Expand the seminar series**. This suggestion, detailed under the "Academic" section above, serves multiple purposes, such as providing information to the general public via public lectures on topics associated with the marine environment.

4 **Build Upon the CFOS Decadal Plan**. The VEC found this to be a succinct and aspirational articulation of CFOS's mission, vision and strategic priorities to achieve excellence in academics, research, service, philanthropy and infrastructure. We applaud the inclusive, College-wide approach to develop this plan and the support from the University's senior leadership to implement this plan.

The VEC recommends CFOS build upon this plan by developing explicit metrics (qualitative and quantitative, depending on the goals) to measure success, and implementation plans that contain greater specificity. With respect to implementation, the current plan recognizes the "…need to adapt and be flexible to near-term opportunities…," and that the plan will be "…achieved on an annual basis by establishing a set of near-term essential goals." CFOS's approach is certainly reasonable, and the VEC also encourages CFOS to consider developing implementation plans with a longer-term horizon, with specific metrics, and concepts of how to achieve them. As the VEC notes elsewhere in this report, CFOS has already developed a multi-year implementation plan to replace faculty, via the "block hire" approach across fiscal years 2017, 2018, and 2019.

Graduate student Alex Ravelo brings a small boat to shore after a dive excursion in Kasitsna Bay. *Photo credit: Brenda Konar*

Partnerships and Philanthropic Giving

FINDINGS

> Partnerships

1 **A solid partnership between NOAA and CFOS exists**. CFOS and NOAA work closely together in areas such as fisheries science, marine biology, and biological oceanography. These partnerships include the Auke Bay Laboratories of the Alaska Fisheries Science Center (AFSC), and UA (not only UAF/CFOS but also the University of Alaska Southeast) at the Ted Stevens Marine Research Institute in Juneau. AFSC Science Director Doug DeMaster gave several examples of the strong NOAA-CFOS partnership and mutual benefits, for example, shared research facilities, knowledge transfer, workforce development, collaborative research efforts, and educational opportunities.

Although the VEC did not visit or discuss the Kasitsna Bay laboratory near Seldovia, Alaska, we understand that this lab, owned by NOAA's National Centers for Coastal Ocean Science and operated by CFOS, is a long-standing, positive relationship where scientific research is conducted and field courses are taught with an emphasis on scientific diving.

Fairbanks campus, September 28, 2017. Associate Professor Peter Winsor (right) and Research Associate Professor Seth Danielson explain how a UAF Slocum Glider is used to measure oceanographic variables. *Photo credit: John Farrell*

2 **The Alaska Department of Fish and Game and CFOS have a solid relationship**. Probably the strongest aspect of this relationship is workforce development, as ADF&G employs undergraduates in support of the CFOS internship/experiential learning program, and also hires many graduates of the CFOS fisheries program.

3 **Other beneficial partnerships occur with federal, and federally supported entities**. CFOS has a number of strong working relationships and partnerships in education and research, including with the Alaska Ocean Observing System (AOOS), NPRB, the Bureau of Ocean Energy Management (BOEM), the Prince William Sound Science Center/Oil Spill Research Institute, and the Alaska SeaLife Center, among others. The CFOS Dean serves on the boards and oversight committees of several of these entities. Since 1993, BOEM has been funding CFOS's Coastal Marine Institute through a cooperative agreement. CFOS researchers serve on NPRB advisory panels and have received significant funding from this organization. CFOS hosts the annual "Tsunami Bowl" educational activity. The VEC learned of a Memorandum of Understanding for cooperation and partnership between CFOS and the Alaska SeaLife Center, which is reasonable given the similarities in mission and physical proximity in Seward.

> Philanthropy

4 **The UA System is unusual** compared to peer institutions, as it consists of three separately accredited Universities sharing one central Foundation. This structure, and the practices that result, have implications, described below, that extend down to the level of Colleges, including CFOS. Development officers in UAF Schools and Colleges are paid by and report to Deans. The UAF Chancellor, on the other hand, has budgetary and programmatic oversight of a Central

Development Office that operates separately, and apparently independently, of development efforts in the Colleges and Schools. Furthermore, development objectives, priorities and efforts differ among the three UA universities (UAA, UAF, and UAS). It was not clear that there is optimal coordination and cohesion in this area at the UA statewide level.

