

**Looking to the Future  
through  
Strategic Thinking**



**University of Alaska Fairbanks**

**School of Fisheries and Ocean Sciences**

Spring, 2004

## PREFACE

Alaska's aquatic regions are vast; they include more than half the nation's coastline, produce more than half the nation's harvest of wild fish, and support over 75,000 jobs. Extensive offshore oil, gas and minerals are potentially major resources as well. At the same time, disasters such as the *Exxon Valdez* oil spill, conflicts over the interpretation of legislation regulating essential fish habitat and endangered species such as the Steller sea lion, and competition with farmed fish from abroad, present significant challenges to the sustainable management of Alaska's aquatic ecosystems and their derived economic benefits. Variable environmental regimes, both natural and man-related, impact Alaska's marine systems, and compromise resources and economic security. Given these circumstances, Alaska offers an ideal environment for training students in the marine sciences (including fisheries, which has a great need for extension services and presents innumerable opportunities and challenges for research). The School of Fisheries and Ocean Sciences serves the entire State of Alaska from its base on the Fairbanks campus, with facilities and/or activities around the entire coastline—a truly broad-based statewide entity.

The University of Alaska's Strategic Plan 2009 includes a call for the University to conduct research that solves problems of importance to the state, the nation, the north, and the world; meet the educational, cultural, and economic needs of the diverse people of Alaska, and demonstrate responsible stewardship of the treasures of the state with which we are entrusted.

Six core mission areas are identified: serving students, educational quality, research excellence, faculty and staff strength, responsiveness to state needs, and technology and facility development. The School of Fisheries and Ocean Science's plans are fully consistent with, and build upon, these university-wide aims.

The School of Fisheries and Ocean Sciences also addresses multiple priorities stated in the University of Alaska Fairbanks (UAF) Strategic Plan: UAF 2005: serve as a world leader in arctic research and related graduate education; form active collaborations with communities, organizations, businesses, and governments to meet identified state, national and global needs; serve as an academic gateway to the study of North Pacific and circumpolar land and sea.

The School of Fisheries and Ocean Sciences, (hereafter referred to as "the School" or "SFOS"), was created by the University of Alaska Board of Regents in 1987 from existing entities housed at several campuses and placed under a single umbrella to be administered as a unit within the University of Alaska Fairbanks. The purpose was to strengthen and unify the programs in fisheries and ocean sciences. The School has since developed a strong history of regional and world-class research, excellent graduate education, and outstanding service to the State and the nation. For example, the School has awarded 61 B.S. degrees, 175 M.S. degrees, and 54 Ph.D. degrees, and currently enrolls about 130 graduate students. The School conducts programs in specialized areas, such as scientific diving, through which nearly 70 divers have been certified since 2000. The School leverages its research base from the University's general fund at a ratio of 10.1:1, the highest return of any research unit within the University System, and thus attains a total annual budget in excess of \$20 million.

Given this high standard of performance, in 2001 the University of Alaska Fairbanks designated the School's Fisheries and Fishery Oceanography programs as one of three campus Programs of Distinction. This was done in recognition of the fact that with a modest investment, the School would make substantial gains. This designation resulted in the creation of an endowed position of President's Professor of Fisheries. Given continued support and growth, the School of Fisheries

and Ocean Sciences will become recognized for its excellence in applying state of the art knowledge and facilities to serving students and constituents, alike. Throughout the last decade, the School of Fisheries and Ocean Sciences has struggled with a few pervasive challenges. From the administrative perspective, there was a need to coordinate among units separated by thousands of miles, to bring these units with differing histories and missions together to form a unified School. Progress has been made in this regard. One area in which adequate progress has not been made is that of facilities. The only new construction during the School's existence was the Alfred A. Owen Building in Kodiak. Although the building was constructed, operating monies were not transferred to the School. From the School's genesis in 1987 to the present, the woeful inadequacy of SFOS facilities has been featured in every report delivered by the SFOS Advisory Council to the Provost. Nevertheless, SFOS has managed to lead the university in leverage of state dollars in procuring federal research support, serve as a premier producer of graduates at the doctoral level, recruit an excellent young and dynamic faculty, and establish strong and productive partnerships with state and federal agencies. The support from the fishing industry is epitomized by the recent endowment of the Ted Stevens Distinguished Chair in Marine Policy by the Bering Sea pollock fishing companies (through the Pollock Conservation Cooperative).

### **The School of Fisheries and Oceans Sciences Mission**

*The School of Fisheries and Ocean Sciences is dedicated to the pursuit of excellence in education, research, and public service concerning marine and freshwater ecosystems, and to fostering the sustainable use of their resources for the benefit of Alaska, the nation, and the world.*

### **School of Fisheries and Ocean Sciences Priorities, FY05–FY10**

The details of the directions and priorities for the next few years are outlined in the several attached unit strategic plans. Here, we present only an outline of the important actions needed to achieve these and abstract the specific requirements. They emphasize needs in facilities and faculty. Needs also exist in strategy and planning, an ongoing activity that must adapt and change continuously in response to financial and academic conditions and national and regional opportunities and needs. The Goals outlined below deal with facilities and faculty, and do not address research direction or extension initiatives. Those will require specific planning among the faculty; for example, potential participation in the International Polar Year and other opportunities. Without the facilities and people, the School is incapable of responding effectively to needs and opportunities. The School will be well-positioned to respond to changing needs and emerging opportunities, given a modest investment on the part of the University.

#### **GOAL I: SECURE THE PHYSICAL FACILITIES NEEDED TO CARRY OUT THE MISSION OF THE SCHOOL OF FISHERIES AND OCEAN SCIENCES**

- I. Construct the co-located fisheries facility with National Marine Fisheries Service at Lena Point, Juneau, to enable the Juneau Center to serve effectively as the SFOS primary fisheries research and graduate teaching entity.
- II. Secure the Alaska Region Research Vessel. The School is leading the design of a new research vessel for Alaskan waters, with this effort supported by the National

Science Foundation. The conceptual and preliminary design phases have been completed. The National Science Board for inclusion in the NSF Major Research Equipment budget request has approved the construction project for FY05 or beyond.

- III. Develop plans, secure funds, and implement construction of a multifaceted oceanographic teaching and research facility, a ship support facility adequate to accommodate a 200ft. + research vessel, and provide for a support node for the Alaska Ocean Observing System at Seward. Create a world-class oceanographic shore complex.
- IV. Work with the NOAA in completing the construction planned, funded, and underway for the Kasitsna Bay Laboratory.
- V. Plan for a new, modern research and teaching facility to bring the SFOS' Fairbanks-based faculty together in a single building. This building will also serve as the central administrative node for SFOS, will further enhance the SFOS identity, and demonstrate the commitment of the University of Alaska to a central role for marine endeavors. *A suggestion was made by one reviewer that this item should be replaced by "seek more effective use of existing space"*
- VI. Collaborate with the National Marine Fisheries Service in the design and construction of an embryology and grow-out facility to be located adjacent to the Kodiak Fisheries Center.
- VII. Secure an addition to the Alfred Owen Building to provide additional office space.

GOAL II. RECRUIT THE FACULTY NEEDED TO PROVIDE RESEARCH, INSTRUCTION, AND ADVISORY PROGRAMS IN SUPPORT OF ALASKA'S NEEDS AND TO ADDRESS CONTEMPORARY MARINE ISSUES.

- I. Institute of Marine Science – acoustical and bio-optical oceanography, ecosystem modeling, experimental marine biologist, fisheries oceanographer, marine chemist, marine geologist, microbial ecologist, satellite oceanographer.
- II. Fishery Industrial Technology Center – fisheries biology, marine finfish (sustainable fisheries), marine resource management, seafood biochemistry. Seafood processing and product technology (seafood processing).
- III. Fisheries – organismal biology; population, community, and ecosystem biology; habitat biology; stock assessment; conservation biology; biometry; ecotoxicology; aquaculture science; applied genetics, marine ecology, and freshwater ecology. (For details, see the Fisheries Division plan, below.)
- IV. Marine Advisory Program – business specialist; marine education specialist; advisory agent for Sitka.

