

STRATEGIC PLAN: DEPARTMENT OF FISHERIES, ANIMAL & VETERINARY SCIENCE JANUARY 15, 2002

I. FAVS HISTORY AND MISSION STATEMENT

History of the Animal Science Program

The origins of the animal science program at the University of Rhode Island go back to the birth of URI as the Rhode Island State College of Agriculture and Mechanic Arts in 1892. At that time all the areas of animal, plant and soil sciences were together under the umbrella of agriculture with the accompaniment of the Rhode Island Agricultural Experiment Station. Work was done specifically on dairy cattle, beef cattle and poultry. As the college grew the areas of discipline developed by 1914 with separate departments of Animal and Poultry Industries and Dairy Husbandry. The faculty were scattered and were not brought together until the occupation of Woodward Hall in the late 1950s. In the 1930's there were two important areas of development. The first was a full-scale poultry facility for over 5000 birds that included rearing facilities for broilers and layers as well as egg laying test facilities. This led to numerous practical and research publications especially in the area of poultry genetics, breeding and selection. The second important area was the building of a first class dairy facility through the auspices of the Works Progress Administration (WPA). This was dedicated in 1936 and included a stanchion barn, milking parlor, bull test stud and an operating dairy plant that supplied the dining halls with milk until the mid 1960s. Research concentrated on genetics, breeding, ruminant nutrition and dairy management problems. In addition, a calf barn was constructed at Peckham Farm.

As of January 1 1960, the animal and veterinary science program area was organized into a Department of Animal and Dairy Husbandry (5 faculty members), Poultry Husbandry (4 faculty members), Animal Pathology (3 faculty members) and a field staff with 3 extension agents. On May 14 1960, Woodward Hall was dedicated by the Secretary of Agriculture Ezra Taft Benson. At that time, all the aforementioned faculty were moved to Woodward Hall and occupied 10 of the 31 laboratories in the North wing. Farm produce such as eggs were sold in Woodward's retail store. The pathology lab in Woodward diagnosed over 1200 specimens for animal diseases annually. The combined departments offered 31 different courses, including a full program in dairy technology. Total college enrollment in 1963 was 235 students (216 were male) and there were 40 faculty members.

By 1973 the dairy and poultry areas were combined into Animal Science with a total of 11 faculty members. Animal Pathology remained separate with 4 faculty members for a total of 15. During this time there were two significant events. The first was the dissemination of the dairy herd over a two-year period and the conversion of the dairy barns to fish culture and then a short time later the elimination of the poultry flock at East Farm and the subsequent retooling of the poultry faculty into aquaculturists. During the 1970's the number of student animal science majors increased enormously as women began to enter animal science programs on a wholesale basis and veterinary schools became somewhat more accessible. At this time recognizing a need for change the department focused its

teaching on the areas of pre-veterinary, animal science and laboratory animal science. Research was carried out in the budding area of lab animal science since that was what facilities were best suited for.

The 1980s were marked by the joining of animal pathology to the animal science group as well as the move of animal pathology to an aquatic orientation and hence to East Farm. This opened a move of the animal and veterinary science faculty, in part to Peckham Farm. This led the animal science area to the present since facilities were available to permit hands on teaching and applied research. The teaching program grew in spite of faculty losses to the largest in the college. Research expanded into new areas including animal biotechnology, reproductive endocrinology, stress and animal behavior and welfare. These fields of research are among the top research priorities of both the American Society of Animal Science and the American Veterinary Medical Association.

Presently, teaching programs remain strong and student numbers are at a record high. Innovative programs in experiential learning and the reputation of the faculty for teaching quality keep us very effective at the undergraduate level. The past decade has, however presented us with one half-time position hire and left us with 5 position vacancies.

History of the Aquaculture Program

The aquaculture program at the University of Rhode Island developed in the mid-1960s in the Department of Animal Science upon the dismantling of URI's Dairy Science Program. Professors Lewis Smith and Thomas Meade built a research program within the Animal Science Department focusing upon the culture of salmonids, including brown trout, rainbow trout and Atlantic salmon, and URI's first freshwater aquaculture facilities was in the URI Dairy Barn that still stands east of the current Automotive Service Facility and the Central Mail Facility. In these early days, the program worked cooperatively with the state Fish and Game hatcheries in Perryville, Lafayette, and Arcadia, RI, and the century-old American Fish Culture Company in Carolina, RI founded by Peace Dale textile magnate Rowland Hazard. Interestingly, the study of aquaculture was not new to URI or the Colleges of Agriculture and Resource Development, the forerunners of the College of the Environment and Life Sciences, then known as the College of Agriculture. In the mid-1910s, URI's first marine laboratory was established at the end of Succotash Road in the village of Jerusalem in Narragansett. Among the duties of the laboratory was to study methods of propagation of marine organisms, including oysters and lobsters. Today, at the site of the original URI marine station is the RI Department of Environmental Management's Coastal Fisheries Laboratory. As a result of a troubled oyster aquaculture industry, research on the aquaculture of oysters at URI continued through the 1930s and 1940s at the URI Narragansett Laboratory (now the Graduate School of Oceanography) when a cooperative arrangement was made with the U.S. Bureau of Commercial Fisheries (now the National Marine Fisheries Service) to house the laboratory of renowned oyster researcher Paul Galtsoff. Presently, the Galtsoff Collection of oyster literature prominently resides in the Challenger Room of the Pell Library, and Galtsoff's oyster hatchery-laboratory building serves as the Mosby Center at the Narragansett Bay Campus. This successful collaboration between a federal agency and URI in aquaculture research led

directly to the establishment of two federal laboratories adjacent to the Narragansett Bay Campus.

The early 1970s brought a wave of expansion in the URI Aquaculture Program. The phasing out of the Poultry Science Program led to the creation of a stand-alone Aquaculture Science and Pathology Department consisting of aquaculturists and animal pathologists from the Animal Science Department supplemented with some additional faculty hires. Additionally in the late 1970s, the Freshwater Aquaculture Center and the Aquatic Pathology Building was constructed at East Farm. During the 1970s and 1980s, research focused on the nutrition and physiology of Atlantic salmon and piscine pathology and virology. Due to the research and outreach efforts of Drs. Yates, Chang and Wolke during this time period, URI had one of the leading aquatic pathology/virology programs in the nation.

The late 1980s brought a wave of consolidation of both terrestrial and aquatic animal sciences at the University with the merger of the Departments of Aquaculture Science and Pathology, Fisheries and Marine Technology and Animal Sciences to form the current Department of Fisheries, Animal and Veterinary Science. During this period, research on problems related to salmonid physiology continued, and there was a renewed interest in molluscan shellfish culture because that was the only form of commercial aquaculture conducted in the state at that time. The department began to distinguish itself by conducting research into the spawning and culture of several species of marine finfish, including striped bass, summer flounder, winter flounder, black sea bass and tautog. By 1995, research conducted at URI led to the commercial establishment of several summer flounder aquaculture operations in the New England region. Much of the work begun in the late 1980s and early 1990s continues on to today, but the department's preeminence in aquatic pathology has waned due to faculty retirements and one single pathology replacement during the last thirty years.

History of the Fisheries Program

The University of Rhode Island made a commitment to the study of marine resources worldwide in the early 1960s. The effort was multi-disciplinary and included fisheries science and technology, economics, food science, oceanography, and social sciences. The original fisheries technology program was conceived in 1966 as a result of a cooperative effort between the University, the Point Judith Fishermen's Cooperative, and various state and federal agencies. At the time, the US catch from the Northwest Atlantic was declining, while the overall catch by all nations from the same waters was increasing markedly. A core faculty from URI developed a curriculum for a two-year vocational program that provided students with an Associate of Science (AS) degree in Fisheries and Marine Technology. URI was the first institution in the United States with a fisheries technology program. The first class entered the program in September 1967. The goal of the program was to produce knowledgeable, and experienced fishermen to lead the US fishing industry.

The fisheries technology program was located at a waterfront facility in Wickford, RI about 12 miles from the main University. It consisted of three buildings and included faculty offices, a library, student lounge, 2 classrooms, a navigation laboratory, and a marine

engineering laboratory. The training vessels ranged from 13 ft Boston Whalers to the 48 foot wooden R/V *Gail Ann*.

The undergraduate AS degree academic program peaked in the mid-70s with an average enrollment of 50-75 students per year class. Eight to 10 faculty served the 100 to 150 students in the program. The need for increasing capacity in the fishing fleet peaked in the late 1980s directly impacting enrollment in the AS program. The last students graduated from this program in September 1986, and the program was transformed to a four-year fisheries science BS degree program upon merger with the Aquaculture Program. However the fisheries technology roots of our program has been maintained by continued course offerings through Professor Wing, and is a unique feature of URI's program in comparison to universities nationwide.

Today, fisheries are facing very different problems: overfishing, overcapitalization, and rebuilding stocks have called for a change in the "catch everything you can" philosophy into a "target what you catch" one. The fisheries technology program at URI has continued to respond to this need for trained personnel by designing a Bachelor of Science, Masters, and PhD program in Fisheries Science and Technology. The graduates of this program are prepared to enter the field of commercial fisheries, fisheries management, fisheries research, and private consulting. The program is now located at a building on the East Farm Campus, located 1.5 miles from the main campus. The research vessels include a variety of small whalers, a 25-foot Romarine and the 54-foot fiberglass R/V *Captain Bert*.

In 1999, a group of staff and faculty began discussions on the future of fisheries as an integrated program at URI. An informal working group was formed under the guidance of Dean Margaret Leinen that met during the summer to develop a strawman for the Fish, Fisheries and Aquaculture Initiative (FFA). In order to advance these ideas, a university-wide, facilitated discussion took place in September 1999 at the Coastal Institute. Nearly 40 URI faculty, staff, and students attended the meeting participating in the SWOT analysis, identification of core values and goals that were used to develop a draft FFA mission statement. A second meeting was held with members from federal, state, and private sectors involved in fisheries and aquaculture. A plan of activities was developed from this meeting that is currently being implemented.

DEPARTMENTAL MISSION STATEMENT

The mission of the Department of Fisheries, Animal and Veterinary Science is to teach, conduct research, and offer extension service in the field of animal production. Production refers to the capture, culture, reproduction, management and health of animals in both natural and contrived environments. Animals include, but are not limited to, molluscan, crustacean, piscine, avian and mammalian species. Teaching is at both the undergraduate and graduate levels including physiology, pathology nutrition, genetics, endocrinology, aquaculture, and fisheries. Such a curriculum should ensure the development of technicians and scientists able to efficiently and responsibly produce many species of animals, and to protect them from environmental insult.

Our Vision - The Future of Animal Science, Fisheries and Aquaculture in the World, Region and Locally in Rhode Island

A growing world population and the consequent pressures on the environment call for the development of sustainable sources of food production. At the same time, with education and economic development public awareness of environmental issues continues to rise. Issues of concern include pollution, habitat degradation, erosion of biodiversity and animal welfare and well-being. These threats particularly impact the aquatic environment, in which the harvesting pressure has increased exponentially during the past century.