5 **Roles of the UA Foundation and UA Board of Regents**. The UA Foundation Board of Trustees and the UA Board of Regents create the policy and procedures for UA development staff, including those at CFOS. There are currently no reporting lines from development officers in Colleges and Schools to Central Development, nor to the UA Foundation, which manages all University of Alaska philanthropic funds.

6 **CFOS fundraising**. Based on information from the UA Foundation, CFOS raised an average of $1.1M per year, over the past nine years. The range of fundraising is from $662K (FY11) to $2,581K (FY14). The value of the CFOS endowment is approximately $16M.

7 **Declining contribution by the Pollock Conservation Cooperative Research Center (PCCRC)**. The PCCRC is the primary philanthropic donor to CFOS. It has contributed approximately $20M to CFOS since February 2000. During the past nine years, PCCRC's donations have represented over 50% of the total giving to CFOS, but contributions to CFOS have declined significantly, over time. This decline in contributions is highlighted as a concern.

8 **Center for Salmon and Society (CSS)**. The VEC notes the solid progress made in establishing and funding the CSS. For example, in the past five years, the Development Officer has been responsible for raising nearly $750K in support of this center.

RECOMMENDATIONS

> Partnerships

1 **Expand partnerships via the Seward Marine Center**. As described below, opportunities exist for CFOS to partner with a variety of vessel operators using the strategically located port of Seward, Alaska, to disembark on marine scientific research expeditions to northern waters, including the high Arctic Ocean. The VEC can envision partnerships between CFOS and other academic institutions that operate UNOLS vessels, and with the federal government (e.g., US Coast Guard, NOAA, Office of Naval Research, among others), and with non-US vessel operators.

2 **Consider reconstituting the CFOS Advisory Council.** The VEC was told that the council was disbanded for lack of funds (Appendix I). If funds materialize, and if a CFOS Advisory Council is considered valuable, as suggested by the fact that it existed for over 30 years, then the VEC suggests that CFOS consider re-establishing the council.

3 **Increase engagement with Alaska Native organizations**. The VEC encourages CFOS to collaborate with entities such as the Alutiiq Pride Shellfish Hatchery, in Seward, with Ukpeagvik Inupiat Corporation Science (e.g., on their efforts to construct and operate the Navy's Arctic ice camp), or indirectly, through association with the Hakai Institute in Canada.

Collaborative opportunities may exist around themes such as ocean acidification, possibly in nearshore waters of rural Alaska Native coastal communities. A joint effort could be established to monitor changes in ocean carbon chemistry and to educate these communities about the project.

There may also be opportunities for additional collaboration between the Ocean Acidification Research Center and the Alaska Ocean Acidification Network.

> Philanthropy

4 **Consider broad restructuring of development at UA**. While the VEC's remit is CFOS, it does not exist within a vacuum. Thus, the VEC suggests that development at the College be considered more strategically within the broader context of the University of Alaska. As such, the UA Foundation Board of Trustees, the UA Board of Regents, and UA leadership (i.e., President, Chancellors, Provosts) may want to review UA's development structure and determine if changes are warranted.

5 **Consider securing additional expertise in philanthropy to advance development, major gifts, donor relationships, and stewardship**. Does CFOS have access to specialists in the foundation, or even in the private sector, with expertise in corporate giving, major gifts, and in working with foundations? If not, such access may be beneficial.

6 **Consider additional industry-sponsored funding of scientific research on Alaska fisheries.** The University's preeminent role in fisheries science and training is threatened by potential state budget shortfalls. Traditionally, fisheries science is not supported by large multi-investigator or long-term grants from agencies (e.g., NSF or NOAA), but rather by modest grants of project-level scope. Fisheries-related funding supporting CFOS is state-appropriated, and has declined in recent years.

Additional support for UAF fisheries programs has historically come from gifts by foundations or industry, for example, generous gifts from the Rasmuson Foundation, the Rasmuson Fisheries Research Center, and the Pollock Conservation Cooperative Research Center (https://www.pccrc.org). The PCCRC is supported by gifts to the University, which have State of Alaska tax advantages. The PCCRC has an independent research board, which establishes proprieties and evaluates proposals, and combines the voluntary contributions from participating companies.