With respect to new faculty, the SFOS is working towards at least three endowed chairs within a few years: The Frank and Marjorie Meek Chair, the Wakefield Chair, and one or two Chairs endowed by the At-Sea Processors (Pollock Conservation Cooperative) through the Pollock Conservation Cooperative Research Center. The Pollock Conservation Cooperative has decided to move one Chair ahead, and start recruiting immediately. They have accelerated their

investment into the faculty endowment fund, and propose to cover the first year or so of salary directly. This position will be called the Ted Stevens Distinguished Chair on Marine Policy.

GOAL III. SIGNIFICANTLY IMPROVE VIDEO AND AUDIOCONFERENCING CAPABILITY FOR THE PURPOSE OF BRINGING THE SFOS UNITS TOGETHER FUNCTIONALLY, WITH APPLICATION TO CLASSROOM TEACHING, SEMINAR DELIVERY, CONFERENCING, COMMITTEE MEETINGS AND MORE.

### **To the Future**

The importance of the oceans and their resources has received considerable attention in recent years. The report of one national commission, the Pew Oceans Commission, has been released. The U.S. Commission on Ocean Policy, created by Congress in 2000 to make recommendations vis-à-vis a national ocean policy, will release its report in April 2004. This will address a broad range of issues, from the stewardship of marine resources, to the structure of Federal ocean agencies, and is expected to recommend a major increase in federal investment in ocean science. Alaska's interests in fisheries and ocean policy are strong, and the School of Fisheries and Ocean Sciences will continue to address national as well as statewide issues of importance.

Meeting the varied challenges facing the aquatic region and its resources is a massive undertaking. The University of Alaska created the School of Fisheries and Ocean Sciences (a.k.a. the School or SFOS, as used elsewhere in this document) in 1987, "to strengthen and unify its programs in fisheries and marine sciences . . . into a School . . . that is capable of having a strong presence in all three of its missions: teaching, research, and public service." The underlying aim of the School has been reiterated in recent planning documents for the entire University of Alaska System. Challenges articulated in the University's plan for 2009 call for the need to: Conduct research that solves problems of importance to the state, the nation, the north, and the world; meet the educational, cultural, and economic needs of the diverse peoples of Alaska; and demonstrate responsible stewardship of the treasures of the state with which we are entrusted.

The University plan aims to achieve excellence in the six core areas of its mission: serving students, educational quality, research excellence, faculty and staff strength, responsiveness to state needs, and technology and facility development. The School of Fisheries and Ocean Sciences' activities are fully consistent with, and build upon, these university-wide aims.

The United States Congress initiated a major national thrust, now pursued actively by the Federal Oceanographic Coordinating Committee. Development of a nationwide integrated ocean observing system is a major national priority. SFOS has been playing a significant role in promoting the development of the Alaskan piece – the Alaska Ocean Observing System (AOOS). Given this, and other new programmatic developments, the research mission of SFOS is on track and assured.

With respect to the instructional activities, there remain areas that need attention. The undergraduate fisheries program needs to be assessed, and decisions made re its future. Enrolment is increasing, but the number of FTE faculty available to the program on the Fairbanks campus remains at only 1.5, whereas the majority of the faculty in fisheries reside at the SFOS Juneau Center. Consideration should be given to consolidating the SFOS graduate programs into a single Graduate Program in Marine Sciences and Fisheries. This may not be desirable, but at least the discussion should be held. Given the few faculty in SFOS (52, the size of a modest department in many institutions) there may be a sound rationale for such a merger. On the other hand, there are significant curricular differences between fisheries and the marine sciences programs.

SFOS has done very well in collaborating with other educational and research entities. The now-failed Seafood Technology Program at Sheldon Jackson University was designed and taught with major participation of faculty from the SFOS Marine Advisory Program. Similarly, SFOS faculty members are assisting with a fledgling Fisheries Technology Program operated by University of Alaska Southeast at Sitka. SFOS faculty teach for UAS in Juneau, as well, and UAS faculty Chair and participate in graduate committees through our Juneau-based fisheries program. The same relationships hold with the Anchorage campus. Distance delivery of courses is making such cooperation available to a larger proportion of the faculty. SFOS should continue its leading role in such approaches.

Strong interactions and cooperation with agencies, including collaborations with organizations in other nations, are a strong pattern in SFOS activities, attesting to the importance of the Pacific Rim and circumarctic nations to our mission.

## **SFOS Component Plans**

### **FISHERIES DIVISION**

Vision: The Fisheries Division envisions a fully developed Center for Fisheries Science, devoted to research, education, and service for the sustainable management and conservation of fisheries resources of Alaska, the nation, and the world.

Introduction. The Status of Fisheries Science and Fisheries Resources: Alaska has half the nation's coastline and ocean, half the nation's fish harvest, half the nation's lakes and rivers (virtually all of the nation's undeveloped lakes and rivers), and a tiny fraction of the nation's economy and population. Alaska's economy historically has been dependent on fisheries resources, though the relative value has declined in the past decade. Alaska's participation in the fish economy of the world has historically been as a supplier of raw material. Conservation of these resources (sustainability of the economic use of these resources) requires the fruits of scientific research (basic and applied) and it requires people educated to apply the scientific results.

Fisheries management nationally and globally is in crisis because most fish stocks have been fully exploited and many are overexploited; there are too many harvesters for too few fish, allocation disputes have polarized fishery participants, and in many fisheries around the world ecological and habitat degradation have not been addressed seriously. The situation is better in Alaska than in most places, but declines in some sea mammal and seabird populations, depletion of some invertebrate and fish populations, and world market forces have led many to question the sustainability of fisheries. The need for contemporary research and training to address sustainability, ecosystem protection, and efficient fisheries has never been greater.

Worldwide production of seafood from capture fisheries is not increasing; growing populations and growing economies worldwide continue to demand increasing supplies of seafood, a demand being met in part by aquaculture (now about 30%). Much of aquaculture's contribution currently depends on marine (fish) proteins and oil for feedstuffs—suggesting that the net contribution of wild-captured fish to seafood production is probably greater than the remaining 70%, although food technology promises to radically reduce the dependence on aquaculture of feedstuffs derived from captured fish. Alaska's contribution to seafood production from capture fisheries (or rather, the contribution of companies mostly from other states but harvesting or buying raw fish in Alaska) is substantial (2 M mt annually, worth \$2B) and supports Alaska's largest employment

(fifty thousand jobs). Increasing the economic value of this production will be difficult, however; the value of Alaska's contribution is declining as the international corporations responsible for seafood production consolidate, reducing competition of raw product, and as high-value species (salmon, halibut, cod, and sablefish) are increasingly provided to the world market by aquaculture.

Alaska's contribution to seafood production from aquaculture is small because intensive fish farming is prohibited by law. Mariculture of mollusks is a small and growing industry, albeit constrained by distance from market. Extensive aquaculture—harvest of salmon returning to private-sector hatcheries—is relatively significant, the dominant share of Alaska's farm production (\$20–\$25M) of \$50M annual farm receipts. Neither intensive nor extensive aquaculture is likely to increase in Alaska in the near future; salmon ranching is perceived to have reached ecological limits; there is little political will to enable intensive fish farming.

Sectors of the seafood economy in Alaska include private for-profit firms (processing companies, harvesting companies, etc.), public agencies (conservation/fishery management in state and federal government), non-governmental organizations, and non profit corporations (salmon ocean ranching corporations). All of these sectors need the products of our School (educated people and scientific understanding); our alumni appear in each but are notably prominent in public conservation agencies in Alaska.

Mission Statement: The mission of the Fisheries Division is education, research, and public service devoted to the understanding of fishery resources, management of human use of fishery resources, and conservation of those resources and the aquatic ecosystems within which they live.

Program Description: Fisheries science (fisheries biology) focuses on populations and organisms; a context of physical, chemical, biological, and anthropological factors. Fisheries scientists focus on the understanding and management of human effects on exploited ecosystems. Fisheries science is complex, requiring the application and interaction of many disciplines.

Goals:

- A. Educate fishery scientists competent to address present and future problems and issues.