We envision a future in which:

- Ecosystem-based management of natural resources is widely used, requiring the ability to model biological systems and account for linkages between pollution of the food chain and negative impacts on food production and human health.
- Consumers demand and pay a premium for food products, such as meat and seafood, that are not only healthy but have been produced in an ecologically sustainable way.
- Threats to the aquatic environment and fishery resources enhance the need for sustainable management of fisheries and the development of aquaculture.
- The quality of our environment will be a critical success factor in decreasing imports (and/or increasing exports) of primary marine products. Industry will increasingly see sound environmental management as being in its enlightened best interest.
- Litigation on marine conservation and management issues continues to grow, having a major influence on law, policy, and research. Increasing recognition that nation states cannot manage environmental issues unilaterally, resulting in more collective action on such issues. International arrangements such as UNCLOS (The United Nations Convention on the Law of the Sea), the Convention on Biological Diversity, the FAO Code of Conduct on Responsible Fishing, and the UN Convention on Straddling Stocks and Highly Migratory Species, will become more important in managing fisheries.
- Major structural changes occur in the management of fisheries and other marine resources; e.g., wide spread adoption of rights based methods and co-management.
- Greater responsibility for environmental decision-making is afforded to State and local governments, communities, and individuals.
- Stakeholders actively conduct research and implement micro-level management of local fisheries and other marine resources.
- The numbers of fisheries and aquaculture researchers and managers grow ten-fold from what they are today, employed not only in government and academic institutions, but by companies, local communities and environmental organizations.
- Fisheries and aquaculture researchers and managers are sought who have both depth and breadth in their training, i.e., possess skills in a wide range of traditional disciplines, from the natural resource sciences and social sciences to the legal and political aspects of management and are able to communicate effectively with managers and other decision makers.
- New technologies emerge for research, reduction of waste, ecosystem modeling, acoustics, and satellite navigation. Changes to aquaculture and fisheries enhancement technology are likely and desirable.

- Aquatic Animal Health management will be an ever-increasing area of research and practical concern as aquaculture production intensifies and becomes commercially more widespread.
- The widespread availability of information technology radically changes the way in which decision-making occurs, e.g., closer to real time information, increased transparency, and greater accountability.
- The continued expansion of the field of animal science into ‘non-traditional’ animals such as game farm and zoo animals.
- The United States horse industry’s financial input to the US gross domestic product currently exceeds \$112.1 billion. As such, there is a sustained demand for innovative research in the areas of nutrition, reproduction, physiology and genetics.
- Continued growth in the field of animal biotechnology necessitates a consistent demand for qualified students
- A continued interest in the ethical treatment of animals especially pertaining to the area of animal production and management
- Increasing participation of women and minorities in Fisheries, Aquaculture and Animal Sciences

Research. *The research component of the vision will focus on a selected research areas that:*

- *Reside in the forefronts of their respective fields;*
- *Lead to increased and significant external competitive grant funding;*
- *Lead to significant peer-reviewed publications;*
- *Have a clear and reasonable relationship to the Mission of CELS;*
- *Have a clear and reasonable relationship to each other in the context of a discipline or area of academic interest.*

We believe that it is essential to interweave research programs in Animal Science with our undergraduate strengths. Our goal is to be team oriented and build discipline depth starting with faculty researchers who direct graduate students who in turn work with and mentor advanced undergraduates. In this manner we can join our teaching and research missions while at the same time meet the continuing demand by undergraduates for experiential learning. The addition of new faculty will permit us to revitalize our graduate program, which has languished in recent years due to the necessary reassignment of faculty time to meet the ever-expanding demands of the undergraduate program. Our general goal is to develop innovative and creative projects that lead to the use of new technologies and implementation of new ideas. In this respect we look to four areas of focus. In no specific order they include animal stress and well-being, animal diseases, animal biotechnology and bioethics, and applied animal research in the area of exotics animals and the equine and animal biotechnology. This focus is appropriate and attractive for FAVS for a number of reasons:

- a) Stress and well-being, biotechnology and the topic of vector borne disease are all currently targeted areas of research by the USDA and AVMA.
- b) Local pharmaceutical companies maintain research and assessment programs using experimental animals, so having expanded objective measures of animal stress may

- be of potential interest when new drugs are evaluated. And there is potential for greater collaboration with this lucrative industry.
- c) Study of animal stress and animal diseases makes for intradepartmental collaboration with fisheries, aquaculture and animal science researchers who study means to reduce stress and disease in terrestrial animals, fish and shellfish to improve production in captivity or survival in the wild.
 - d) We have previously enjoyed a very active research team in the area of stress and welfare, but the loss of Dr. Richard Rhodes III has slowed research in that sphere. The envisioned revitalization of animal stress research would be appropriate to build a departmental partnership with the Agricultural Experiment Station.
 - e) Study of vector borne disease in animals provides opportunity for cross-department collaborations within CELS and external collaboration with state and regional public health agencies.
 - f) Study of animal responses to vector borne diseases allows for focus on topics of particular interest to the region, particularly the equine industry (e.g., Lyme Disease, West Nile Virus, Eastern Equine Encephalitis) that require animal models and are likely to garner considerable external funding.
 - g) The significance of the equine industry in the region and the demand for equine programs at both the undergraduate and graduate level coupled with the availability of funding from both the USDA, for vector borne disease research, and the equine industry itself, for research into all aspects of equine health and well-being, justify the development of an equine research program.
 - h) The intense interest in exotic animals at both the undergraduate and graduate levels is a phenomenon observed not only nationally but regionally as well. We are well positioned to initiate an applied exotic animal research program due to our close proximity and ties with the numerous zoos and game farms in the region. . This interest in exotic animals makes for interdepartmental and external collaborations (such as Roger Williams Zoo) interested in biodiversity and conservation issues.
 - i) The explosion of the animal biotechnology industry in our state and region has created not only interest but also the means to fund research into subject matters directly applicable and beneficial to the industry itself. We will couple the existing strengths in FAVS with collaborative research that crosses departmental regulatory agencies to develop appropriate research-based policies.

In the Program Area of **Aquaculture**, we envision an expansion of an already solid and internationally renowned research program in the young fields of marine aquaculture and biotechnology. This vision involves continued research into successful areas including: assessment and development of novel aquaculture species, marine finfish larviculture, fish physiology, shellfish restoration, environmental impacts of various types of aquaculture operations, development of molecular tools for the prevention of fish and shellfish diseases and the use of biotechnology to improve fish production. We also envision an expansion into our area of former strength, i.e. finfish and shellfish pathology and health management and a significant participation in large-scale interdepartmental research initiatives in Invertebrate Pathology and Vaccine Development. We see utilizing the new Luther Blount Aquaculture Center at the Narragansett Bay as a cornerstone in our energized program in marine finfish culture, pathology and aquaculture biotechnology. We also foresee the

rehabilitation and modernization of the Freshwater Aquaculture Center at East Farm to better support ongoing research and teaching with freshwater species of finfish.

In the Fisheries Program Area, we envision continuation and expansion of our research area of fishing gear and target species interactions, and we envision becoming a major research center in the area of ecosystem based-fisheries management. A major revolution is beginning on how fisheries are to be managed, and FAVS can be at the forefront by being THE place for the study of trophic interactions among fisheries species, and THE place for interdisciplinary work in ecosystem fishery management along with other strong departments with intersecting interests (e.g. MAF, ENRE, GSO).

Teaching. *The teaching component shall be a realistic, coherent vision of undergraduate and graduate education, which reflect explicit goals of the B.S., M.S., and Ph.D. in that Department. Degrees offered should provide competitive preparation to remain current with the evolving needs of industry and society.*

Animal Science –

The overall vision of the teaching program with Animal Science is to provide a broad education in the animal sciences that combines biology, chemistry and the applied sciences that will not only enable students to focus on the care, physiology, ethology and health and well-being of animals but will also position these students to respond to the ever evolving needs of society. The diversity of the undergraduate Animal Science program will adequately prepare students to go in a number of possible directions such as veterinary school, graduate school or technical employment in the ever expanding field of animal biotechnology. The future of the undergraduate teaching program in Animal Science will be three pronged. The first goal in teaching will be to capture and expand on the extraordinary interest in exotic animals. To this end, this past spring we introduced an experimental exotic animal management course that attracted over 80 students. We are already poised to work in this area and have the advantage of numerous zoos in the immediate area. Our second goal in animal science will be to develop an equine program that can compete for the bevy of potential students who currently attend other institutions with larger equine programs than ours. We are well positioned to expand into this area with the recent hire of a farm manager with extensive experience in the equine field both as a farrier and as a youth educator and a current faculty member with undergraduate and graduate training in equine science. Our facilities at Peckham Farm can be modified to house a larger number of horses with relative ease so that the course work in the equine program would be enhanced with experiential hands-on learning. The third area is animal biotechnology. Biotechnology companies have been hiring our students as fast as we can turn them out. The future will allow us to develop an animal biotechnology major designed for students who are interested in molecular biology, genetics and biochemistry as they relate to animals. There is already strength in related areas in CELS so we expect this to be a cooperative teaching effort.

All of the above areas give us the opportunity to assist students to identify with and better understand the ethics and goals of the profession and encourage a lifetime of learning. The department's long time focus on research in animal welfare and well-being is a natural blend into the aforementioned areas of emphasis. We will continue to include bioethics into many of our course offerings and hope that CELS will consider a college

wide emphasis in this area as we continue our planning. As long as URI Central administration depends heavily on the Program Contribution Analysis, the maintenance of a strong undergraduate program is unequivocally in our best interest. The beauty of our programs is that we provide students with the hands on experience they want so badly in classes, research laboratories and in the field. We envision expanded course offerings in equine management and management of exotic and wild animals and expanded collaboration with staff from the Roger Williams Zoo.

Aquaculture and Fisheries –

In the area of Aquaculture and Fisheries Science instruction, there has also been a long tradition of hands-on experiential learning. The inclusion of fishing gear technology courses in our fisheries program has been a unique feature of the FAVS Program in comparison to other universities with fisheries science programs. In the last year we have joined together the Fisheries Science and Technology (FST), the Marine Resource Development (MRD) and Aquaculture Science and Pathology (ASP) programs administered by FAVS into a single unified Aquaculture and Fisheries Science (AFS) program. This merging of instructional programming in the aquatic sciences in the department represents a realization that seafood production is a continuum from capture of pure wild stocks, through enhanced and managed fisheries to fully managed and enclosed ecosystems of aquaculture. The merger makes sense from the points of view of both good management and intellectual synergism. We envision continued excellence in the hands-on nature of our gear technology instruction and aquaculture technology, as well as continuous pursuit of the ‘cutting edge’ of instruction in Aquaculture and Fisheries Science by new course offerings in Crustacean Aquaculture, Environmental Impacts of Aquaculture, Aquatic Health Management, Issues in Biotechnology, and Ecosystem-Based Fisheries Management.

Outreach. *Each department should have an explicit plan for a significant outreach component, easily identified by potential stakeholders. This will vary with the department in question, and need not be related to CE. Ultimately, however, a good outreach Vision and/or Mission and must look like an attractive investment to stakeholders.*

Animal Science –

Vector borne diseases are in the forefront of public awareness and subsequent concern in the state of Rhode Island. We envision an expanded insect identification laboratory serving the Rhode Island public with high visibility, quality service in screening for deer ticks and Lyme spirochetes in ticks. But this laboratory will be a combined Mosquito/Tick Lab administered by the Plant Sciences Department. FAVS outreach personnel will assist the in outreach program delivery in the area of effects of vector borne disease on horses and other livestock.