This model of industry support for academia has worked well specifically with respect to pollock stock assessments and related research supporting this lucrative fishery. There are other lucrative fisheries using Alaska ecosystems that do not contribute funding directly to the UAF system in an organized manner (certainly they do contribute indirectly to appropriations as part of their state and local taxes on business income).

The table below indicates that over the 2015–2016 timeframe, roughly 5.8 billion pounds of seafood were landed per year in commercial fisheries off Alaska, with an average "first-sale" value of nearly $1.7B per year. As a thought exercise, we calculated the net benefit to a research fund based on a one cent per pound, and one cent per dollar formula. Such an assessment would generate between $17M and $58M per year, respectively, that could be used to support both a UAF fisheries fund and potential partners, such as AOOS and ADF&G, in supplying research. This fund could support monitoring and training at a scale that would stabilize the funding stream and provide enhanced benefits to fishers and communities.

Year	Pounds Landed	First-Sale Dollars
2015[1]	6,038,185,000	$1,763,425,000
2016[2]	5,585,905,000	$1,550,840,000
Average	5,812,045,000	$1,657,132,500
	1¢ per pound landed **$58,120,450**	1¢ per dollar landed **$16,571,325**

[1] Data Source: NMFS 2016; [2] Data Source: NMFS 2017

The VEC does not necessarily advocate for such a direct funding mechanism, and recognizes the complex funding, taxation, and logistical issues such an approach would entail. Nevertheless, the VEC is cognizant of the ongoing funding issues facing the UA System and the State of Alaska, and such approaches seem worthy of consideration. We recommend that the University administration consider engaging in dialog with representatives of the Legislature, State Administration, and fishing industries to explore options to further support vital UAF training and research programs of importance to the State's most lucrative industry.

Infrastructure

FINDINGS

1 **Lena Point Fisheries Facility appeared to be modern, safe, secure, effective, and in very good condition**. Sharing of capabilities and close coordination and cooperation with federal researchers at NOAA's co-located facility (in the Ted Stevens Marine Research Institute) provide mutual benefits.

2 **The scientific research vessel *Sikuliaq*** is of central importance to Alaska, and CFOS's management and oversight of the vessel are progressing well. This $200M, ice-capable vessel is a significant benefit to Alaska, as well as a great responsibility. CFOS's operation of *Sikuliaq*, which became fully operational only in March 2016, adds to the well-deserved reputation of the College as a first-rate institution and highly competitive with other oceanographic institutions not only in the United States, but globally. Together, the vessel, the approved plan to "block hire" five sea-going tenure-track faculty, and (if successful) plans to modernize the Seward Marine Center form a solid foundation upon which CFOS can build a grant-based science program to achieve the CFOS Decadal Plan goal of 20% usage of *Sikuliaq* by CFOS personnel.

The VEC was pleased to see that CFOS has developed "Community and Environmental Compliance Standard Operating Procedures" (CECSOP) for *Sikuliaq*, which is now published in the peer-review journal *Marine Policy* (Konar et al., 2017). These procedures serve as guidance to Principal Investigators planning to use the vessel to conduct scientific research activities. The intent of CECSOP is to facilitate the use of best practices and outreach to minimize the effect on subsistence communities and to ensure compliance with federal environmental regulations. The consultative process by which the CECSOP was developed, and the outcome of this effort, are discussed above in the "Partnership" section of this report.

The VEC also notes that the vessel:

a. Undoubtedly attracts students, particularly graduate students, to the CFOS academic and research programs. As such, *Sikuliaq* serves as a valuable recruiting tool, as well as research infrastructure.
b. Generates the lion's share (approximately 45%) of the ICR at CFOS.

Researchers prepare to deploy a mooring that is part of the Chukchi Ecosystem Observatory near Hanna Shoal. *Photo source: Seth Danielson*

3 **Arctic Research Icebreaker Consortium Membership.** The VEC acknowledges and applauds CFOS's successful effort to join the icebreaker consortium, ARICE (Arctic Research Icebreaker Consortium), supported by the European Commission. Membership in this consortium will certainly increase international visibility of R/V *Sikuliaq* and likely use of this vessel by non-US investigators.