The continuing need for educated fishery scientists and fishery managers is evident in the rapidity with which our graduates find employment, and the continuing recruitment of candidates from outside Alaska and from disciplines other than fisheries science to fill positions in public and private agencies. While the State of Alaska's Department of Fish and Game remains the largest agency (several hundred scientists and resource use managers, several dozen entering the profession each year), the most rapid growth at present is in federal agencies with growing responsibilities for fisheries resources in Alaska. These agencies also recruit several dozen new professional scientists and managers each year. A recent report by the National Research Council suggests the need by the National Marine Fisheries Service for at least 300 additional Ph.D. scientists. The retirement of baby boomer scientists in all agencies has created an unprecedented need for scientists and managers at all levels.

Recommendations:

- ❖ Implement the BS in Fisheries Plan.
- ❖ Review curriculum and establish a core curriculum for the MS degree.
- ❖ Develop fellowship programs to support research for the duration of a Ph.D. degree (3–5 years.)

## B. Conduct Useful Research.

Multidisciplinary, collaborative, synergistic work will be required on an array of problems in Alaska in the coming five years and beyond, a capability to mount five or more projects simultaneously is an attainable goal for the Fisheries Division.

Specific areas Recommended for additional faculty:

- ❖ Stock Assessment (How abundant are stocks and how much harvest is ecologically sustainable?)
- ❖ Harvest Management (How can harvest maximize value without detriment to the viability of stocks?)
- ❖ Forecasting.
- ❖ Habitat Ecology (What habitat features are essential to the viability of stocks?)
- ❖ Conservation Biology (understand population viability, habitat complexity).
- ❖ Ecotoxicology (set water quality standards for mine discharges, understand fitness effects of chronic exposure to contaminants).
- ❖ Basic Biology of Species (systematics, evolution, population genetic structure, population dynamics, behavioral ecology, habitat requirements, ecological relationships).

## C. Provide Technically Expert Advice in Service to Public and Private Agencies.

- ❖ Advisory Committees
- ❖ Planning Committees
- ❖ Review Panels
- ❖ Response to Requests for Information

### Objectives:

**Facilities:** Progress in the Fisheries Division is primarily limited by its substandard facilities. The present faculty, minimal as it is, is constrained by the lack of research space. The faculty cannot grow and develop without further space. The plan for a building at Lena Point is the Division's primary objective. Interim improvement of facilities, during the 3–5 years development of that facility, will enable the Division to develop modestly beyond its current expertise.

**Expertise:** Provide a full range of fishery science expertise. The disciplines required include those now provided by the Fisheries Division and several others. The Fisheries faculty currently numbers less than ten, and will need to grow to about twenty within a decade if it is to meet the goals outlined above. The University of Washington and Oregon State University each have about thirty fisheries faculty members, and both states together have but a small fraction of the coastline, waters, resources, and industry of Alaska. The following are essential:

- ❖ **Organismal Biology:** The minimum needed to provide the teaching, research, and service outlined above will be expertise on at least six of Alaska's major fishery resources (which include several salmon, trouts and chars, rockfishes, cods, halibut, soles, sablefish, and herring. Several crabs. Shrimps and prawns, clams, urchins and cucumbers, and kelps) and expert ability in at least three basic organismal biological disciplines (physiology, biochemistry, developmental biology, genetics, or pathology).

- ❖ Population, Community, Ecosystem Biology: Minimal competency will require expertise in at least three integrating disciplines (e.g. genetics, population and community biology, ecosystem analysis, or pollution biology).
- ❖ Habitat Biology: The faculty will require expertise in the biology of a range of habitats (estuarine and oceanic marine habitats, freshwater lakes, and rivers).
- ❖ Stock Assessment: Harvest management informed by rigorous stock assessment is a central part of fishery science. An important strength of our faculty lies in its cumulative skill in quantitative stock assessment and its systems analytical approach to understanding harvest management. Required expertise includes fish population dynamics, stock assessment, population analysis, sampling design and analysis, and harvest systems analysis.
- ❖ Conservation Biology: Alaska includes most of the nation's wilderness, refuge, preserve, and parklands. Recent federal law calls for the establishment of marine reserves. Conservation biology is the scientific approach that deals with the rational management of refuges, preserves, and parks. Its component sciences include population biology, population genetics, and ecology, but also a range of other biological and human sciences. At a minimum, the faculty will require three conservation biology scientists.
- ❖ Biometry: This is applied to all facets of fishery science—virtually every research project and every graduate thesis requires the application of more than one biometric tool. Many projects and theses require experimentation and rigorous experimental design, a branch of the field of statistics. Currently, SFOS has limited expertise in this area and offers no coursework beyond basic analysis of variance. Minimally, at least four biometricians will be needed in the areas of experimental design, sampling theory, multivariate statistics, and spatial statistics.
- ❖ Ecotoxicology: Alaska's role in the national and international economy includes important exploitation of raw materials (petroleum, metals, coal, and timber). Toxic byproducts disposed of in natural waters and accidental discharge of toxic products into natural waters are inherent environmental costs associated with these industries, and are borne by fishery resources. Ecotoxicology is the science that seeks to understand the mechanisms of these environmental costs and to provide the means to ameliorate them, through the application of several basic biological sciences. These include biochemistry, organic chemistry, physiology, developmental biology, pathology, and habitat ecology. At least three experts in Ecotoxicology sciences will be required.
- ❖ Aquaculture Science: In the face of static production by fished stocks worldwide, aquaculture is increasing annual production rapidly (now near 20M t annually). Intensive culture of fish is not permitted in Alaska; however, culture of salmon (ocean ranching) contributes significantly to the fishing economy (about \$50M annually). Culture of mollusks is a growing industry in Alaska. Aquaculture science applies the methods of genetics, physiology (including nutrition), pathology, and engineering to solving the problems of production aquaculture. The faculty will require three experts in this area.

The Fisheries faculty lacks expertise in many areas, including ecosystem analysis and modeling, ecotoxicology, pathology, physiology, nutrition, developmental biology, aquaculture systems, limnology, and is shorthanded in most others. Priorities within the next five years are:

- ❖ A physiologist doing research on one of the species exploited by an Alaskan fishery.
- ❖ A systems ecologist doing research in one or more of the essential habitats used by species exploited in Alaskan fisheries.
- ❖ An ecotoxicologist/pollution biologist.

## **FISHERY INDUSTRIAL TECHNOLOGY CENTER (FITC)**

Mission Statement: The Mission of the Fishery Industrial Technology Center is to increase the value and sustainability of Alaska's Seafood Industry and Marine Resources through research, technological development, education, and service.

Introduction: FITC has two major academic programs: Sustainable Harvesting and Seafood Processing. We direct our programmatic efforts across the following major research, teaching, and service areas:

1. *Sustainable Harvesting* – to assist the seafood industry by conducting research, education, and service facilitating the economic and ecological sustainability of Alaska's marine resources.
2. *Seafood Processing* – to assist the seafood industry in more fully, and yet prudently, utilizing Alaska's fishery resources in an economically effective manner, through applied research, technology transfer, and education.
3. *Mariculture and the Remediation of Locally Depleted Stocks* – to develop the marine technology required to promote mariculture in Alaska in an environmentally responsible manner and to educate a cadre of marine technologists with expertise in mariculture.
4. *Nearshore Fisheries Oceanography – Essential Fish Habitat* – to more fully understand the ecology of Alaska's nearshore environment and how changes in that environment affect marine populations.
5. *Ecosystem Dynamics* – to more fully understand the physical and biotic variables and the relationships between these variables that affect marine populations in Alaska.
6. *Human Interactions with the Marine Environment* – to minimize the negative effects of human interactions with the environment and its biota.
7. *Contaminants* – to understand the relationship between natural and man-made contaminants in our marine resources and their economic consequences.

FITC, a unit within the School of Fisheries and Ocean Sciences (SFOS), is administered through the University of Alaska Fairbanks (UAF). The enabling legislation creating the Fishery Industrial Technology Center provided for the establishment of an FITC Policy Council to guide and advise the Center on the kinds of problems facing coastal communities and the Alaska Seafood Industry, and in part, to review our programs. Our Policy Council meets twice yearly and reviews FITC's Strategic Plan as necessary. Goals that have been achieved are removed from the plan and new goals are discussed and prioritized by the Policy Council and the faculty, in turn. The Policy Council and the faculty also prioritize positions for new hires.

We are also in frequent contact with a wide variety of enterprises across the state, the nation, and internationally regarding fisheries and seafood issues.