The horse industry within the state of Rhode Island is a significant one, which, for the most part, is unsupported within the FAVS department. Steps have already been taken to begin to interface with cooperative extension and 4-H clubs within the state. Our ultimate vision is the coordinated development of a dynamic, cutting edge resource that will not only serve to enhance the continued education of all levels of the equine industry in the state but will encourage new interest in horses, particularly in the youth of the state.

The outcome of our outreach program that targets vector borne diseases and the horse industry will be an increased visibility of the University within the community and throughout the state of Rhode Island. This increased visibility will effectively bring people to the campus of the University of Rhode Island and thus complete the mission of higher education in the Land Grant & Sea Grant traditions.

Aquaculture and Fisheries Science –

The vision for fisheries and aquaculture outreach centers upon continued collaborative efforts with the Regional Aquaculture Extension Program of the Northeastern Regional Aquaculture Center, the Aquaculture and Fisheries Program Area of Rhode Island Cooperative Extension, and Rhode Island Sea Grant. In all three entities, there has been a change in leadership in the last 12 months. In both RI Sea Grant and NRAC, the new directors have considerable interest and experience in aquaculture and fisheries research and extension, and FAVS is in a good position to improve on an already strong collaborative relationship with their agencies. We envision our outreach program in Aquaculture and Fisheries from industry advisory panels, the Fish, Fisheries and Aquaculture (FFA) initiative of the URI Coastal Institute, as well as sister state agencies with interest in Fisheries and Aquaculture management (e.g. DEM Division of Fish and Wildlife and the Coastal Resources Management Council). Key program areas envisioned in the next ten years include information support to the fisheries industry and regulatory agencies grappling with a transition from single-species based management to ecosystem and/or ecosystem based management schemes. We also envision expanded outreach in aquatic pathology and quarantine issues as the aquaculture industry expands in the state and regionally. We envision the continued expansion of the Annual Rhode Island Aquaculture Conference into a fully institutionalized multi-state biannual Conference and Trade Show Expo for the Northeast. We further envision expanded outreach support in the area of public aquaculture for shellfishery and coastal habitat restoration. Fisheries extension will continue to work in issues of interest to fishermen and federal and state agencies. New areas of outreach will be designed with NMFS and ASMFC input in fisheries science and management.

II. CURRENT STATUS. *This is the “Where are we now?” statement of the Department.*

These assessments are ideally presented with real historical data ranging over the 3 –5 period preceding the analysis, such as history of enrollment, yearly research expenditures (as distinguished from awards per given year), graduate employment profiles, average graduate GRE scores, and comparisons with peer programs at other institutions. Such data might be most effectively presented graphically or in tabular form.

Staffing:

At present, Dr. Michael Rice serves as chairman of the FAVS Department. Dr. David Bengtson serves as the Departmental Graduate Program Director, and Katherine Favreau and Marion Houston provide clerical support at Woodward Hall and East Farm respectively.

The Aquaculture and Fisheries Science (AFS) Program faculty and staff provide support for both the capture fisheries and aquaculture instruction, research and extension. No new faculty members have been hired in the area of capture fisheries since 1983 and the number of fisheries faculty have declined from 7 in 1983 to 2.5 in 2001, even though this remains a very active programming area in the State of Rhode Island. The current fisheries faculty and staff are:

Fisheries Faculty	Allocation	Staff	Funding Allocation
Dr. Joseph DeAlteris – full prof.	9 month CELS / 3 month recontract	Kathleen Castro	10 month SG / 2 month research
Dr. Conrad Recksiek – full prof.	12 month CELS	David Beutel	10 month SG / 2 Month CE
Richard Wing associate prof. equivalent	4.5 month CELS / 1.5 recontract	Laura Skrobe	12 month SG
		Barbara Somers Tom Puckett	12 months research Part-time boat account

The majority of the Fisheries staff are supported by RI Sea Grant (SG) Extension funding. Additional funds are obtained through research projects or Cooperative Extension (CE) support. It is important to note that Professor Wing is currently on the half-time retirement incentive program and is expected to fully retire in 2003, and this will be creating a severe problem in curriculum delivery if a replacement is not sought.

The faculty and staff responsible for delivery of the aquaculture curriculum research and outreach in the AFS Program are listed in the following table (4.0 FTE):

Aquaculture Faculty & rank	Allocation	Staff	Funding Allocation
Dr. David Bengtson full prof.	9 month CELS / 3 month recontract	Charles Wentworth	12 month CELS
Dr. Terence Bradley full prof.	9 month CELS / 3 month recontract	Sheila Polovsky	12 Month CELS/AES (retired as of 2/1/02)
Dr. Barry Costa-Pierce – full prof.	12 month Sea Grant (Sea Grant Director)		
Dr. Marta Gomez-Chiarri – asst. prof.	9 month CELS / 3 month recontract		
Dr. Michael Rice – full prof.	9 month CELS / 3 month recontract		

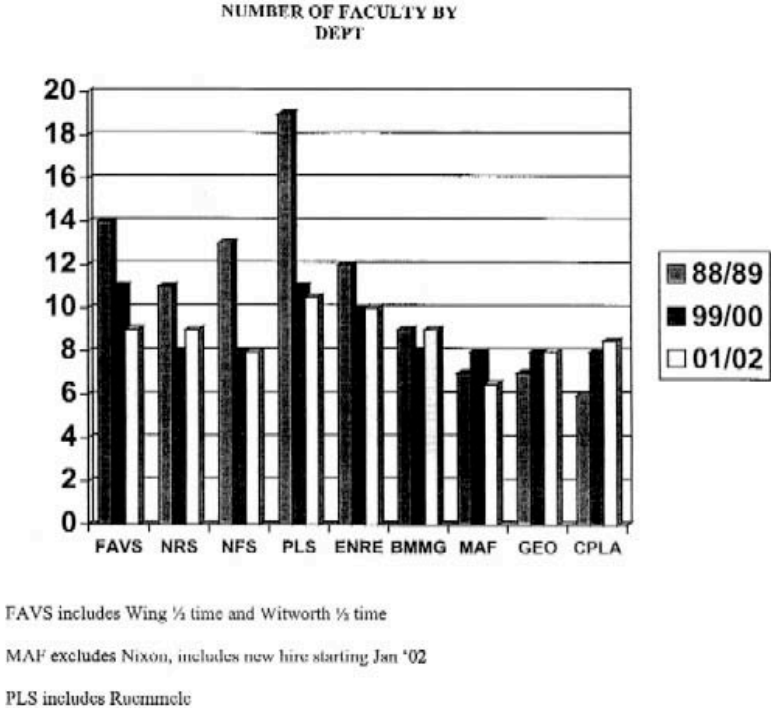
The following faculty and staff responsible for the delivery of the Animal Science (AVS) programming (2.5 FTE tenure track & 1.0 FTE lecturer):

Animal Science Faculty and rank	Allocation	Staff	Funding Allocation
Dr. Anthony Mallilo – full prof.	9 month CELS / 3 month recontract	David Marshall	12 mo. CELS
Dr. Murn Nippo – full prof.	9 month CELS / 3 month recontract	Kristen Morrone	Part time MP-7 (FAVS/CELS)
Dr. Katherine Petersson - lecturer	9 month CELS / 3 month recontract		

Dr. Ulysses Whitworth – asst. prof.	6 mo. CELS 6 mo. Research Office (University Veterinarian)
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David Marshall was hired in September, 2001 and is serving as the manager of the Peckham Farm Facility. Kristin Marrone is a part time assistant manager providing critical coverage of animal care and feeding during weekends and times of absence of the manager. Although filling the farm manager position solved a critical problem of University compliance with USDA regulations, the tenuous nature of Ms. Marrone’s appointment status is problematic given the necessity of 24/7 ‘on-call’ coverage requirements for livestock.

The following graph shows the general trends in FAVS faculty numbers in relation to other departments in CELS. Over the years there has been a steady decline in faculty numbers since 1989 when the department had a total of 14 tenure-track FTEs. Currently the total is nine, and in 2003 with no replacement for Professor Wing it will be 8.5.



Facilities and Major Equipment:

Aquaculture research activities are carried out at the Kingston campus, East Farm, and the Narragansett Bay Campus. The Kingston campus houses several of the aquaculture laboratories including a laboratory equipped to study aquatic pathology and biotechnology. At East Farm, the Freshwater Aquaculture Center is a 12,500 sq. ft. building housing most of the salmonid aquaculture research. An Aquatic Pathology Laboratory (3,500 sq. ft.), including histopathology and disease challenge facilities, and an aquaculture greenhouse

(1,500 sq.ft.) are also located at East Farm. The Department has a 1983 S-10 pickup truck to support the aquaculture operations. At the Narragansett Bay Campus, FAVS aquaculture research on black sea bass, tautog and summer flounder is collaboratively ongoing in several laboratories including the 9,800 sq. ft. Ann Gall Durbin Aquarium Building under a space-sharing arrangement with the Dean of the Graduate School of Oceanography. Beginning with a March 2002 groundbreaking, an additional aquaculture laboratory for both marine finfish culture and shellfish aquaculture (The Luther Blount Aquaculture Laboratory) will be built. This 6200-sq. ft. facility jointly funded by the U.S. Department of Agriculture, Mr. Luther Blount and the University will include isolation laboratories for work with transgenic organisms and research on aquatic pathogens.

Fisheries research and instructional activities are carried out at the Kingston campus, East Farm, and occasionally at the Narragansett Bay Campus. The department maintains a 54-ft. (17-m) fishing/research vessel (*R/V Captain Bert*), which is docked at the Wickford Shipyard about 20 km from the main campus on the Narragansett Bay. The Kingston campus houses laboratories used for instruction. At East Farm, the Fisheries Center is a 6,050 sq. ft. building housing much of the fisheries instructional and research equipment, including several diesel engines in the fisheries engineering lab, machine shop, and a net and gear development laboratory. The Department also has a 5,000 sq. ft. warehouse/storage building for fisheries and field research gear. A 500 sq. ft. carpentry/woodworking shop is housed in this storage building. A small fleet of 16-ft. (5-m) Boston Whalers and other small craft are housed at the Fisheries Center. There are several boat trailers and a flatbed truck but there is a need for an additional vehicle for transporting boats.

At present, the on-campus livestock facility for the Animal and Veterinary Science program is a 14-acre parcel of land known as Peckham Farm, which consists of three main buildings, a few scattered outbuildings and large sections of pasture. The main barn currently houses the office of the farm manager and Southern Rhode Island Cooperative Extension and 4-H as well as the university's horses and goats. It was recently rehabilitated with a fresh coat of paint and money has been appropriated for a new roof. The second large building on the property is used for feed and equipment storage and the third houses the university's sheep and poultry. The recent, partial, rehabilitation of the Peckham Farm Animal Facility is in line with the departmental goal of keeping a vibrant experiential learning and animal research program in the department. Farm equipment, including a 1960s vintage David Brown tractor is highly unreliable and in need of replacement.