From this European Commission initiative, which began in 2018, CFOS will receive approximately $550K of the total $7.1M awarded. These funds will be used for CFOS staff salaries, travel support, and to cover at least seven days of at-sea operations of R/V *Sikuliaq*. The ARICE award is therefore welcomed not only by the State of Alaska, but also by NSF.

As the only vessel in UNOLS based in the Pacific sector of the Arctic, R/V *Sikuliaq* is well positioned to be used by international partners. ARICE will also enable members to partner with the maritime industry in their "ship of opportunity" program, and to explore new technologies that could lead to an improvement of ship-based and autonomous measurements of the Arctic Ocean.

4 **Seward Marine Center**. For over 50 years, the Seward Marine Center (SMC) has supported research vessel operations oceanographic research, and educational programs. The shore-side infrastructure supports the R/V *Sikuliaq* and a variety of research activities. The physical location, laboratories warehouses, auditorium, meeting and office space, and dormitories at the SMC are in fair to good condition and are well positioned to support major field programs centered around the vessel and ancillary sampling modalities (e.g., gliders, buoys, autonomous underwater vehicles, and other emerging technologies).

These assets are underutilized, however, and in several cases, would benefit from modernization. Several SMC laboratories stand unused, even though high-quality seawater is easily accessible. A significant amount of leased office space is unoccupied (apparently, the lease agreement is controlled by an administrative unit in UA, rather than by CFOS). Similarly, garages, warehouses, machine shots, and instrument laboratories are not used to their full capacity or capability (likely due to a decade of inaction after the loss of R/V *Alpha Helix* in 2006, and the end of the Global Ocean Ecosystem Dynamics program in 2004).

Graduate student Leah Zacher sieves through a box-core sample, separating sediment from animals. *Photo credit: Caitlin Bailey*

Additionally, the UAF pier at the SMC pier needs work before it can successfully be used. For example, the rebar in the concrete panels is significantly corroded, and the pier is currently rated at only 40% of its original design load rating (e.g., automotive vehicles should not use the pier). Overall, the center would benefit from a significant modernization effort, should it be possible to generate sufficient work to support such.

Despite some of the challenges noted above, the VEC thinks that the SMC presents an excellent opportunity for UAF to create an oceanographic expedition support center by engaging, or partnering, with other oceanographic organizations and entities that might use Seward as a key port between the Arctic and the Pacific Oceans.

The VEC also strongly supports the idea of moving the glider program (currently located in Fairbanks) to Seward. This plan, with another strategic hire or two, would create a critical mass in ocean instrumentation. In particular, given the challenges of distance in Alaska, remote-sensing applications using leading edge technologies seem particularly important; saildrones are a perfect example of this.

Significantly, the SMC has supported the "Seward Line," a long-term observation program that began in the late 1990s to understand marine ecosystem response to climate variability. The value of this observing program was critically important to CFOS in securing $5.6M in funding over five years, starting in March 2017, from NSF for an LTER program in the northern Gulf of Alaska (NGA). Additional support from the M.J. Murdock Charitable Trust, with matching funds from UAF, CFOS, and AOOS, will enable continuous oceanographic measurements from a new mooring system located along the Seward Line.

Given the growing international pivot to the Arctic region, and an increasing focus on Arctic marine research (see NSF's Big Idea: Navigating the New Arctic (https://www.nsf.gov/news/special_reports/big_ideas/arctic.jsp and https://www.nsf.gov/pubs/2018/nsf18048/nsf18048.jsp?org=NSF), the VEC thinks that Seward is strategically located. Seward is the most northern, seasonally ice-free, deepwater port connected to rail, road and air systems. As such, it's an excellent port, or forward base, from which to launch expeditions to the Bering, Chukchi, and Beaufort Seas, and the Pacific sector of the high Arctic Ocean.

The SMC could, for example, provide additional operational and scientific support services to a wide variety of domestic vessels (for example, USCG cutters, both current and planned, and NOAA hydrographic and fisheries vessels) and international scientific research vessels (such as operated by China, Korea, Russia, Japan, Sweden, among others), in addition to R/V *Sikuliaq*.