### **Fishery Industrial Technology Center Programs**

#### ***I. Sustainable Harvesting Program***

**SUSTAINABLE HARVESTING GOAL STATEMENT:** The goal of the Sustainable Harvesting Program is to assist the fishing industry by conducting research, education, and service that will facilitate economic and ecological sustainability of Alaska's marine resources.

Past projects have addressed bycatch reduction, gear design, and shipboard fish quality. Currently, we are addressing endangered species impacts on fisheries restrictions, food web dynamics of commercial fish stocks, stock assessment and designation of Essential Fish Habitat, and understanding environmental impacts on the physiology and behavior of commercial fish.

**SUSTAINABLE HARVESTING FUTURE PLANS:** In the near future, we want to develop academic and technical expertise in mariculture of non-salmonid marine fin fish to remediate local depletions and enhance stocks. Our goal will be two-fold; first, to develop the technologies of raising in vitro, releasable, locally depleted marine finfish from eggs. The second goal is to develop a cadre of college graduates at the bachelor's and graduate levels, with expertise in such technologies. The major reason for this focus is that our best estimates of the kinds of businesses that will be cost effective in the smaller communities in western Alaska are limited to live delivery of captured wild fish and non-salmonid fish farming.

Future research topics include development of harvest methodologies to improve fish quality, techniques for efficient delivery of live-seafood, and remediation of species of local decline. In addition, we will continue projects addressing endangered species, food web dynamics, stock assessment, environmental impacts on physiology and behavior, and Essential Fish Habitat. Critical to the success of this program is the training of future scientists who understand the delicate relationship between ecological and economic sustainability of Alaska's marine resources. Paramount to this success is the recruitment and matriculation of quality graduate students.

**SUSTAINABLE HARVESTING RESOURCES:** We now have two permanent FITC faculty in Sustainable Harvesting and a total of 2.35 FTEs. Dr. Robert Foy was hired in August of 2000 and Dr. Loren Buck began at FITC in May of 2001. Dr. Quentin Fong's time (0.25FTE) is directed towards establishing a seafood business outreach and assistance program using the resources of the Marine Advisory Program and FITC to support the Alaskan Seafood Industry. Dr. Scott Smiley's time (0.10FTE) is spent developing funding, in consultation with industry leaders regarding their concerns, and in serving on the Essential Fish Habitat Committee for the North Pacific Fisheries Management Council.

**SUSTAINABLE HARVESTING NEW HIRES:** We will ask for two new personnel for the mariculture project: one with expertise in fisheries biology and one with expertise in mariculture of marine finfish.

## *II. Seafood Processing Program*

**SEAFOOD PROCESSING GOAL STATEMENT:** The Seafood Processing Program assists the industry in fully utilizing Alaska's fishery resources through applied research, technology transfer, and education efforts.

Our Seafood Processing Program includes research into all aspects of handling fish, from producing a safe product, to maintaining quality, to efficient utilization of the byproducts of seafood processing, to increasing processing efficiency and increasing the percentage of harvested biomass turned into food. A listing of past research projects is appended to the end of this document.

**SEAFOOD PROCESSING FUTURE PLANS:** Near-term projects include developing several new products, development of a functional flaking process for pink salmon, analysis of processing byproducts, increasing shelf life, seafood quality and safety, and increased processing efficiency.

Long-term, we will be dynamically involved as the industry changes from a maximum harvest orientation to one focused on maximum value. This will include the necessity of marrying market information and process efficiency with new product development, while constantly keeping our eye on food safety. We are in the process of advertising for a post-doc to be affiliated with the ARS seafood waste project.

**SEAFOOD PROCESSING RESOURCES:** We now have 3.9 FTE faculty working in our Seafood Processing Program. Dr. Charles Crapo is the State Salmon Specialist in MAP Seafood Processing (0.5 FTE). Dr. Quentin Fong – Resource Economics (0.25 FTE). Dr. Brian Himelbloom – Seafood Microbiology (1.0 FTE). Dr. Alexandra Oliveira – Seafood Chemistry (1.0 FTE). Dr. Scott Smiley – Seafood Biochemistry (0.15 FTE). Dr. Sathivel Subramaniam – Seafood Processing / Engineering (1.0 FTE).

**SEAFOOD PROCESSING NEW HIRES:** We anticipate that we will require new faculty as our program grows. These would include faculty in the area of marine resource management, seafood biochemistry, and seafood processing and product technology.

### *Education at FITC*

**A. SUSTAINABLE HARVESTING:** Currently, the Sustainable Harvesting Program supports 2 Post Docs, 2 Ph.D. candidates, and 9 M.S. students. Sustainable Harvesting students are enrolled in a variety of academic units including: the Fisheries Program, the Graduate Program in Marine Sciences and Limnology within SFOS, and in the UAF Biology and Wildlife Program.

**SUSTAINABLE HARVESTING FUTURE PLANS:** The participation of graduate students within our Sustainable Harvesting Program is strong, considering its relatively short history. We hope to enroll more graduate students in our program through recruiting talented undergraduates, and from graduate programs at other universities.

**SUSTAINABLE HARVESTING RESOURCES:** All of our faculty members are involved in this program. Our faculty and students are also active in K–12 programs through the Kodiak Island Borough School District.

**B. SEAFOOD PROCESSING:** We are witnessing the loss of seafood technologists in the industry through attrition, and are certain that there will be numerous opportunities for highly skilled employees. We are focusing our attention on the seafood science and technology program to recruit new graduate students. Three recent faculty hires fill our core group and will enhance our ability to secure future graduate funding. A new affiliate faculty member, with USDA at SFOS in Fairbanks, has been spearheading an effort in attracting graduate students. His connections will benefit us in developing new avenues for graduate funding. Affordable housing is already available for students next door to FITC.

Another component of the education program is outside the standard graduate program. Adult education or continuing education short courses and workshops will be beneficial for seafood industry employees. Through the newly available two-way videoconferencing system, we will evaluate distance delivery of lecture courses.

**SEAFOOD PROCESSING FUTURE PLANS:** We have identified four specific objectives for enhancing the education component. The first objective is to have a viable, current web site for the seafood processing program. We will investigate working with Alaska Sea Grant for their communication services. The second objective is to advertise, outside of the web site, through

direct mailings to food science program department heads. The third objective is to determine which internal UAF funding programs can be expanded to encompass funding for seafood science and technology graduate students. A fourth objective is to revise the current nomenclature of food science and nutrition (FSN designator) and replace it with seafood science and technology (SST). Further revamping of the program will be to remove it from an interdisciplinary program of study under the UAF Graduate School and have it accepted by the UA Board of Regents as a new program of study under SFOS.

**SEAFOOD PROCESSING RESOURCES:** All members on our faculty are involved in this program. Our faculty and students are also active in K–12 programs through the Kodiak Island Borough School District.

### *Service at FITC*

One major reason why FITC was formed by the Alaska legislature was to provide help for coastal communities and the Alaskan Seafood Industry in its broadest sense. A significant portion of our effort is spent in answering questions and solving problems posed by the public and the industry regarding fisheries and fisheries resources. Most of our research projects in Harvesting and Processing have a strong service component. The original stimulus for most of our research activity is through the concerns of the industry and the public as voiced to us. FITC is a proximal link between the resources of the University and the concerns of the industry and the public.

**FUTURE PLANS:** In the future, as the volume of fish delivered to processors in Alaska diminishes and greater value must be extracted from each fish, we anticipate more activity in this area. We are continually seeking new ways we can be helpful to the industry and the communities it sustains.

**RESOURCES:** All our faculty, staff, students, and administrators are involved in this program.

### *V. Facilities Issues*

**A. NEW MARICULTURE FACILITY:** Aside from normal repair and maintenance we have several new facilities issues. In a new increment for marine fin fish mariculture, we will be looking to partner with NMFS on a 5,000 ft<sup>2</sup> embryology and grow-out facility to be located adjacent to the Kodiak Fisheries Research Center and using their sea water system. Initial estimates peg the cost at approximately \$2.0–2.5M, including furnishings. The building would be roughly 50' x 100' and divided into a 20' x 50' embryology section and a 80' x 50' grow-out section.