Teaching:

In order to provide students with a basic understanding of animal and fisheries science as it relates to production, harvesting, reproduction, environment and disease, the undergraduate program embraces the following degree areas:

1. BOS-210 Animal Science (AVS) with options in: Animal Science, Pre-veterinary Medicine, and Laboratory Animal Management
2. BOS-280 Aquaculture, Fisheries Science and Technology (AFS)

Graduate programs in Animal Science, and Aquaculture and Fisheries Science are offered at the M.S. and Ph.D. levels. Specialization tracks leading to the M.S. degree in Fisheries,

Animal & Veterinary Science include: Animal Science, Aquaculture Science, Aquatic Pathology, and Fisheries Science. The Department offers a Ph.D. Program in Environmental Sciences with specialization in Animal Science, Aquaculture and Fisheries depending upon faculty interest and expertise.

The Department is implementing curricular changes for those students majoring in Aquaculture and Fisheries Technology who wish to concentrate in aquaculture. These changes are intended to increase student retention and to provide a more structured and complete educational experience, in terms of both breadth of courses and experiential learning. Freshmen will now take Introduction to the Marine Environment (AFS 210) in their first semester and Introduction to Aquaculture (AFS 102) in their second. The sophomore year will stress hands-on experience through Shellfish Aquaculture (AFS 201) in the Fall semester and Finfish Aquaculture (AFS 202) in the Spring. We will soon be submitting new course proposals for three more “required” 300-level courses to be taken in the junior and senior: Aquaculture Systems, Aquaculture Health Management, and Aquaculture Nutrition, all of which are deemed to be fundamental to the training of our majors. We expect to continue to offer our current selection of 400-level courses to both undergraduates and graduate students. We are moving to a system in which 300- and 400-level courses are offered only on an alternate-year basis, so that we can meet these new course commitments with existing faculty.

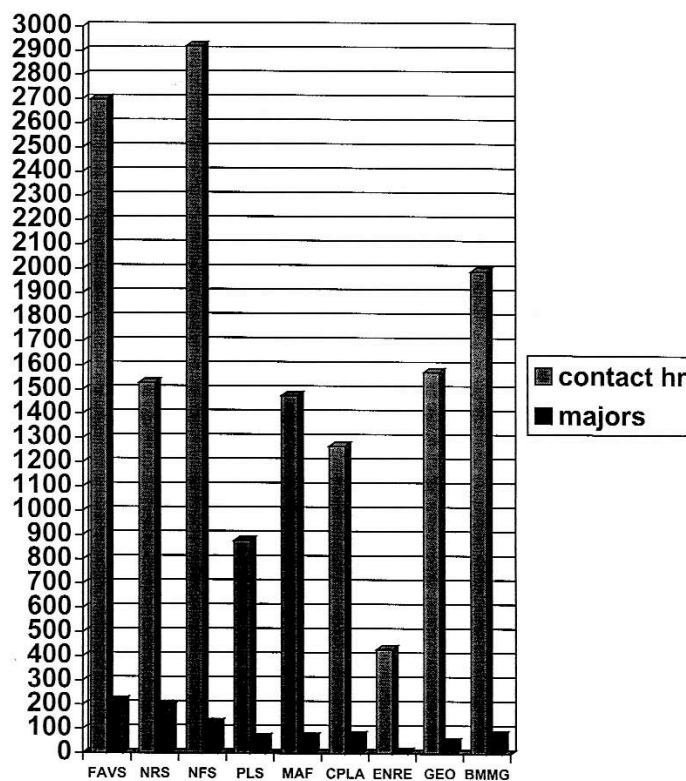
Graduate students concentrating in aquaculture are required to take 4 courses, one from each of the principal FAVS aquaculture faculty, to obtain broad training in disease, nutrition, shellfish aquaculture and finfish aquaculture. They can then choose from a variety of other specialized courses that are available. All these courses are also offered on an alternate-year basis.

One of the real strengths of the URI undergraduate major in Aquaculture and Fisheries Technology is the availability of technology courses in the fisheries area. With the impending retirement of Prof. Wing, it is unlikely that a replacement will be hired to teach all the courses he offered. At the same time, it would be extremely desirable for students concentrating in the aquaculture area to be able to take an aquaculture technology course in which they learned “nuts and bolts”-level techniques so necessary to the operation of an aquaculture facility. One possible model would be to have people similar to the Peckham Farm manager (who teaches and manages) in place at both the Fisheries Center and the Aquaculture Center to teach a course in fisheries technology and aquaculture technology, respectively. In this model, each person would teach at least one course and have other duties as well (e.g., managing the facility, engaging in Cooperative Extension). In this time of tight resources, with needs for technology instruction, CE and facilities management (especially with the new Blount Building coming on line), a creative approach to defining positions with multiple duties would be fruitful.

The Department has participated heavily in efforts over the last 5 years to “change the culture of learning” for undergraduates at the University. Two of us (Rice and Bengtson) have served on the Steering Committee of the Partnership for the Coastal Environment, helping to develop and implement the Coastal Fellows program, develop new interdisciplinary courses for undergraduates, develop tools for student assessment, and

attract USDA funding to improve experiential learning in CELS. In addition, four of us (Rhodes, Nippo, Mallilo, and Bengtson) serve on the CELS committee on Assessment of Student Outcomes, in which we have developed a series of “goal statements” for undergraduate majors in CELS and will continue to build the College’s capacity for assessment. Finally, our faculty is also involved in the recruitment of undergraduate and graduate students from minority backgrounds into CELS through the *JUMP* program and the Sloan Foundation. Thus, the Department is committed not only to its role of providing a traditional curriculum, but implementing national trends in experiential learning, multiculturalism, and student assessment.

CONTACT HOURS/STUDENT MAJORS BY DEPT

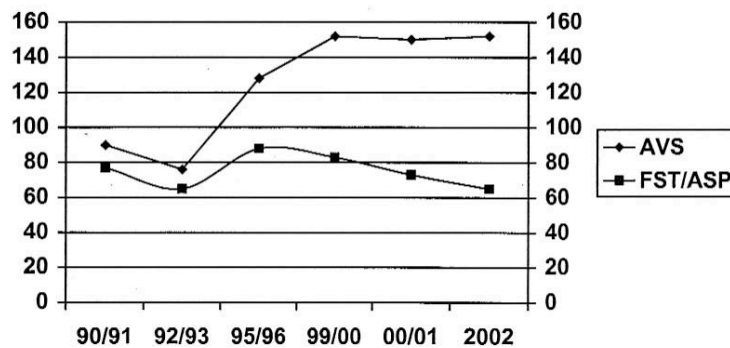


Service of undergraduate students by the FAVS department is considerable. The preceding graph shows student contact hours and number of undergrad majors in the Department in both the AVS and AFS programs. At present, the FAVS department services the largest number of undergraduate majors in CELS and services a substantial number of non-majors through the AVS101 (Introductory Animal Science) course, which is a science credit course in the URI General Education Program.

The following graph shows student enrollment trends in the FAVS undergraduate programs. Student Enrollments in the Aquaculture and Fisheries Program (BOS-280) has

remained steady between 60 and 80 students over the last decade in spite of the net loss of two faculty members serving them. Over that same time period, however, enrollment in the Animal Science Program (BOS-210) has nearly doubled to about 150 students with a net loss of 3 faculty FTEs, all of which occurring in the last two years, two to retirement and one to promotion to the office of Vice Provost. This loss is softened by the year 2000 hire of Dr. Katherine Petersson, who now teaches full-time courses taught by Drs. McCreight and Rhodes and Professor Gross. The leveling in the enrollment trend in the Animal Science enrollments over the last three years is arguably an indication of a 'saturation' of facilities and staff. All Animal Science faculty are teaching to full capacity. Student laboratory rooms and classes are also at full enrollment capacity perennially. This full commitment to undergraduate instruction by all tenure track AVS faculty has left little time for all other academic activity within the Animal Science Program.

ENROLLMENT TREND, FAYS DEPT



Faculty, staff and students from the both the Animal Science and Aquaculture and Fisheries Programs are accessible to the public through its many outreach programs, and visible in their respective professional circles. For example, many of the graduates from the Aquaculture and Fisheries Program are leaders in the industry and various scientific agencies that are responsible for science and management of the fisheries resources and the production of seafood products. The first fisheries alumni reunion at Fish Expo in Providence in 2000 brought in over 70 graduates from the program. As testimony to the effectiveness of our animal science curricula, within 18 months of graduation virtually 100% of our students seeking employment within the animal science field have found it. Equally impressive is the competitiveness of our pre-veterinary program where we have in excess of a 50% acceptance rate. Correspondence from our students in veterinary school indicate that they find themselves as well or better prepared for the rigors of veterinary school as their counterparts from other universities. These types of statistics are the yardsticks by which we measure the success of our undergraduate teaching program. It is anticipated that our graduate program will continue to support, with coursework, our current and proposed areas of research such as vector borne disease, bioethics, animal welfare and applied animal research focusing on the exotics and equine.

In terms of graduate student enrollment in the last six years, the total number enrolled per academic year is:

1996-97	27
1997-98	34
1998-99	32
1999-00	40
2000-01	39
2001-02	33

Graduate enrollments in the FAVS Department have remained relatively steady mostly between 30 and 40 over the last six years with the majority of students in the MS Degree Program in the Aquaculture and Fisheries Science Program area. Almost all graduate students accepted into the program have support funding. Over the last six years, the Department typically has been funding students with 3 University Teaching Assistantships to FAVS, 3 AES Research Assistantships, 2 CE Assistantships, 2 to 3 University Teaching Assistantships through the Department of Biological Sciences, 2 to 3 Sea Grant Assistantships and the rest on external grants to individual PIs or to students as fellowships from external agencies or foreign countries.

The number graduate degrees per year granted through the FAVS Department, are listed in the following table (all M.S., except 1 Ph.D. - Todd Smith - included in the numbers for 1997-98).

1996-97	5
1997-98	6
1998-99	2
1999-2000	8
2000-01	6
2001-02	7 (through Dec. 01)

Average time taken to obtain the M.S. degrees is 6 semesters (median) or 6.3 semesters (mean). The Ph.D. took 13 semesters.

Funding of graduate assistantships has been identified by the Department as a key limiting factor in research productivity. The practice of 'tuition waivers' practiced at many other Land Grant and state universities may be a means to lower the cost of student tuition line items on external grants making those grants more attractive to granting agencies, but this has been a traditional sticking point with the Board of Governors of Higher Education for decades.

The Department will participate in the new Master's of Environmental Science and Management degree program once the Board of Governors has approved it. The Sustainability focus area within this program fits well with the interests of the Department in developing sustainability in both fisheries and aquaculture. This non-thesis program should bring new students into several of our graduate-level courses, particularly non-

traditional students already practitioners in environmental science or management who are seeking an update in their field, or upgrade of skills for career advancement.

Research:

Currently, research in the area of terrestrial domestic animals focuses on **animal, vector and parasite interactions** in the area of animal science. Research in the area of animal and veterinary science includes:

Vector Borne Diseases in particular field application of biological control and acquired resistance to ticks and their associated pathogens. This relates directly to the host animal itself as well as the potential for zoonotic disease.

Stress Biology and Animal Well-Being with emphasis on stress due to standard management practices used regionally and nationally. Faculty graduates of the National Bioethics Institute have pledged to integrate welfare considerations into departmental research programs. This important area of research has recently become dormant due to the promotion of Dr. Richard Rhodes, our Animal Physiologist, to the office of Vice Provost of the University.