Other facilities and research centers in Seward with which CFOS is connected include the Alutiiq Pride Shellfish Hatchery, the Alaska SeaLife Center, and the Alaska Vocational Technical Center (AVTEC), which sponsors a number of marine training courses, such as in ice navigation.

5 **Ocean Acidification Research Center**. Clearly, based on prior state funding, and support from the Alaskan congressional delegation, Alaskans are becoming keenly interested in the increasing acidification of its already low pH marine waters, in part because of their potential impact on fisheries (Mathis et al., 2015). This interest has spread broadly, to include Alaska Native communities and commercial fishers (e.g., McCune, 2018).

RECOMMENDATIONS

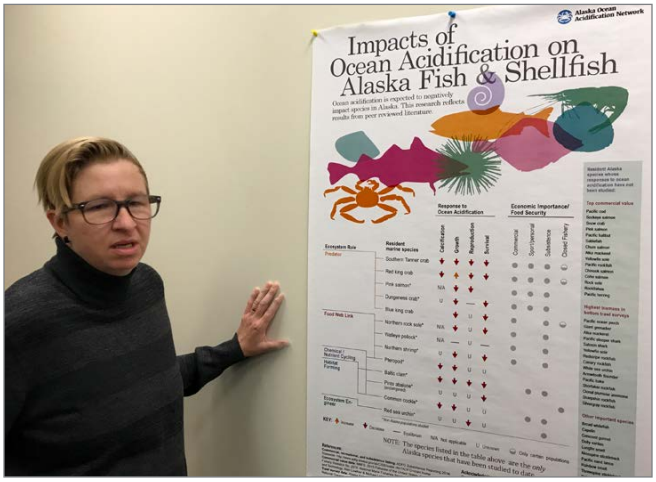
1 **Continue to generate funds to support and use R/V *Sikuliaq***. Although CFOS is an obvious national home for this Global Class, ice capable UNOLS vessel, the State of Alaska and the University of Alaska, writ large, should ensure that its support for the vessel, and for academic oceanography, remains strong. Continued state support (i.e., the UAF commitment of $500K per year) to maintain a competitive advantage and to keep this vessel in Alaska is crucial. This state commitment is important in light of the federal requirement to re-compete for this vessel in 2023.

2 **Regularly host workshops and Town Hall meetings**. The VEC suggests that CFOS, possibly in cooperation with other entities, host a workshop, town hall meeting at a larger science gathering, such as the Fall Meeting of the American Geophysical Union, or an associated activity that would provide an opportunity for potential investigators to learn more about the unique capabilities and potential uses of the vessel, and the services at the Seward Marine Center, to conduct scientific research and exploration, primarily, but not exclusively, supported by the federal government.

3 **Upgrade Seward Marine Center**. The VEC suggests that CFOS consider pursuing laboratory or research infrastructure funding opportunities offered by NSF, or other agencies, that would enable CFOS to modernize the SMC. One such opportunity is the NSF funding opportunity in the Directorate for Biological Sciences titled, "Improvements in Facilities, Communications, and Equipment at Biological Field Stations and Marine Laboratories" (https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5449). Another, relevant opportunity is the recent NSF "Dear Colleague Letter" request for information on mid-scale research infrastructure (https://www.nsf.gov/pubs/2018/nsf18013/nsf18013.jsp).

The VEC suggests that the SMC, in addition to supporting R/V *Sikuliaq*, also consider the possibility of providing additional support services for other US and non-US vessels, given the SMC's strategic location in Seward, Alaska, and given the decades of experience and knowledge in providing such services to the oceanographic community. A strategic plan to develop the facilities and science programs that they will support seems imperative.

The VEC suggests that CFOS consider whether "Map Server," the shipboard web-based geographic information system currently in use on *Sikuliaq* and formerly used on USCG Cutter *Healy*, could be developed to the point that it could be successfully licensed and operated on other scientific research vessels (e.g., the UNOLS fleet). MAP Server enables oceanographers and mariners to visually display spatial data of their surroundings, including real-time ship data. This real-time mapping provides mission-critical service and significantly increases scientific productivity. CFOS might be in a position to help commercialize this product, which might result in financial gain and additional job opportunities.