**B. LAB AND OFFICE SPACE:** A second future facility should include a new office section for faculty and students attached to the easternmost end of the Alfred Owen Building. Utilities were stubbed out at this location when the Owen Building was built in 1991. We are reviewing tentative plans for having sustainable harvesting laboratories located on the bottom floor of a new add-on. We are also interested in secure, unheated, but covered outside storage that might be developed with this new wing or may be developed at a different site.

**C. PILOT PLANT EQUIPMENT STORAGE:** Equipment storage is a growing concern and we will request a storage floor be added to the pilot plant in the Alfred Owen Building. We can use our forklift to raise palletized equipment to this floor for storage. The new floor would also allow us to remove the klieg lights in the pilot plant and use lower cost fluorescent lights hung 12' from the floor. These will provide greater illumination than the expensive klieg lights.

## Short Term Goals and Strategies

### ***Administration***

- 1) Assist in the further growth and enhancement of the SFOS
- 2) Assist in developing a University initiative for supporting research and education in the mariculture of marine finfish for remediation of local depletions
- 3) Assist in developing a research program on the efficacy of impounding live commercial species – close to processing centers to increase quality
- 4) Assist in developing a program to investigate industrial uses for components of fish milt in finfish mariculture

### ***Sustainable Harvesting***

- 1) Fish Distribution and Biomass Assessment: Hydroacoustics, Oceanography, Gear Design, Remote Sensing
- 2) Trophodynamic Interactions: Fatty acid analyses, Diet analyses, In vitro feeding studies, Bioenergetic modeling
- 3) Essential Habitat: Nearshore fish monitoring program, Nearshore habitat assessment, Oceanography
- 4) Linkages to Processing and Bioeconomics: Herring utilization, Halibut shipboard quality

### ***Seafood Processing***

- 1) Develop unique seafood ingredients using mechanical dicers commonly found in meat and vegetable industries
- 2) Evaluate alternative processing methods for aquacultured Alaska oysters and mussels that will expand markets and product value
- 3) Develop a better understanding of chalkiness in halibut
- 4) Develop products from undersized sole and pollock
- 5) Develop unique seafood ingredients using mechanical dicers commonly found in meat and vegetable industries
- 6) Evaluate alternative processing methods for Alaska oysters and mussels produced by aquaculture that will expand markets and product value
- 7) Develop a better understanding of chalkiness in halibut
- 8) Develop products from undersized sole and pollock

### ***Seafood Marketing***

- 1) Investigate opportunities for flaked products from pink salmon
- 2) Investigate the value of shelf-life extension for pink salmon
- 3) Complete the assessment of the Hong Kong smoked salmon trade
- 4) Complete Herring market survey
- 5) Assist in Pearl farm market and economic study

### ***Seafood Microbiology***

- 1) Investigate the utility of natural antibiotics (bacteriocins) for seafood quality
- 2) Develop Molecular Tracking of *Listeria monocytogenes*
- 3) *Clostridium sporogenes* evaluation for uncooked products
- 4) Develop new methods for maintaining salmon quality on boats and in plants
- 5) Maintain Pink Salmon quality using natural antimicrobials
- 6) Investigate salmon caviar safety and quality
- 7) Investigate the use of chlorine dioxide in RSW to reduce bacterial load

- 8) Investigate the utility of controlled atmosphere shipping for salmon

### ***Seafood Chemistry***

- 1) Development of a fatty acid profile database for commercial fish species in Alaska by region and season
- 2) Investigate the use of new technology for rapid seafood quality assessment
- 3) Determine the nutritional properties of fish by-products and underutilized fish species
- 4) Investigate the Isolation of Omega-3 rich fractions from fish oils

### ***Seafood Engineering***

- 1) Analyze properties of hydrolysates derived from fish processing byproducts
- 2) Make marketable fish oil from salmon byproducts
- 3) Extend shelf life of fresh pink salmon fillets using chitosan
- 4) Analyze thermal stability on the decomposition of fish oils
- 5) Analyze the effect of antioxidants on fish oil stability
- 6) Analyze the physical and chemical properties of salmon fish oil

## **Long Term Goals and Strategies**

### ***Administration***

Assist SFOS in becoming a center of excellence by:

- 1). Developing long-term stable funding for existing FITC programs
- 2). Developing funding for marine fin fish mariculture as a research, education, and service venue at FITC
- 3). Developing mechanisms to support growth of FITC and its programs
- 4). Assisting the State of Alaska in seafood related issues as it transits from a production to market orientation

### ***Sustainable Harvesting Program***

Future research in the Sustainable Harvesting Program is focused on using ecological and oceanographic tools to test hypotheses directed toward the ultimate goal of developing more efficient and more informed utilization and management of Alaska's fisheries resources. Sustainability has traditionally referred to single species issues in fisheries research / management. In order for a resource to be "sustainable" it must be managed in a way that addresses the entire ecosystem within which it functions. In the context of "ecosystem based" research, we will focus on questions that address the concerns of industry, managers, policy makers, and scientists regarding the Gulf of Alaska ecosystem that include specifically, endangered marine mammals, essential fish habitat, and environmental interactions.

### ***Mechanisms***

Seek additional research funding. Inform funding agencies of these research needs

### ***Seafood Processing Program***

- 1) Contribute to the revitalization of Alaska's salmon industry through applied research aimed at product diversification – quality and educational programs that train seafood professionals
- 2) Develop greater value in food products from flatfish and rockfish species
- 3) Develop processes for utilizing arrowtooth flounder

- 4) Develop cost effective technologies to uncover the value in fish oil extracted from byproducts from seafood processing
- 5) Develop a greater understanding of factors involved in seafood safety and quality
- 6) Continue to field a multidisciplinary team to assist the aquatic products industry by disseminating timely market information through personal contacts, research, educational programs, and training projects (marketing workshops for coastal communities)

### ***Mechanisms***

Develop greater connection with processing firms. Seek additional research funding. Inform funding agencies of these research needs

### ***Education***

- 1) Train the next generation of QA/QC leaders for the Alaskan seafood industry
- 2) Develop cogent distance education programs based on our course offerings
- 3) Develop undergraduate marine fin fish mariculture program
- 4) Field pertinent 500 level fisheries oriented professional development courses for K-12 teachers in coastal communities
- 5) Work with MAP and Community College teachers to develop an adult or continuing education program in seafood quality for training of harvesters and in plant personnel
- 6) Develop graduate intern program in seafood science with graduate food science and nutrition programs at other universities

### ***Service***

- 1) Become the first choice for information by members of coastal communities seeking answers to their questions in fisheries and fisheries related questions
- 2) Become the first choice for answers by the seafood industry to questions related to fish harvesting and processing
- 3) Continue to provide clear information regarding seafood safety and quality and how to achieve it.
- 4) Instill in our partners a sense of trust in the application of the scientific method as a mechanism to address complex questions

### ***Mechanisms***

Increase FITC visibility through fisheries journal articles. Rebuild FITC web site. Increase FITC visibility through greater faculty participation on boards and commissions.

## **MARINE ADVISORY PROGRAM**

November, 2003

### ***Mission***

The Marine Advisory Program enhances the sustainable use, conservation, understanding and enjoyment of seas and coasts by developing and disseminating science-based information to the broad array of Alaska's marine resource users.

### ***Program Description***

The Marine Advisory Program (MAP) is a unit in the School of Fisheries and Ocean Sciences (SFOS), University of Alaska Fairbanks. MAP responds to the needs of its constituents by

providing marine and fisheries information, technical assistance, and education throughout Alaska. The program consists of specialists, field agents, and staff who work to keep the State's coastal and marine constituencies up-to-date with new information, technology, and ideas. The size of the state and breadth of marine issues make this a challenging goal. MAP's faculty is often the only source of timely, responsive assistance for marine users, and the only direct connection to the School of Fisheries and Ocean Sciences.

MAP faculty work directly with people in coastal communities in an interdisciplinary approach that includes fields such as biology, sociology, economics, public policy, engineering and others. Although we are a small unit, our program is strengthened and leveraged through our partnerships with private and public companies, agencies, organizations, and individuals whose decisions and actions affect marine resources in Alaska.