In the aquatic sciences realm, research focuses on aspects of molluscan and finfish aquaculture and fisheries science. The field of fisheries science begins with knowledge of fish ecology and biology. This knowledge forms the basis of developing meaningful harvesting strategies. The single species management outlook is rapidly being replaced with an ecosystem approach, incorporating all known food chain dynamics, species interactions, and relationships with the environment.

Biology - Growth, distribution and mortality of aquatic living resources including northern quahogs, oysters, lobster, black sea bass and other fish, and sharks.

Fisheries Ecology - Temperate and tropical reef ecology and management; larval fish ecology.

Fisheries are considered to be the interaction between the fishing gear, the fish and man. More recently the effect of fishing on habitat has been identified as an important aspect of these activities. Essential fish habitat has been identified as an important component to understanding fish population dynamics. Fisheries management may involve dealing with one (or more) of these components.

Fisheries Technology - understanding and improving size and species selection of fishing gear; development of archival tags for tracking fish; marine bioacoustics; effectiveness of fish aggregating devices.

Fisheries Habitat - use of artificial reefs; impacts of fishing on habitat and habitat recovery; marine protected areas.

Fisheries Science, Population Dynamics and Stock Assessment - development of multispecies and ecosystem based models; tag/recapture modeling.

Aquaculture is considered the controlled or semi-controlled husbandry of aquatic organisms. By being a form of husbandry, aquaculture can be considered a form of agriculture, thus it has a natural affinity with the terrestrial agricultural sciences. However, the techniques used in aquaculture intersects fisheries by providing means for enhancing fisheries, restoring depleted fish stocks or restoring degraded aquatic habitats. Aquaculture research areas in the FAVS Department include:

Fisheries Enhancement – use of hatchery rearing and other forms of aquaculture for enhancing or restoring natural stocks of lobsters, oysters and quahogs; public aquaculture.

New Species Development – recent research in the department has led to basic knowledge leading to hatchery and larviculture improvements and/or commercialization of various marine species including summer flounder, winter flounder, black sea bass and tautog.

Aquaculture/Environmental Interactions – impacts of shellfish aquaculture on the environment, excretion and feed utilization by marine and freshwater fish species

Aquatic Pathology and Immunology– characterization of the causes of bacterial and parasitic diseases in cultured fish and shellfish; epizootiology of aquatic diseases in shellfish; disease resistance in fish and shellfish; effect of pollutants on fish immune response.

Aquatic Biotechnology – research in the department focuses on problems such as the characterization of genes responsible for freshwater and saltwater osmotic tolerance in fish, genetic markers, growth enhancement through genetic modification, development of novel vaccines for fish, development of disease resistance strains of fish and shellfish.

Research Funding (2000-2001)

Bengtson, D.A., M.A. Peck and C.A. Oviatt, “Metabolic studies of juvenile cod and haddock”, U.S. Dept. of Commerce, NOAA/NMFS, \$105,234, 1997-2001.

Bengtson, D.A. and J.L. Specker, “Enhancing production of flounder fingerlings”, U.S. Dept. of Commerce, Sea Grant, \$286,000, 1998-2001.

Bengtson, D.A. and D. Alves, “Effects of water velocity on conditioning of summer flounder for net pens”, University of New Hampshire Sea Grant, \$60,000,

Bengtson, D.A. and C.M. Lee, “Increased efficiency of summer flounder aquaculture through nutrition”, Rhode Island Agricultural Experiment Station, 2001-2004.

Bradley, T. 1999 – 2002 Molecular Mechanisms of Osmoregulation in Salmon
USDA NRICGP \$250,000 (Acct # 535928)

- Bradley, T. and B. White (U. Illinois) 1999 – 2002. Microbial Ecology of the Salmon Gastrointestinal Tract: A Molecular Approach. USDA NRICGP \$187,000 (Acct. # 536810)
- Bradley, T. 2000 – 2002. Development of Tri- and Tetranucleotide Microsatellite DNA Markers for Discrimination of Tautog (*Tautoga onitis*) Populations. NOAA CMER \$62,644 (Acct. #531628)
- Bradley, T. 2001-2002. Investigation of the Effect of Inhibition of Myostatin on Growth and Muscle Development in Rainbow Trout (*Oncorhynchus mykiss*). Cape Aquaculture Technologies. \$70,000
- Bradley, T. 2000-2002. Net Pen Culture of Black Sea Bass. UNH Sea Grant \$60,000 (Acct #536966)
- Bradley, T. and D. Berlinsky. 2002 – 2004 Development of Diets and Rearing Conditions for Commercial Aquaculture of Black Sea Bass. NRAC, USDA \$178,840
- Castro, K. M., J. S. Cobb, and J. Catena. 1996-2001. \$250,000. Effect of habitat addition and stock enhancement for lobster. CMER, NOAA Office of Habitat Restoration.
- Castro, K. M., B. Somers, J. Collie, and A. DeLong. 2001-2003. \$270,000. Monitoring the v-notch restoration project after the North Cape oil spill. CMER, NOAA Office of Habitat Restoration.
- Castro, K.M. and J. Sorlien (RI Lobstermen’s Association). 1999-2001. Co-management of the Lobster Resource – Taking Responsibility and Action. \$75,000. NMFS S/K funding.
- Gomez-Chiarri, M. Cohen, Nelson, co-PIs Vaccine development for bacterial pathogens: The Nutrient Approach RIAES (\$23,510)
- Gomez-Chiarri, M. Nelson, Smolowitz, co-Pis) (\$54,000) Management of Flounder Infectious Necrotizing Enteritis, Northeast Regional Aquaculture Center.
- Gomez-Chiarri, M. and D. Nelson. URI Council for Research, Proposal Development (\$9,706) Delivery of DNA vaccines by immersion
- Gomez-Chiarri, M. RIAES H885 (\$35,033). Development of DNA vaccines for the prevention of bacterial diseases in aquaculture.
- Gomez-Chiarri, M. and L. Martin. USDA NRICGP – Seed grant (Martin, co-PI) (\$71,355) Feed-based delivery of recombinant antimicrobial peptides for shellfish aquaculture
- Gomez-Chiarri, M. National Sea Grant Oyster Disease Research Program (\$186,000) Molecular immune responses of the eastern oyster to *Perkinsus marinus*
- Grossman-Garber, D., A. Gold, T. Husband, M. Rice and D. Bengtson, “Strengthening experiential learning in vertically integrated problem-based teams”, U.S. Dept. of Agriculture, Higher Education Challenge Grants Program, \$80,000, 1998-2000.
- Grossman-Garber, D., R. Rhodes, W. Wright, T. Husband, C. English, B. Maynard, and Bengtson, “Experiential learning and expected student outcomes: closing the curricular loop”, U.S. Dept. of Agriculture, Higher Education Challenge Grants Program, \$100,000, 2001-2003.
- Grossman-Garber, Wright and others (including Whitworth, U.G., M.A. Rice and Gómez-Chiarri) 2000 Project Jump redux. \$100,000. USDA

- Lee, C.M. and D.A. Bengtson, "Comprehensive utilization of squid processing waste for aquaculture feed development", Rhode Island Agricultural Experiment Station, 2001-2004.
- Recksiek, C.W. 1999-2001. Development and validation of design criteria for marine fishery reserves (URI subcontract to University of Puerto Rico Project, R.S. Appeldoorn, PI). UPR (Mayaguez) NOAA Sea Grant College Program. \$10,215.
- Recksiek, C. W., G. Fischer, and H. T. Rossby. 1998-2002. \$107,675. Architecture of miniature, programmable, archival animal tags and pelagic floats for physical/biological oceanographic applications. Catalyst Foundation.
- Rhodes, R.C. 2001 Confocal scanning microscopy for environmental biotechnology. \$177,377. USDA
- Rice, M.A. 2000-2003. Bivalve filter feeding to control estuarine eutrophication. Approx. \$8,000 (excluding assistantships), Project #H-886, Rhode Island Agricultural Experiment Station.
- Skrobe, L., DeAlteris, J.T., Castro, K.M., D. Beutel (URI), Gell, W. and C. Borden (Commercial fishermen) and N. Lazar (RI DEM). 2002. \$31,000 Evaluation of catch efficiency and size selectivity of New England fish pots for black seabass and scup as a function of escape vent size. NMFS Set-Aside Research Funds.
- Specker, J.L. and D.A. Bengtson, "Improving flounder productivity through enhanced growth", U.S. Dept. of Agriculture, \$119,000, 1999-2002.
- Specker, J.L. and D.A. Bengtson, "Maximizing survival of summer flounder: the importance of synchrony", U.S. Dept. of Commerce, Sea Grant, \$245,000, 2001-2003.
- Whitworth, U.G. 2000 Increasing the number of Ph.D.s in science \$2000.
- Zhioua, E. and U. Whitworth 1999-2001. \$7,954 Evaluation of Deer Tick hemocytes as antigens for an anti-tick vaccine. URI Research Council Award.

Research Publications (2000-2001)

- Appeldoorn, R.S., K. Foley, E. Molina, and C.W. Recksiek. 1999. Benthic mapping from fish and habitat transect data using GIS technology. Proc.Gulf Caribb. Fish. Inst. 52:674-685.
- Appleyard, C. and J. DeAlteris. 2001. Modeling the growth on the Hard Clam, *Mercenaria mercenaria*. Journal of Shellfish Research.
- Appleyard, C. and J. DeAlteris. 2001. Factors affecting the growth of the hard clam in a floating upweller. Submitted to Aquaculture.
- Bengtson, D.A. and G. Nardi. 2000. Summer flounder (*Paralichthys dentatus*). Pp. 907-913 in Encyclopedia of Aquaculture (R.R. Stickney, ed.), John Wiley & Sons, New York.
- Bengtson, D.A., T.L. Simlick, E.W. Binette, R.R. Lovett IV, D. Alves, A.M. Schreiber and J.L. Specker. 2000. Survival of summer flounder (*Paralichthys dentatus*) larvae on formulated diets and failure of thyroid hormone treatment to improve performance. Aquaculture Nutrition 6: 193-198.
- Berlinsky, D., M. Watson, G. Nardi and T.M. Bradley 2000. Investigations of selected parameters for growth of larval and juvenile black sea bass, *Centropristis striata* L. Journal of the World Aquaculture Society 31:426-435.