Fairbanks campus, September 28, 2017. Assistant Professor Amanda Kelley explains a poster on the topic of impacts of ocean acidification on Alaska fish and shellfish. *Photo credit: John Farrell*

4 **Increase CFOS's presence on the UAF Campus**. Compared to other colleges on the UAF campus, the CFOS presence, largely in the O'Neill Building (built in 1973), would benefit from modernization. The VEC recommends identification or creation of appropriate space on the UAF campus to enable CFOS to work effectively, as the original design of the O'Neill Building is inconsistent with the space needs of the current occupants. Furthermore, the building is challenged by low energy efficiency and lack of an auditorium. New space may enable CFOS to incorporate entities that are currently located elsewhere, such as Sea Grant, which is largely based in Anchorage. The laboratory facilities in the West Ridge Research Building, completed in 2003, appear to be meeting the needs of CFOS researchers.

5 **Expand programs at the Ocean Acidification Research Center**. This center could continue to work closely with and help strengthen the Alaska Ocean Acidification Network, which helps engage researchers and stakeholders to expand the understanding of ocean acidification in Alaska. Specifically, OARC may want to help the network as it expands community-based water sampling programs in western and even northern Alaska.

From an operational point of view, the VEC was not clear about the current leadership of this center. Clearly, Amanda Kelley, who provided the VEC with a tour of the facility), is an on-site, active faculty member at CFOS.

Acknowledgments

The VEC thanks Dean Moran for the invitation to review CFOS. The VEC was both impressed by and appreciative of the extent and degree to which faculty and other staff contributed to the review process, both during the visit, and through follow-on communications. The VEC interpreted this enthusiasm as indicative of "buy-in" for the assessment process and as optimism in the ongoing improvement of management and outcomes for the College.

Divers in Antarctica work on a rebreather testing project. P*hoto credit: Brenda Konar*

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APPENDIX I

Charge to and Expectation of the Visiting Expert Committee

COLLEGE OF FISHERIES AND OCEAN SCIENCES
University of Alaska Fairbanks
P.O. Box 757720, Fairbanks, Alaska 99775-7720

S. Bradley Moran, Dean
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Date: August 21, 2017

TO: CFOS Visiting Expert Committee

FROM: S. Bradley Moran, Dean

SUBJECT: Visiting Expert Committee Charge and Expectations

On behalf of the College of Fisheries and Ocean Sciences, I am delighted that you have agreed to serve as part of the first Visiting Expert Committee (VEC). This is an important effort because your findings and recommendations will help provide guidance on the future path of the College.

To provide some background and context, for many years the former School of Fisheries and Ocean Sciences sought external input from an Advisory Council. Following the formation of CFOS in 2016, Interim Chancellor Thomas, in consultation with Provost Henrichs and myself, dissolved the Advisory Council. The formation of a VEC is a new approach to seek external advisory input, one that follows directly from our proposal to form the new College: "*The advice of Visiting Committees of renowned faculty and leaders from other institutions will be chartered as required to help the senior leadership assess the health and needs of the new College's research, teaching and outreach efforts*."

As such, the charge to the VEC is to provide a critical assessment of the College's academic, research and public service activities, philanthropy, and major infrastructure (i.e., Centers, Institutes, Laboratories, R/V *Sikuliaq*). We are particularly interested in your observations and recommendations regarding our new administrative structure and functionality, research programs and support, growing our undergraduate and graduate degree programs, facilities and operations, communications, public engagement, and interactions with other UAF/UA units and external partners. We are of course interested in any ideas you have regarding ways to advance CFOS as a premier organization focused on Arctic and North Pacific aquatic research, education and public engagement.

An expectation of the Committee is provide a written report of your observations and recommendations to improve our research, teaching and public engagements activities. This report will be transmitted to UAF Chancellor Dan White and members of his Cabinet.

Your collective input is an important part of the development and future direction of the College. And, your advice in shaping that direction is therefore extremely valuable and very much appreciated.

Thank you once again for your time and effort on behalf of CFOS.