MAP's areas of activity cover the full spectrum of marine issues in Alaska. Past and current activities relate to aquaculture, marketing and business management, commercial fisheries, conservation, marine mammals, safety, recreation and tourism, seafood technology, and coastal community development.

Educational activities by MAP faculty uses four principal methods: direct response to information requests, educational programs such as workshops, conferences and video production, long-term projects, or applied research and publications. Direct, or "rapid", response to constituent needs requires reserving adequate resources for unplanned activities and for spending time with marine users to establish connections. The latter three methods allow MAP to plan for and address emerging issues. The close contact between MAP faculty and staff and marine users is an essential part of identifying relevant subjects to address in this manner.

MAP is collaborative in nature. The program works closely with local, state, university, federal, Native, and private marine-oriented groups to identify needs and provide appropriate services. The hallmark of MAP's success, therefore, is collaboration with marine user constituencies and flexibility in responding to the needs of those groups and individuals. Examples of our myriad partners include: Alaska Sea Grant; Washington Sea Grant; Oregon Sea Grant; Alaska Departments of Fish and Game, Community and Economic Development, Environmental Conservation; NOAA Fisheries; United States Fish and Wildlife Service; United Fishermen of Alaska; Alaska Seafood Marketing Institute; Alaska Marine Safety Education Association; Alaska Shellfish Growers Association; Chugach Regional Resources Commission, Native American Fish and Wildlife Association; Bristol Bay Economic Development Corporation; Cordova District Fishermen United; University of Alaska Anchorage Institute of Social and Economic Research; University of Alaska Fairbanks Department of Alaska Native and Rural Development.

### **Approach**

- The Marine Advisory Program's goal is to serve Alaska's marine resource users through a timely and responsive program of education, applied research and creative activity, and service. We accomplish this by:
  - Identifying emerging problems and issues and creating programs and activities to meet those needs.
  - Developing links with organizations, institutes, and agencies in areas of importance to leverage MAP's efforts.
  - Delivering programs that effectively meet the needs of MAP's constituents.

- Evaluating the impacts of our programs and adjusting efforts in response.

### **Future Program Growth Needs:**

#### ***Personnel***

- \* Hire new specialists in disciplines currently lacking
  - MAP business management specialist
  - Marine education specialist
- \* Hire new agents in geographic areas not currently served by MAP
  - Prince William Sound Agent (accomplished 5/04)
  - Dutch Harbor Agent (accomplished 4/04)
  - Sitka Agent
- \* Hire support staff for outlying offices
  - Part time support staff for Homer office
  - Part time support staff for Ketchikan office
  - Part time support staff for Bethel office

#### ***Facilities***

- reestablish PWS office (accomplished 5/04)
- establish new Dutch Harbor office (accomplished 4/04)
- move Anchorage office (pending)

#### ***Administrative Support***

- \* Provide for faculty development
  - identify needs for training, equipment, and exchanges with other programs
  - establish a dedicated budget for such activities
  - train staff to provide additional support to give faculty more time for development activities
- \* Provide effective communication within MAP and within SFOS
  - improve the flow of information within MAP, from faculty to director, director to faculty, and among faculty members, so that all are informed of what MAP is doing collectively
  - better communication from SFOS about the activities and affairs of the school and its divisions
  - better feedback from the SFOS administration about MAP activities in relation to the school as a whole
  - better electronic reporting procedures to improve flow of information in both directions between MAP and SFOS
  - publication of an annual SFOS report with feedback from all divisions so everyone can keep current and get feedback
  - fostering a sense of being a school
- \* Participate in school-wide instruction
  - MAP faculty to become more involved in SFOS instruction, e.g., through participation in the Seminar Series or through distance delivery of courses or course modules

\* Increase funding for MAP activities

- help Sea Grant to grow
- obtain more state and other funding through SFOS, recognizing the services MAP provides to many Alaskans (i.e., not in competition with other SFOS needs, but in addition to them)
- pursue competitive grants, with help from SFOS in identifying opportunities and preparing proposals (SFOS to seek MAP-related activities, not just research RFPs)
- promote better integration of MAP's outreach activities with the projects and programs of other SFOS divisions, to build outreach in at the beginning and not as an afterthought (this increases the relevance of the outreach by getting to the target audience more directly and quickly, and helps the research program by adding a strong outreach component which can help with funding)

***School-Wide Topics*** (for consideration for other parts of the overall plan)

Faculty needs

- regular faculty meetings, including time for informal interactions among faculty
- school support for other inter-divisional faculty interactions
- SFOS internal communications

Sea Grant

- continued good communication with Sea Grant, especially the circulation of relevant materials from all sources

Business office

- provide real-time, accurate accounting at the project and program levels

School administration

- continue in-person administrative meetings with divisional leaders and SFOS and UAF leadership
- give greater authority to division directors to re-allocate funds within the division
- develop better sense of shared mission and support between SFOS and MAP
- recognize that MAP should not be limited by the other parts of the school, but should respond to needs and opportunities relevant to MAP's mission, which is fully reflected in the overall school mission

Communication

- need better school-wide programs for external communication and outreach

**GLOBAL UNDERSEA RESEARCH UNIT**

***Mission Statement***

The mission of the Global Undersea Research Unit is to promote understanding and exploration of the undersea environment through research, administration of research programs and education.

### ***Program Description***

The Global Undersea Research Unit (GURU), established in 1998, has academic faculty and administers the West Coast and Polar Regions Undersea Research Center. The faculty members are part-time staff members of the Center, which provides approximately 50% of their salary. Disciplines represented by the faculty are geological oceanography, geochemistry, and marine biology. This faculty group is very active in submitting research proposals and has been quite successful in obtaining research funds. Research activities are quite diverse and span the North and South Pacific Oceans and polar seas, and range from the intertidal to abyssal depths. The faculty also contribute to the Graduate Program in Marine Science and Limnology by teaching oceanographic and marine biological core courses, other University courses, and training graduate students. The Kasitsna Bay Laboratory is an important teaching and research site for faculty and students. Development of a major diving program is underway at the Lab, and other undersea activities using the Lab as a base of operations are being planned

In 1990, NOAA's Undersea Research Program (NURP) established the West Coast and Polar Regions Undersea Research Center at SFOS, following a national competition in which we submitted the successful proposal. The Center's mission is to promote, facilitate, and support undersea research along the west coast of the United States, including Alaska, and in Arctic and Antarctic regions. The Center places scientists underwater directly through use of submersibles and advanced wet diving or indirectly by using remotely operated vehicles (ROVs), autonomous underwater vehicles (AUVs) and remote observatories. Projects are selected from fisheries, oceanographic, and marine biological proposals through an annual peer review process. The Center's region includes about 2/3 of the U. S. continental shelf and coastline, with fisheries resources constituting over 60% of the U.S. total catch. A significant amount of science supported by the Center is related to fisheries resources. The region covered by the Center also includes active tectonic margins with earthquake-producing subduction zones, transform fault zones, seamounts, and mid-ocean ridges. These areas are targets for Center-supported research in geology, geophysics, chemistry, and biology. The Arctic and Antarctic Oceans are also targets for basic and applied research because of their unique environmental conditions, resources, and susceptibility to global climate change. In Alaska, the Center has primarily funded fisheries research in Southeast, Prince William Sound, Kodiak, and the Bering Sea. Funded projects have also included nutrient, benthic, and gray whale feeding studies in the Bering and Chukchi Seas.