- Buckley, L.J., T.M. Bradley, and J. Allen-Guilmette. 2000. Production, quality and low temperature incubation of eggs of Atlantic cod *Gadus morhua* and Haddock *Melanogrammus aeglefinus* in captivity. *Journal of the World Aquaculture Society* 31:22-29.
- Castro, K. M. and T. E. Angell. 2000. Prevalence and progression of shell disease in Rhode Island waters and the offshore canyons. *Journal of Shellfish Research* 19(2): 691-700.
- Castro, K. M., Cobb, J. S. Wahle, R. A. and J. Catena. 2001. Habitat addition and stock enhancement for American lobsters, *Homarus americanus*. *Marine and Freshwater Research* 52: (in press).
- DeAlteris, J. T., L. Skrobe, and K. Castro. 2000. Effects of fishing on biodiversity and habitat in offshore New England waters in history, status, and future of the New England offshore fishery. Special Issue of the *Northeastern Naturalist* 7(4): 379-394.
- DeAlteris, J., D. Williams, D. Beutel, and N. Thompson. 2001. Differential growth of oysters in Narragansett Bay. *Journal of Shellfish Research*.
- King, N.J., W.H. Howell, M. Huber and D.A. Bengtson. 2000. Effects of larval stocking density on laboratory-scale and commercial-scale production of summer flounder, *Paralichthys dentatus*. *J. World Aquacult. Soc.* 31: 436-445.
- Martin LM, Elsaid KA.; Dorrington T, Gómez-Chiarri M. 2001. Synthetic Studies on the Antimicrobial Activity of Pleurocidin. In *Peptides: The Wave of the Future* Houghten, Richard A.; Lebl, Michal; Fields, Gregg B.; and Barany, George eds., Kluwer Academic Publishers, Dordrecht, The Netherlands.
- McGowan, J.E., Sysyn, G., Petersson, K.H., Sadowska, G.B., Mishra, O.P., Delivoria-Papadopoulos, M. and Stonestreet, B.S. Effect of dexamethasone treatment on maturational changes in the N-methyl-D-aspartate receptor in sheep brain. *J. Neurosci.* 20(19):7424-7429, 2000.
- Pan, F., Zarate, J. and Bradley, T.M. 2002. A homolog of the E3 ubiquitin ligase Rbx1 is induced during hyperosmotic stress of salmon. *Amer. J. Physiol.* (In Press).
- Pan, F., Zarate, J., Tremblay, G.C. and Bradley, T.M. 2000. Molecular cloning of the salmon hsp90 cDNA and its upregulation by thermal and osmotic stress. *J. Exp. Zool.* 287:199-212.
- Recksiek, C., B. R. Murphy, R. S. Appeldoorn, and K. C. Lindeman. 2001. Integrating fish fauna and habitat assessments: a fundamental step in developing fishery reserve design criteria. *Proc. Gulf Caribb. Fish Inst.* 52: 654-666.
- Rhodes III, R. C. 2001. Assessment of student learning in animal science programs: how do we know that they know? *J. Anim. Sci.* 79(Suppl. 1):165.
- Rice, M.A., A. Valliere, and A. Caporelli. 2000. A review of shellfish restoration and management projects in Rhode Island. *Journal of Shellfish Research* 19:401-408.
- Rice, M.A. 2000. A review of shellfish restoration as a tool for coastal water quality management. *Environment Cape Cod* 3(2):1-8.
- Rice, M.A. 2001. Aquaculture at the University of Rhode Island. *World Aquaculture.* 32(2):24-26.
- Stonestreet, B.S., McKnight, A.J., Sadowska, G.B., Petersson, K.H. and Patlak, C.S. Effects of duration of positive-pressure ventilation on blood-brain barrier function in premature lambs. *J. Appl. Physiol.* 88:1672-1677, 2000.

- Stonestreet, B.S., Sadowska, G.B., McKnight, A.J., Patlak, C.S., and Petersson, K.H. Exogenous and endogenous corticosteroids modulate blood-brain barrier development in the ovine fetus. *Am J. Physiol. (Regulatory Integrative Comp. Physiol)*:279(2): R468-R477, 2000.
- Sysyn, G.D., Petersson, K.H., Patlak, C.S., Sadowska, G.B. and Stonestreet, B.S. Effects of postnatal dexamethasone treatment on blood-brain barrier permeability and brain water content in newborn lambs. *Am. J. Physiol. (Regulatory Integrative Comp. Physiol. 280)*:R547-R553, 2001.
- Thlusty, M.F., D.A. Bengtson, H.O. Halvorson, S.D. Oktay, J.B. Pearce and R.B. Rheault, Jr., eds. 2001. *Marine Aquaculture and the Environment: A Meeting for Stakeholders in the Northeast*. Cape Cod Press, Falmouth, Massachusetts, USA, 324 p.

Intellectual property: Patents, patent applications and invention disclosures

Gómez-Chiarri and Nelson. Delivery of DNA vaccines into fish by immersion. US Patent application filed on July 2001.

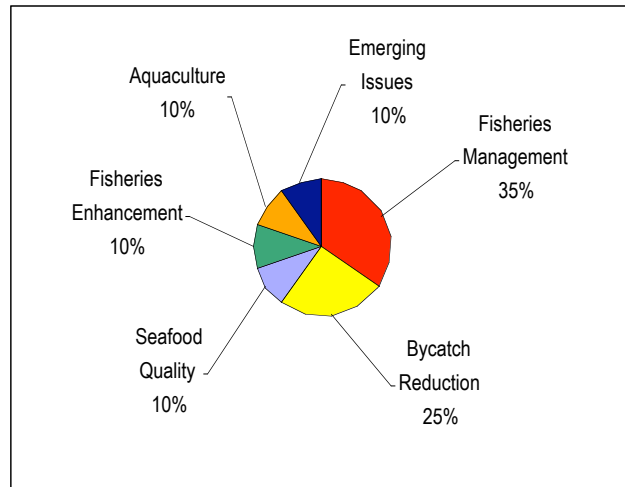
Gómez-Chiarri. Feed-based delivery of antimicrobial peptides for the prevention and treatment of infectious diseases in aquaculture. URI Invention Disclosure 98-0910 URI-144

Extension:

The Department and its predecessor departments have a long history of involvement in Cooperative Extension programs. Up until recently, Extension has been limited to the animal science faculty with the tradition of supporting the poultry and livestock industries. These activities have been augmented with support for 4-H youth programs, horse clubs and owners, sheep producers and goat owners. However, this traditional program delivery is largely on an *ad-hoc* basis by faculty largely engaged in the delivery of the undergraduate curriculum.

The URI Tick Laboratory managed by Dr. Elyes Zhouia is URI's most visible outreach presence in the area of Animal Sciences. During the warm-weather season of 2001, approximately 400 citizens of Rhode Island and nearby states submitted ticks that potentially carried the Lyme Disease spirochete for analysis. This service has been highly popular in that local citizens might receive information aiding in their decision to seek costlier medical treatments for themselves and their livestock or companion animals. In 2001, the website associated with the Tick Laboratory was the most active internet site at the University of Rhode Island. The Tick Laboratory has been managed as a ledger 3 cost center by charging \$45 per tick including tick ID and screening for the Lyme spirochete. Of the \$45 collected for the service \$40 per sample is forwarded on to the Immugen Company to run an antibody test for the spirochete. The remaining \$5 per sample is insufficient to make the Lab economically self-sufficient.

The department has involvement in Extension to in both fisheries and aquaculture. Castro from FAVS serves as the leader for the RI Sea Grant Fisheries, Aquaculture and Seafood Extension Program. This program is funded for \$225,000/year and develops proposals and a corresponding plan of work with an outside advisory committee and Sea Grant guidance. In a recent Program Assessment conducted by the National Sea Grant Program, extension received an “excellent” rating making it one of the best in the country. The following chart illustrates the distribution of effort among the various components of the Sea Grant funded program.



In addition to the Sea Grant funded outreach, David Bengtson serves as the Program leader on the Rhode Island Cooperative Extension theme area in aquaculture. Outreach activities in Aquaculture Programming through Cooperative Extension include the coordination of the annual Rhode Island Aquaculture Conference (held since 1995), that has recently expanded to cover all of Southern New England and Long Island and will further expand to include all New England States and a trade show November, 2002. Also under the auspices of the Cooperative Extension Aquaculture Program, FAVS faculty and staff are working with the Ocean State Aquaculture Association (the state aquaculture trade association) by providing informational support in their efforts to work with state agencies to streamline the permitting and regulatory process.

In the late 1990s, the Department housed an aquaculture extension position, which was supported 50% by Sea Grant, 50% by CE. Due to CE cutbacks, the person filling that position left the University. Nevertheless, CE has continued to put some funding into aquaculture with positive results. With Sea Grant, CE jointly funds the shellfish aquaculture course run every summer by Dave Beutel. Within the last 18 months, CE has funded Beutel to work with commercial and recreational fishers to collect information on resource usage in Rhode Island waters and personnel from the Environmental Data Center have put that information into GIS format on a web site for the public.

Outreach Funding (2000-2001)

Bengtson, D.A. (2000 & 2001) Aquaculture and Fisheries Program Area, RI Cooperative Extension. \$41,020.

Castro, K. M. 2001-2003. University of Rhode Island, Fisheries, Aquaculture and Seafood Program. Support of RI Sea Grant for \$250,000. CELS match for approximately \$80,000, and industry match for \$20,000.

Beutel, D. 2001-2003. Cooperative Extension for approximately \$9,000.

DeAlteris, J. T. and L. G. Skrobe. 2001-2003. Atlantic States Marine Fisheries Commission. \$9,000.

Gomez-Chiarri, M., E. Carrington, and M. Rice 2000. Shellfish Disease Survey Program, State of Rhode Island \$39,358. Rhode Island Department of Environmental Management.

Gomez-Chiarri, M., E. Carrington, and M. Rice 2001. Shellfish Disease Survey Program, State of Rhode Island \$38,696. Rhode Island Department of Environmental Management.

Rice, M. 2000-2001. Funding for Annual Southern New England Aquaculture Conferences \$10,000

Outreach Committees

- Bengtson:*** Cooperative Extension Aquaculture theme area leader
CRMC Working Group on Aquaculture Regulations
Advisory Group, Aquaculture Program at Cranston West High School Career and Technical Center
Senior Fellow, Coastal Institute
- Beutel:*** Sea Grant Fisheries Theme Team.
RI DEM Industry Advisory Committee – Menhaden 2000-present
Advisory Committee, Ocean State Aquaculture Association
Northeast Regional Aquaculture Consortium
RI Aquaculture Working Group
- Castro:*** National Sea Grant Executive Committee for National Assembly of Extension Leaders, Secretary/Treasurer.
RI DEM Industry Advisory Committee – Lobster 1994-present.
URI Coastal Institute Fellow
Science Advisor, Lobster Management Subcommittee for Coastal Institute
Member, Fisheries Enhancement committee, National Sea Grant Program
- Costa-Pierce:*** Sea Grant Theme team Chair, Ecosystems and habitats
- DeAlteris:*** Atlantic Scientific Review Group for reauthorized of Marine Mammal Protection Act, 1996-2001.

NMFS – Marine Mammal Take-Reduction Team for Fisheries interacting with offshore cetaceans, 1996-2001.

NMFS Marine Mammal Take-Reduction Team for fisheries interacting with Mid-Atlantic harbor porpoise and bottlenose dolphin, 1996-2001.

National Research Council Committee to review the effect of fishing on marine ecosystems, 2000-2001.

Gomez-Chiarri: Rhode Island Aquatic Biosecurity Board CRMC-RIDEM
RI Aquaculture Working Group (CRMC)

Rice: Advisory Committee, Ocean State Aquaculture Association
Northeast Regional Aquaculture Center Extension Working Group
RI Aquaculture Working Group (CRMC)
RI Legislative Commission on Aquaculture
Rhode Island Aquatic Biosecurity Board CRMC-RIDEM
National Sea Grant Extension Workgroup on Aquatic Exotics
Chairman, Conservation Commission-Town of South Kingstown
Senior Fellow, Coastal Institute

Skrobe: RI Industry Advisory Committee – Winter Flounder 2000-present
(Vice-chair).

Outreach Publications (2000-2001)

Atlantic States Marine Fisheries Commission, American lobster stock assessment sub-committee (Castro and others). 2000. American lobster stock assessment report for peer review. 170 pp.