With warm regards,

S. Bradley Moran, Dean

APPENDIX II

Visiting Expert Committee Agenda

Monday 9/25
Arrive in Juneau

Tuesday 9/26

8:30 am – 9:30 am	Meet with Juneau faculty, staff, NOAA's Doug Demaster and ADF&G's Chris Siddon
9:30 am – 11:00 am	Tour Lena Point Facility
11:00 am – 12:00 pm	Meet with students – Lena Point 101
12:00 pm – 1:00pm	Transportation to airport
1:50 pm – 3:30 pm	Depart Juneau to Anchorage
4:30 pm – 6:30 pm	Work Session

Wednesday 9/27

8:30 am – 9:30 am	Meet with Alaska Sea Grant/Marine Advisory Program
10:00 am	Depart Anchorage to Seward by vehicle (~2 hours)
12:30 pm	Meet w/ Seward Marine Center Staff / Tour Seward Facility
3:00 pm	Depart Seward for Anchorage
5:30 pm – 6:45 pm	Work Session

Thursday 9/28

7:00 am – 9:00 am	Depart Anchorage to Fairbanks (UAF)
9:30 am – 10:45 am	Meet w/Faculty, Staff, and Chancellor White – Elvey/Globe Room
10:45 am – 11:30 am	Meet w/ Dean's Executive Committee – O'Neill 245 "Fish Bowl"
11:30 am – 12:15 pm	Work Session – O'Neill 245 "Fish Bowl"
12:15 pm – 1:00 pm	Lunch – O'Neill 245 "Fish Bowl"
1:00 pm – 2:00 pm	Meeting with Students – O'Neill 201
2:15 pm – 3:15 pm	Meet w/Provost (Henrichs), Vice Chancellor for Research (Hinzman), and VC of Administrative Services (Burrell) – O'Neill 245 "Fish Bowl"
3:15pm – 4:00pm	Tour UAF laboratories
4:00 pm – 6:00 pm	Work Session – O'Neill 245 "Fish Bowl"

Friday 9/29
Depart Fairbanks

APPENDIX III

Visiting Expert Committee Biographies

John W. Farrell (Chair)

US Arctic Research Commission, Arlington, VA

Dr. John W. Farrell is the Executive Director of the US Arctic Research Commission, an independent federal agency of Presidential appointees that advises the White House and Congress on Arctic research matters and works with executive branch agencies to establish and execute a national Arctic research plan. The Commission also facilitates cooperation with local and state governments and recommends means for developing international scientific cooperation in the Arctic.

Farrell previously served as the Associate Dean of Research and Administration at the Graduate School of Oceanography at the University of Rhode Island. Before that, he was Director of the international Ocean Drilling Program that involved over 20 nations and had an annual budget of approximately $65M/yr. The program was dedicated to advancing scientific understanding of the Earth.

Farrell helped organize and conduct the first successful international scientific ocean drilling expedition to the high Arctic in 2004. He also participated in a US ocean mapping effort aboard the icebreaker US Coast Guard Cutter *Healy* in 2012.

He obtained a PhD and ScM in geological sciences from Brown University, and a BA in geology from Franklin and Marshall College. He was an NSF-funded Postdoctoral Fellow at Brown University and an NSERC-funded Senior Research Associate at the University of British Columbia, in Vancouver, Canada.

Roberta L. Marinelli

Oregon State University, Corvallis, OR

Dr. Roberta L. Marinelli serves as Dean for the College of Earth, Ocean, and Atmospheric Sciences. Prior to coming to Oregon State University, she was the Executive Director of the University of Southern California, Wrigley Institute for Environmental Studies. She played a leadership role in planning and implementing an expansion of academic and research programs in environmental studies at USC's University Park Campus, and directed the Philip K. Wrigley Marine Science Center on Santa Catalina Island. Marinelli also oversaw the George and Mary Lou Boone Center for Science and Environmental Leadership, a nexus where scientists and policymakers can meet to resolve environmental challenges.

Marinelli was the Vice Chair of the Board of Trustees of the Consortium for Ocean Leadership, the President of the Board of Directors of the Southern California Marine Institute, a member of the Executive Committee of the Western Association for Marine Laboratories, and served on the Governing Board of the Southern California Coastal Ocean Observing System.