### **Program Goals and Objectives**

#### ***Undersea Research***

GURU faculty, even though they are part-time, have been very successful in competing for extramural funding. In fact, faculty members are essentially funded for most of their available time so future growth in this area will be somewhat limited until new faculty can be added. A major objective is to increase undersea research and undersea research opportunities. Some specific goals are to:

- Maintain current research and funding levels
- Grow through addition of new faculty members in Marine Biology, Marine Geology and Fisheries
- Provide opportunities for graduate students to conduct research utilizing undersea technology
- Increase research at Kasitsna Bay Laboratory and in Alaska, especially, research utilizing SCUBA (see Center goals below)
- Develop collaborations that will contribute to GURU goals, such as with the Kachemak Bay NERR, NOAA's Center for Fisheries and Coastal Habitat

Research and NOAA's Environmental Cooperative Science Center (a Minority Serving Institutions program)

- Develop a major program in seafloor/habitat mapping
- Participate in the International Ocean Drilling Program
- Expand NaGISA to a global program (Census of Marine Life)
- Develop, in collaboration with IMS, a strong Marine Geology Program
- Conduct research on tectonic margins and seafloor ridges and flanks
- Conduct research on the Bering and Arctic Ocean benthos
- Develop research on the marine geology and volcanism of the Aleutian Arc

### ***Teaching***

GURU faculty are part-time and their teaching contributions to the Graduate Program in Marine Science and Limnology are expected to be only a portion of that of regular faculty. The objectives are to contribute expertise to GPMSL core courses and to periodically offer advanced electives for Marine Biology and Oceanography graduate students. Specific goals, all in collaboration with GPMSL, are to

- Contribute to high quality educational opportunities for students
- Provide SCUBA courses at Kasitsna Bay Laboratory
- Provide graduate electives in Marine Biology and Geological Oceanography such as: Polar Marine Biology, Macroalgology, and Submarine Geology of Island Arcs, plus service courses in marine biology for school teachers
- Increase opportunities for graduate training in marine biology and geology, in collaboration with IMS
- Develop an undergraduate marine biology degree program, in collaboration with IMS

### ***Service***

GURU faculty, being part-time, have relatively limited service workloads. However, the faculty participate in many activities similar to full-time faculty that provide a service to the University, the research community, the education community, and the public, such as service on committees, panels, and councils. The objective is to provide expertise and time as appropriate that constitutes a significant contribution to the needs and goals of the receiving entity. The goals are to:

- Serve the University through participation in various committees and governance bodies
- Serve the research community through the peer-review process, advisory groups, and active participation in professional societies
- Serve the education community through guest lectures and school presentations, curricular activities and teacher mentoring/courses
- Serve the public through provision of expertise in an advisory capacity to community groups and local governments

### **West Coast and Polar Regions Undersea Research Center**

The Center is funded by NOAA's Undersea Research Program (NURP) and, consequently, the Center must develop a strategic plan nested within those of NOAA and NURP. NOAA is in the process of developing a new strategic plan so a formal Center plan is in abeyance pending completion of the planning exercise at NOAA. However, the plan elements provided here should suffice for near-term SFOS purposes. The objectives for GURU are to continue to operate the Center in a professional manner, to maintain an impeccable peer-review process, and to expand

opportunities for undersea researchers through growth of the Center's budget and scientific staff. The goals are to:

- Utilize initiatives to focus undersea research funds on regions or topics of special interest.

Examples:

- 2003 Workshop for Washington/Puget Sound research
- 2004 Exploratory research: Western Gulf of Alaska – Aleutians
- 2005 ALVIN Art (with NURP) – research and outreach
- 2005 Washington/Puget Sound Research Initiative

- Future possibilities for Initiatives:

- Deep-water Fisheries
- Benthic habitats/essential fish habitat
- Eastern Gulf of Alaska – Seamounts
- Bering Shelf Slope and canyons
- Aleutian Trench
- National Marine Sanctuaries

- Encourage hypothesis-based exploration science
- Increase emphasis on shallow-water ROV science, AUV science, and seafloor observatories
- Stay abreast of technological developments for undersea applications
- Improve Center outreach through increased report and article production
- Fund a visiting scientist program (contributes to outreach)
- Develop a major Cold-Water Dive Program at Kasitsna Bay Laboratory
- Center Fellowships (or Postdoc) for SCUBA research at Kasitsna Bay Lab
- Add at least one faculty/staff scientist in Marine Biology or Marine Geology
- Increase Center budget through increase in NURP budget – SFOS, UA help needed.

The Center's performance was reviewed in 2000 by a Board of Visitors appointed by NOAA. On the recommendation of the Board, the Center's strategic plan includes the following:

- Exploration research efforts are encouraged.
- Add staff if budget increases:
  1. Communications/outreach
  2. Field office in Washington or Oregon

### Kasitsna Bay Laboratory

The Kasitsna Bay Laboratory has been utilized for many years by GURU faculty for teaching, research, and training graduate students. The Lab was officially transferred to GURU to manage in April 2003. The major objectives will be to provide financial stability, participate in NOAA construction planning for Lab upgrades, and to develop a major Cold-Water Dive Program based at the Lab. The goals are to:

- Increase all types of research at the Lab.
- Increase SCUBA research and activities based at the Lab through:
  - ✓ disseminating information about opportunities at the Lab
  - ✓ exploring collaborations with other NURP Centers
  - ✓ providing financial aid to graduate students doing research at the Lab
  - ✓ providing seed money to faculty and other researchers in the form of small grants to develop research at the Lab
  - ✓ funding a Postdoctoral position at the Lab, budget permitting
- Increase collaborations and interactions with local entities, i.e. the Kachemak Bay National Estuarine Research Reserve and with the Center for Coastal Habitat and Fisheries Research.

- Utilize the Lab to involve UAF in NOAA's Environmental Cooperative Science Center (a Minority Serving Institutions program)
- Encourage faculty and other researchers to submit NURP proposals for research at the Lab
- Contain Lab operating expenses through improved oversight

### ***Administrative Support Needs***

GURU and the West Coast and Polar Regions Undersea Research Center will benefit from the following actions by SFOS and UAF.

- Work with the Alaska delegation to increase the budget for NOAA's Undersea Research Program, including the WC&PRURC
- Help GURU maintain Kasitsna Bay Laboratory for SFOS use
- Provide centralized, quality space for the Center
- Provide laboratory space for future faculty hires (as needed)
- Work with the State to provide a significant number of SFOS ship days each year for the new vessel for benefit of SFOS faculty and students

## **INSTITUTE OF MARINE SCIENCE AND GRADUATE PROGRAM IN MARINE SCIENCES AND LIMNOLOGY**

### ***Mission Statement***

The Institute of Marine Science and Graduate Program in Marine Science and Limnology discover new knowledge and educate about marine and fresh waters, focusing on Alaska and the Arctic but extending efforts worldwide.

### ***Program Description***

Alaska has 54% of our nation's coastline, 76% of its continental shelf area, its most productive fisheries, its largest estuary, the only deep sea trench within U.S. territorial waters, and the United States' only Arctic shore. The Institute of Marine Science (IMS), in cooperation with other units of the School of Fisheries and Ocean Sciences (SFOS), is uniquely positioned to conduct Arctic and subarctic research in the aquatic sciences. Much of Alaska's marine and fresh waters remain largely unexplored, and fundamental observations of environmental conditions and biological communities are an essential step in developing a functional understanding of marine and freshwater ecosystems. Current research projects include interdisciplinary studies seeking to understand the effect of climate variability on marine ecosystems and fishery productivity of the Bering, Chukchi, and Beaufort Seas, and the northern Gulf of Alaska. Other areas of research emphasis include Arctic climate change, nutrient dynamics, marine and freshwater ecology, anthropogenic contaminants, and the coastal ocean and observing systems. IMS research is supported by State and Federal agencies, private foundations, and industry. International cooperation with other nations of the North Pacific Rim and Arctic is an important element of IMS programs.

IMS was established in 1960, by an act of the Alaska State Legislature, to conduct research and provide graduate education in marine science and related fields. Since 1987 IMS has been part of SFOS. The Graduate Program in Marine Science and Limnology (GPMSL) houses education programs in biological, physical, chemical, geological, and fisheries oceanography, marine biology, and limnology. Research and education facilities include modern laboratories on the Fairbanks campus, major coastal facilities at the Seward Marine Center, and the Kasitsna Bay Laboratory. The Seward Marine Center has a high-quality running seawater system and

laboratories and is the home port of the R/V *Alpha Helix*, a 133-foot ice-strengthened research vessel operated by the University of Alaska Fairbanks for the National Science Foundation. The Kasitsna Bay Laboratory is a marine biology field station providing access to the extensive intertidal communities of Kachemak Bay. The Alaska SeaLife Center in Seward, an excellent private facility for marine mammal and sea bird research, has several resident IMS faculty and students.