Brust, J. C. and L. G. Skrobe (editors). 2000. Fisheries Stock Assessment User's Manual Part I and II: An Introduction to Basic Methods and Models. Atlantic States Marine Fisheries Commission, Washington, D. C.

Gomez-Chiarri, M., M.A. Rice, E. Carrington and A. Ganz. (2001). Shellfish disease survey program 2000, State of Rhode Island. Final Report Presented to the Rhode Island Department of Environmental Management, Division of Fish and Wildlife, July, 2001. 18pp + 7 appendices.

Krauter, J., B. Dewey and M.A. Rice. (2000). Response to EPA's Aquaculture Industry Regulatory Development Needs. Joint Subcommittee on Aquaculture, Aquaculture Effluent Task Force, Molluscan Shellfish Aquaculture Technical Subgroup. 35pp + 6 Appendices & 2 Addenda.

Mugg, J., A. Serrano, A. Liberti, and M.A. Rice. (2000). Aquaculture effluents: A guide for aquaculturists and water quality regulators. Publication 00-003, Northeastern Regional Aquaculture Center, University of Massachusetts, Dartmouth. 12 pp.

Nippo, M.M. (2000) Why Behavior? William H. Miner Agricultural Research Institute Farm Report.

Nippo, M.M. Okay, now what behavior? William H. Miner Agricultural Research Institute Farm Report.

Rice, M.A. 2000. Perspectives on possible factors influencing the abundance of hard clams. Pp. 61-79. In: C.G. Schlenk (ed.). Transcript of the workshop on hard clam population dynamics: Research priorities for the south shore of

- Long Island. New York Sea Grant, State University of New York, Stony Brook. 94pp. + appendices.
- Rice, M.A. (2001). Environmental impacts of shellfish aquaculture: Filter feeding to control eutrophication. Pp. 77-86. In: M.F. Thlusty, D.A. Bengtson, H.O. Halvorson, S.D. Oktay, J.B. Pearce and R.B. Rheault, Jr. (eds.) Marine Aquaculture and the Environment: A Meeting for Stakeholders in the Northeast. Cape Cod Press, Falmouth, MA. 316pp.
- Thlusty, M.F., D.A. Bengtson, H.O. Halvorson, S.D. Oktay, J.B. Pearce and R.B. Rheault, Jr. (eds.) 2001. Marine Aquaculture and the Environment: A Meeting for Stakeholders in the Northeast. Cape Cod Press, Falmouth, MA. 316pp.
- Wolke, R.E., D.A. Bengtson, M.A. Rice, and M. Whittaker. (2000). Diseases of cultured flatfish: diagnosis and prevention. Publication 00-001, Northeastern Regional Aquaculture Center, University of Massachusetts, Dartmouth. 12 pp.

Strengths & Weaknesses of Current FAVS Programs:

Major strengths:

- Strong teaching program in Animal Science.
- Strong research program in Aquaculture.
- Strong outreach program in Aquaculture and Fisheries.

Major weaknesses:

- Almost no research in Animal Science
- Need to increase undergraduate numbers in Aquaculture and Fisheries.

Fisheries and Aquaculture.

A recent forum sponsored by the Coastal Institute has elevated fisheries management issues to the Governor's Office visibility level. The Governor's Office has created the First Intergovernmental Working Group on Commercial Fisheries to handle these issues. Phase 1 and 2 of this process are nearly completed with URI and FAVS Fisheries Extension involvement. The Fish, Fisheries and Aquaculture (FFA) initiative at URI will continue to grow in importance and foster interdepartmental collaboration between FAVS and other departments in the University, including MAF, ENRE, and GSO.

There is a tremendous need for trained fisheries professionals in the agencies that are responsible for fisheries research and management. This has been documented by the Ocean Studies Board of the National Academy of Sciences in their recent review of the National Marine Fisheries Service (NMFS). Although the supply of biologists is sufficient to meet the demand of the agency, there is an insufficient supply of trained fisheries scientists skilled in the areas of stock assessment and social sciences. One of the largest bottlenecks was identified as existing university programs not having sufficient faculty to accommodate larger classes. NMFS' anticipated expansion exceeds the present capacity of all university programs. A SWOT analysis (Strengths, Weaknesses, Opportunities & Threats) was conducted during the FFA Initiative process involving internal and external feedback to examine our ability to expand our capacity to provide these trained professionals. The following list highlights the discussions:

SWOT Analysis Results Aquaculture and Fisheries Science	
<p>Strengths of URI Aquaculture & Fisheries</p> <ul style="list-style-type: none"> <input type="checkbox"/> Good research and teaching faculty/staff <input type="checkbox"/> High graduate to undergraduate ratio <input type="checkbox"/> Good interdepartmental linkages- Breadth of disciplines and wide ranging capabilities <input type="checkbox"/> Good outside connections/ reputation <input type="checkbox"/> High commitment <input type="checkbox"/> Good physical location – proximity to water and other organizations (NOAA, EPA) <input type="checkbox"/> Some good facilities (i.e. Cap'n Bert) <input type="checkbox"/> Productive with what we have <input type="checkbox"/> Fisheries & Aquaculture are important to Rhode Island <input type="checkbox"/> Outreach programs in place <input type="checkbox"/> Strong ties to fisheries management and seafood industry 	<p>Opportunities</p> <ul style="list-style-type: none"> <input type="checkbox"/> We are a Sea Grant, Land Grant, Urban Grant, Space Grant university <input type="checkbox"/> Linkages with private sector and government <input type="checkbox"/> Don't need money, need communication and creativity <input type="checkbox"/> Need to build on reputation <input type="checkbox"/> Post graduate courses related to these fields and non-thesis options <input type="checkbox"/> Tremendous need for research within state. <input type="checkbox"/> Should tap into rising concern surrounding the coastal zone both state and worldwide <input type="checkbox"/> URI Initiatives such as Fisheries management, Fish, Fisheries and Aquaculture, Sustainable Coastal Communities and the Biotechnology Initiatives.

<p>Weaknesses</p> <ul style="list-style-type: none"> <input type="checkbox"/> Few junior faculty <input type="checkbox"/> Lack of visibility and PR Marketing <input type="checkbox"/> Lack of modern equipment and facilities (especially seawater aquariums) <input type="checkbox"/> Lack of support staff/infrastructure <input type="checkbox"/> Competition within the University <input type="checkbox"/> Vacant unfilled positions, FTE cap <input type="checkbox"/> Lack of state support 	<p>Threats</p> <ul style="list-style-type: none"> <input type="checkbox"/> Competition with other institutions and agencies <input type="checkbox"/> Gap between junior and senior professors <input type="checkbox"/> Budget cuts <input type="checkbox"/> Competition for limited and decreasing external funds
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A similar effort was carried out to assess the animal and veterinary side of the department. By the nature of the institution and the state a number of these items overlap, but that is to be expected.

SWOT Analysis Results Animal Science	
<p>Strengths of URI Animal & Veterinary Science</p> <ul style="list-style-type: none"> <input type="checkbox"/> "Cool" major with virtually universal appeal <input type="checkbox"/> Award winning teaching faculty <input type="checkbox"/> Large numbers of undergraduate majors <input type="checkbox"/> Faculty and staff with a broad range of expertise <input type="checkbox"/> Attracts a large number of Presidential 	<p>Opportunities</p> <ul style="list-style-type: none"> <input type="checkbox"/> We are a Sea Grant, Land Grant, Urban Grant, Space Grant university <input type="checkbox"/> Linkages with private sector and government <input type="checkbox"/> Animal Science field has broad areas open for external funding

<p>Scholars</p> <ul style="list-style-type: none"> <input type="checkbox"/> Program appeals to a large number of women <input type="checkbox"/> On-campus hands-on teaching facility <input type="checkbox"/> Diverse programs that allows students the flexibility to go in a number of different career directions <input type="checkbox"/> High visibility through the general education program <input type="checkbox"/> Opportunity for students to participate in learning communities <input type="checkbox"/> High level of participation in outside of classroom activities <input type="checkbox"/> Strong internship program <input type="checkbox"/> Highly successful placement program <input type="checkbox"/> Excellent location of URI near high population areas 	<ul style="list-style-type: none"> <input type="checkbox"/> Tremendous potential for increased instate visibility with outreach program <input type="checkbox"/> Potential to attract increased numbers of students with exotic and equine program development <input type="checkbox"/> Research in highly visible areas such as Lyme Disease, West Nile Virus etc.. <input type="checkbox"/> Expansion of URI programs such as Partnerships, learning communities and the honors program <input type="checkbox"/> USDA Project JUMP, undergraduate multicultural scholarships <input type="checkbox"/> Research opportunities that cross departmental boundaries <input type="checkbox"/> Opportunity to work with state veterinarian for form response teams for zoonotic outbreaks
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<p>Weaknesses</p> <ul style="list-style-type: none"> <input type="checkbox"/> Low number of faculty <input type="checkbox"/> Lack of visibility and PR Marketing <input type="checkbox"/> Lack of modern equipment and facilities <input type="checkbox"/> Lack of support staff/infrastructure <input type="checkbox"/> Competition within the University <input type="checkbox"/> Vacant unfilled positions, FTE cap <input type="checkbox"/> Lack of state support 	<p>Threats</p> <ul style="list-style-type: none"> <input type="checkbox"/> Competition with other institutions and agencies <input type="checkbox"/> Further budget cuts <input type="checkbox"/> Competition for limited and decreasing external funds
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III. GOALS. *This section is the statement of the Department’s long-term goals. These goals need to be measurable and attainable. The sky is the limit here, and that may involve new faculty hires to build particular strengths, the rearrangement of departments to establish a core of faculty in a particular research, teaching, or outreach area, and the addition of labs and/or equipment to get to a particular place. Attention should be paid to faculty retirements and replacements in the context of the plan.*

A. Overall. *The overarching balance of activities proposed within the Department should be proposed here.*

Justification/Rationale. *Each of these sections ought to include a relatively detailed justification for the department’s goals. Among other things, the department’s goals ought to be supported by evidence that there is a need to move in a particular designated direction, and by an evaluation of the potential for success should the move be effected. Information from outside the University (including alumni or other external reviewers) ought to be*

sought to realistically support the attainability and relevance of the department's goals.

Overall goals for the Fisheries and Aquaculture Program

Rhode Island is the smallest and the second most densely populated state in the nation. The entire state lies within 25 miles of the coastline, and the roughly one million residents are considered to be the coastal population. The nickname - Ocean State - also reflects the state's long history of marine-related commerce and recreation, as well as the public value placed on these aquatic attributes. Rhode Island is a mesocosm of the major problem areas facing the nation and the world: overpopulation, stressed coastlines and living resources, overlapping agencies, and limited financial resources. Lodged geographically between the major metropolitan cities of New York and Boston, Rhode Island often finds itself facing conflicting choices in determining its future. The newly renovated city of Providence with its expanded international airport has made RI into a destination, instead of a pass-through economy. The development of ecotourism locations and activities is often in conflict with the idea for development of a major shipping port. The traditional harvesters are often in conflict with the recreational users. Rhode Island often finds itself as the "pilot project" for research and policy development.