Prior to her arrival at USC, Marinelli was the Director of the Antarctic Organisms and Ecosystems Program in NSF's Antarctic Sciences section, where she helped to lead the development of collaborative, interdisciplinary programs across the Foundation, including the International Polar Year, Climate Research Investments, and SEES (Science, Engineering and Education for Sustainability). She was a tenured associate professor on the faculty at the University of Maryland's Center for Environmental Science, and an assistant professor at the Skidaway Institute of Oceanography. Marinelli received her master's and doctoral degrees in marine science from the University of South Carolina, and her bachelor's degree from Brown University. She is a member of the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society.

Larry A. Mayer

University of New Hampshire, Durham, NH

Dr. Larry A. Mayer is a distinguished professor and, in 2000, became the founding director of the Center for Coastal and Ocean Mapping at the University of New Hampshire, and the co-director of the NOAA/UNH Joint Hydrographic Center. He has a broad background in marine geology and geophysics and his research interests include sonar imaging, remote characterization of the seafloor, and advanced applications of 3-D visualization to ocean mapping challenges. He is jointly appointed in UNH's Ocean Engineering and Earth Science Departments. Mayer has participated in more than 90 scientific research expeditions (over 70 months at sea) during the past 40 years. He has been chief or co-chief scientist of numerous expeditions including seven cruises on the US Coast Guard Cutter *Healy* mapping unexplored regions of the Arctic seafloor in support of a potential U.S. submission for an extended continental shelf under the Law of the Sea Treaty.

After receiving his PhD in marine geophysics from Scripps Institution of Oceanography in 1979, Mayer was selected as an astronaut candidate finalist for NASA's first class of mission specialists. He went on to a postdoc at the School of Oceanography at the University of Rhode Island and then to a faculty position at Dalhousie University in 1981 and then became the NSERC Industrial Research Chair in Ocean Mapping at the University of New Brunswick in 1991.

Mayer was awarded the Keen Medal for Marine Geology, an honorary doctorate from the University of Stockholm, the University of New Hampshire's Excellence in Research Award and the University of Rhode Island's Graduate School of Oceanography's Distinguished Alumni Award. He served on the President's Panel for Ocean Exploration, and chaired a National Academy of Sciences committee on "National Needs for Coastal Mapping and Charting." He co-chairs NOAA's Ocean Exploration Advisory Working Group and chairs the National Academy of Sciences Ocean Studies Board.

Steven A. Murawski

University of South Florida, St. Petersburg, FL

Dr. Steven A. Murawski is a fisheries biologist and marine ecologist involved in understanding the impacts of human activities on the sustainability of ocean ecosystems. He has developed approaches for understanding the impacts of fishing on marine fish complexes exploited in mixed-species aggregations. Additionally, his work on impacts of marine protected areas and other management options has formed the scientific basis for regulation. Such assessments can help inform investments to rebuild the Gulf of Mexico from effects of the oil spill, loss of juvenile nursery areas, nutrient enrichment, overfishing, and other factors.

Murawski currently serves as Director of the Center for Integrated Analysis and Modeling of Gulf Ecosystems (C-IMAGE), which is funded by a grant from the Gulf of Mexico Research Initiative. Additionally, he is applying advanced technology solutions to the next generation of marine ecosystem surveys through a joint program with the Center for Ocean Technology to develop towed video systems for fish and habitat assessments. In addition to his science activities, Dr. Murawski is a USA Delegate and formerly a vice-president of the International Council for the Exploration of the SEA (ICES), a 20-nation organization dedicated to increasing understanding of ocean ecosystems in the convention area, which includes the United States, Canada, and 18 European countries. He is also a member of the National Academy of Sciences' Ocean Studies Board, and USA Committee for the International Institute for Advanced Systems Analysis. In 2013, Murawski was appointed a committee member for the Decadal Survey of Ocean Sciences 2015. This survey, managed by the National Academies, set the science priorities for the next decade in the context of the current state of knowledge, ongoing research activities, and resource availability.

Eric Collins, Kyle Dilliplaine, and Brian Ulaski are lowered in a man basket to the ice below from the deck of USCGC *Healy*. *Photo credit: Caitlin Bailey*

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