The basic research conducted by IMS has many practical benefits in both the short and long term. Among these are predicting and developing strategies to mitigate natural hazards; improving the safety, security, and efficiency of marine operations; reducing risks to public health and marine life from harmful algal blooms, introduced species, and toxic pollutants; improving predictions of climate change and its effects on marine ecosystems, fisheries, and coastal communities; and providing knowledge that will aid the protection and restoration of coastal marine ecosystem health and help sustain our living marine resources for future generations.

### **Program Goals and Objectives**

- Through integrated biological, fisheries, and oceanographic research, IMS aims to understand the relationships among marine, coastal, and freshwater ecosystems, Alaska's bountiful fisheries, and environmental change.
  - ♦ IMS will develop understanding of the biodiversity, structure, and function of aquatic ecosystems. Understanding of the complex controls on productivity and ecosystem function requires studies that identify and quantify the environmental, physiological, and behavioral factors that affect organisms and their interactions.
  - ♦ IMS aims to discern the coupling of physical, biological, and chemical changes across the North Pacific and Arctic regions, and link these to the global system. Continuous observations over decades, as well as investigations of the sedimentary record of millennia, are essential for identifying linkages between temporal changes in biological communities and changes in the physical and chemical environment.
- IMS will acquire the knowledge needed to facilitate safe human interactions with the oceans and foster wise use of marine resources.
  - ♦ IMS will obtain information needed to assess, warn against, and mitigate marine hazards such as severe storms, storm surges, tsunamis, and harmful algal blooms.
  - ♦ IMS aims to provide information essential to marine transportation, including accurate predictions of currents and coastal erosion and sediment deposition patterns.
  - ♦ IMS will investigate human impacts on ecosystem health, including those due to global warming, pollution, fisheries, and non-indigenous species.
- GPMSL will strengthen and update graduate education programs for the 21<sup>st</sup> century. We will provide for student collaboration in cutting-edge research programs. We will improve the education of our students in the following areas:
  - ♦ Acoustical oceanography, bioacoustics, and fisheries acoustics, the latter in cooperation with the Fisheries Program.
  - ♦ Bio-optical techniques in oceanography
  - ♦ Experimental marine biology
  - ♦ Fisheries oceanography, as a true integration of oceanography and fisheries.

- ♦ Marine chemistry, including the use of geochemical tracers.
  - ♦ Marine geology, in collaboration with GURU.
  - ♦ Marine policy and resource management, in collaboration with MAP and other units of SFOS.
  - ♦ Microbial ecology.
  - ♦ Molecular biology applications to oceanography and marine biology.
  - ♦ Oceanographic field and laboratory methods.
  - ♦ Satellite oceanography
- GPMSL will deliver programs statewide as needed to meet demand for graduate education in marine sciences. Initially, we will focus on making programs fully accessible to students based in Juneau, Kodiak, and Seward.

## Tasks

### *Research and education:*

- IMS faculty, in collaboration with other SFOS and UAF faculty and with coordination and support from administration, will develop interdisciplinary research plans and seek extramural funding to support our research goals. Some example topics include:
  - ♦ Ecosystem studies linking environmental conditions to fisheries
  - ♦ The role of the coastal zone in sustaining marine populations
  - ♦ Transport of contaminants and other materials in the coastal ocean
- IMS faculty and administration will seek extramural and University funding for shared-use equipment and instruments for research and education. Some examples of needed equipment include:
  - ♦ Equipment to support continuous ocean observations.
  - ♦ An inductively coupled plasma mass spectrometer (ICPMS).
  - ♦ A gas chromatography-mass spectrometry (GCMS) system for characterization of organic molecules.
  - ♦ A flow cytometer.
  - ♦ Videoconferencing equipment.
- IMS faculty, with support and coordination from administration, will develop a coastal observing program using existing laboratories and automated coastal facilities.
- IMS faculty will participate in local, national, and international research and research infrastructure planning efforts, representing IMS and SFOS interests, as well as their own.
- Major research programs will encourage and provide for graduate student collaboration and education.
- GPMSL faculty and the Program Head will work to recruit well-qualified students, but particularly in disciplines where students are difficult to enroll.
- IMS and GPMSL faculty will collaborate with other SFOS faculty to employ modern videoconferencing technologies for instruction and for research planning and implementation.
- With the assistance of SFOS administration, IMS and GPMSL faculty will increase collaboration with other UAF programs, including Geology and Geophysics, Biology and Wildlife, Chemistry and Biochemistry and Engineering, to strengthen our curriculum and research programs.

***Faculty positions:***

- Efforts should continue to raise funds to establish endowed chairs in the fields of oceanography and marine biology.
- Since one of IMS' greatest strengths is interdisciplinary research, it is important to have faculty in all major disciplines, i.e., biological, chemical, fisheries, geological, and physical oceanography and marine biology.
- New faculty hires are needed in the following areas. Faculty positions are not in order of priority, because the best choice for an open position will be affected by presently unknown factors, including restrictions set by the funding source, retirements or other departures of faculty, and opportunities for shared positions with other departments.
  - ♦ Acoustical oceanographer. IMS needs a faculty member with research interests in zooplankton or marine fishes. This is a very important approach (and likely to become more so) for studies of structure and function of marine ecosystems.
  - ♦ Bio-optical oceanographer. Bio-optical oceanography is an approach to measurement of primary productivity and its response to light that allows continuous observations in time and space, which is extremely valuable in studies of marine ecosystems.
  - ♦ Ecosystem modeler. This expertise is essential for large, multidisciplinary programs, particularly the capability to combine biological and environmental data.
  - ♦ Experimental marine biologist. The ideal candidate would utilize our coastal facilities and have interests in research on commercial species.
  - ♦ Fisheries oceanographer. An individual with strong interests in integrating fisheries and oceanographic research would be a key in developing understanding of the relationships among climatic change, ocean environments, ecosystems, and fisheries.
  - ♦ Marine chemist. Specifically, a faculty member skilled in the use of geochemical tracers is needed. This is an important research area for studies of coastal transport processes.
  - ♦ Marine geologist. IMS needs a faculty member with interests and capability to examine ocean sediments for records of change in climate, physical ocean conditions, and biological productivity, including the long term records obtainable by drilling the sea floor.
  - ♦ Microbial ecologist. Multidisciplinary studies need to include this key component of marine food webs, and currently we must use collaborators from other institutions. The ideal candidate would employ molecular biological techniques and could enhance the graduate curriculum in that area.
  - ♦ Satellite oceanographer. This approach is crucial to adding larger spatial and temporal scale information to ocean observations from ships, moorings, and coastal installations.

***Facilities:***

- *Short term need*
  - ♦ There is a need for inside, secure, and accessible storage for samples; warm, refrigerated, and frozen sample storage areas are needed.
- *National funding priority*
  - ♦ Efforts should continue to secure the UNOLS Alaska Region Research Vessel, which will provide a unique ability to combine field work in fisheries and traditional

oceanographic disciplines, provide highly sophisticated sampling systems to the interdisciplinary research team, and offer students opportunities to learn modern approaches to sample collection and oceanographic observations.

- *Capital investment in SFOS*
  - ♦ Continued efforts to expand Seward facilities to accommodate the new ARR V are a high priority, including warehouse expansions, shops, offices, sample storage, dock improvements, and laboratory upgrades to continue experiments begun at sea. Classroom and teaching laboratory facilities should be included in the improvements, to support expanded education programs.
  - ♦ A new, modern research and teaching facility is needed to bring SFOS Fairbanks faculty together in a single building.
  - ♦ External funds should be sought for upgrades to Kasitsna Bay Laboratory.
  - ♦ The administration should work with other University and external groups to improve and maintain research facilities in Barrow.

***Planning and program development:***

- The strategic plan should be updated regularly.
- There should be frequent opportunities for SFOS faculty at different sites to meet and discuss research and education programs.
- UAF and UA Statewide leadership should be informed about and asked to assist in achieving IMS and SFOS goals.
- National funding initiatives and evolving research directions should be examined for opportunities. This needs to be a collaborative effort between the administration and the faculty.
- The administration should nurture and advocate for new programs.

***External relations:***

- SFOS and IMS should help to build the user group for the ARR V by working with organizations such as the North Pacific Research Board that can fund ship time for the researchers they support.
- IMS and GPMSL faculty will work with administration and staff to increase visibility of our research and education programs through improved public information activities.

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***Commentary and Acknowledgements:***

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