The Rhode Island Economic Policy council has identified the Rhode Island seafood industry as one of the ten business sectors in the state with potential to add value to the Rhode Island economy. Utilizing accepted economic multipliers, the seafood industry, from harvesting to processing to retail, has added well over 700 million dollars per year in economic value to the state economy. There is no doubt that fisheries will continue to play a major role in the State. In a survey conducted by NOAA in 2000, Point Judith placed 18th in landed volume and 16th in landed value out of 60 ports assessed making it a one of the major fishing ports for the USA.

In New England, there has been a recovery of every major unit stock (except for northern cod) with effort reductions. Management agencies are struggling with the issues of stock rebuilding; how to "manage for success" and the mechanisms needed to control effort to produce sustainability of fish stocks and fishing communities. While the success and contribution of the Rhode Island fishing industry is clear, it has had to face the rapidly changing regulation landscape with the rest of the country. Recovering species, bycatch reduction, marine mammal interactions, essential fish habitat changes due to fishing, and the fishing code of ethics are just some of the issues confronting the seafood industry today. Bycatch issues encompass both commercial and recreational fisheries. In the commercial fisheries, the bycatch or incidental take or entanglement of protected species, threatens the future of lobster, gillnet, and other selected fisheries. Finfish bycatch in the trawl fisheries hinders stock rebuilding processes for groundfish and other depleted species.

Damage to sensitive habitat by fishing operations will also dictate the need for more habitat friendly gears. The emergence of essential fish habitat as a major concern in fisheries has brought to the forefront the need for basic information relative to the basic biology and ecology of exploited aquatic resources. As NMFS attempts to catalog the state of knowledge of the managed species, it ranges from simple presence/absence data to detailed

ecological relationships for some species. Effective management will require much more information about ecosystems.

Generally, traditional forms of fisheries management have not been successful at avoiding overfishing. The social consequences of fisheries management have largely been overlooked in fishery plan evaluation. The following highlight the findings of a recent study (Griffith and Dyer, 1996):

- Fishermen respond to crisis by moving into new fisheries as opposed to other sectors of the economy.
- Current regulations confine fishermen to specific fisheries only.
- Fishermen view process of regulation as biased based on inaccurate data.
- Vessel buy-back program and fishermen retraining programs have been unsuccessful.
- Safety problems have occurred as a result of days at sea limitations, and crew size reductions.
- The current crisis originated with overcapitalization of two decades ago.
- Fisheries managers do not take into account the social impact of their decisions.
- Regulators largely ignore economic consequences i.e. Growth in fishery imports and ex-vessel prices.
- Credit and insurance have become severe problems for fishermen, trip suppliers, marine repair and other fisheries related businesses.

The use of public aquaculture is a growing area for research and knowledge. As a restoration tool to enhance natural stocks of lobsters and molluscan shellfish, URI Fisheries is addressing several projects related to oil spill mitigation. This is an opportunity for RI to lead the nation in the area of research.

In the aquaculture area, we recognize the potential for outreach not just to the aquaculture industry defined strictly in terms of food production. One area ripe for growth is outreach to teachers who are using aquaculture in science education at all K-12 levels and especially those developing aquaculture programs in several of the Career and Technical Centers in the state. When state support for CE was terminated several years ago, a decision was made to stop fisheries and aquaculture outreach to schools. It may be time to reach out again and try to re-develop state support for CE. Another area for growth of aquaculture outreach is the population of Rhode Island citizens who maintain pet fish either in aquaria or water gardens. There might be an equivalent to the Master Gardener program (Master Aquarist) that has become so popular among growers of plants. In a similar way, we might provide outreach support to the pet stores and gardening centers that sell ornamental fish to the public.

Additionally, according to the 2001 annual report on aquaculture in Rhode Island produced by the Coastal Resources Management Council, commercial aquaculture has been growing in terms of dollars produced and numbers of farms at a rate of in excess of 20 percent per year since 1995. This is the fastest growing sector of agriculture in Rhode Island. Our goal is to position our departmental research portfolio in aquatic pathology, novel species,

shellfish production and environmental impacts to best serve this rapidly developing clientele and to contribute positively to the economic development of the state through this 'green' industry. Although RI Aquaculture is growing, it will likely not grow to be a multimillion dollar business in the foreseeable future, but we are in the position to develop a lot of the technology that will be used in other regions of the world: we have the intellectual ability and creativity, connections and the basic knowledge on aquaculture species needed to build upon, and the body of knowledge represented by the discipline can be applied to a host of problems such as habitat remediation that are of critical importance to our state.

Overall Goals for the Animal and Veterinary Science Program

There continues to be an overarching interest in animals in the state of Rhode Island, New England and the nation. With this comes a high demand for student programs and a need to conduct research in areas that impact the well being of animals and the people who own and associate with them. With the estimated domestic and companion animal population of Rhode Island nearing one-half million, the involvement is enormous. This involvement leads to an animal related career as a life's ambition for many students. Animal science allows the students to combine their zeal for animals with their desire to learn what makes animals tick. The "substance" of the program allows the students to combine biology, chemistry and applied sciences to focus on the care, physiology, ethology and health and well-being of these animals. It is, therefore, essential that the central purpose of the animal science program remain education in its broadest terms. We have an expectation that faculty demonstrate leadership skills, technical competency in emerging areas, analytical and integrative thinking ability as well as an ability to function in a society that is multi-cultural and increasingly global. Our goal is to transfer these skills, where appropriate, to undergraduate students, graduate students and our broad-based clientele.

B. Research. *The exact nature of the research focus and goals should be proposed here. Again, the criteria for the establishment of the focus and goals should be global prominence, excellence of the research effort, relevance to stakeholders, and the economic diversification and improvement of the quality of life in the State of Rhode Island.*

Justification/Rationale

Research Goals

- To continue to be at the forefront in fisheries and aquaculture research building on our expertise in basic science and technology.
- Continue to work within the Fish, Fisheries and Aquaculture Initiative to develop programs that examine all aspects of fisheries management including biological, legal, economic and social.
- Maintain a direct link between research and management by working directly with agencies responsible for these activities.
- Strengthen research programs focusing on environmental impacts of fishing and aquaculture

- Re-establish a world-class presence in the field of aquatic and invertebrate pathology and serve as a regional center for research/extension partnerships in aquatic livestock health management and quarantine issues.
- Establish a world-class reputation in aquaculture biotechnology, strengthening the areas of genomics, pathogenomics, genetic transformation and vaccine development by building up collaborations and linkages with other Departments at CELS (i.e. CMB) and industry (i.e. Cape Aquaculture, Alpharma Inc.).
- Re-establish our internationally known research program in animal and veterinary science with new faculty hires in biotechnology and stress (environmental) physiology.
- Build up facilities at Peckham Farm for better self-sufficiency in support of the research enterprise.
- Develop multidisciplinary teams within the department, CELS and the university (i.e. Center for Invertebrate Pathology, Vaccine Development).

C. Teaching. *The exact nature of the teaching mission should be proposed here. In general, it should be noted that the CELS mission calls for an increase in experiential learning, but it also calls for an increase in the number of undergraduates that pass through our classes. These two (at times) antithetical goals need to be resolved within the teaching plan. Goals for all degree-granting programs must, separately, be clearly articulated and justified. In general, Departments should not structure teaching plans including per-course instruction. Outcome assessment should be incorporated into all teaching plans.*

Justification/Rationale

Teaching Goals

- Produce the undergraduate and graduate students who will become the future leaders in fisheries science and management.
- Produce students that have sufficient knowledge and background to initiate non-traditional fisheries and aquaculture management options.
- Increase the enrollment in Fisheries and Aquaculture by increased advertising – both intramurally and extramurally.
- Continue our large scale program in general education based experiential learning which enhances the educational process and serves to attract new majors to the Animal Science and Aquaculture and Fisheries Science programs.
- Utilize and improve upon departmental facilities such as Peckham Animal Center, with a proposed increase in the equine emphasis, and the fishing vessel the Captain Bert to increase the “hands-on” experiences of our majors.
- Continue our participation in learning communities with a goal of becoming the first program in the university to offer learning communities beyond the first semester.
- Provide every student with a capstone experience.
- Foster partnerships both on a formal and informal basis that allows mentoring of students by faculty, graduate students and peers thereby teaching students a team approach to modern science.

- Guarantee that through our teaching program students will learn to write, think critically, speak, solve problems and be motivated towards life-long learning.
- New faculty hires will permit us to meet the demands of students for new information in a changing society that continuously demands new and better science.
- To build on the college initiative in outcome assessment by creating a discipline specific blueprint (such as portfolios) for ongoing charting of student development and success.

D. Outreach. *The exact nature of the outreach mission should be proposed here.*
Justification/Rationale

Outreach Goals

- Involve stakeholders in FAVS research and management issues
- Educate stakeholders in FAVS research and management issues
- Continue to set national standards and programs based on credible scientific research and program delivery.
- To interface with Southern Rhode Island Cooperative Extension and 4-H to facilitate the information transfer from the scientific community to the general public and thereby contribute to the states continuing adult and youth education program.
- Improve Peckham Farm Facilities to better serve as a demonstration farm facility.
- Provide specific guidance in areas such as vessel safety, tick analysis and spirochete identification, equine health and management awareness
- Better use of media such as the World Wide Web and statewide television access to bring our programs to a larger audience.
- Increase fee based programming where appropriate to work towards program self-sufficiency.
- Continue to expand the annual Rhode Island Aquaculture Conference into a world-class regional expo and trade show

IV. THE PLAN. *In this section, the department must detail the steps it will take to achieve its goals.*

A. “Gap Analysis.” *This is the section in which the gap between “what is” and “what we want to be” (or, the vision) is elaborated. The exact method by which the changes will be effected is proposed in this section. A possible way to handle this section is to divide the changes into parts (Research, Teaching, Outreach, Other?) and then delegate/deputize faculty committees to produce plans for each of the changes.*

Animal Sciences:

To accomplish the research, teaching and outreach goals of the Animal Science Program Area, we intend to make the best use of our existing strengths and take advantage of opportunities such as filling faculty and staff vacancies to develop excellence in priority

areas. During the past year the Department has lost three animal scientists (two to retirement and one to a change in position). To maintain technical leadership in the most heavily enrolled BOS program in the College (BOS 210; Animal Science and Technology) and to revitalize our research program which has atrophied due to faculty attrition and subsequent refocusing of remaining faculty to course load demands, hiring new tenure-track animal scientists are essential. To this end, we are requesting three tenure-track faculty positions for the animal and veterinary science area of the department and one additional permanent part-to-full time staff position for the Peckham Farm animal facility. The specialty areas of the three animal scientist positions listed below dovetail nicely with existing expertise within the department while at the same time add the needed depth to the department in the areas that we consider to be critical to the existing program and necessary for the future direction of the program. The following positions are listed in order of priority:

Proposed Faculty Hires

1.) Animal Husbandry/Nutrition/Outreach

Animal scientists are now making significant contributions in a number of different professional settings. Several decades ago, animal scientists were concentrated almost exclusively in the agricultural domain. Today that has changed. The shift in Rhode Island from traditional family livestock farms to horse and exotic animal farms along with the advent of the technological revolution has opened the door to many new opportunities for individuals with training in animal science. Many local pharmaceutical and biotechnology companies are hiring our animal science graduates because they have practical hands-on skills in animal care and management. With diminishing numbers of farm families in the state, there are diminishing opportunities for learning animal management, and we provide that opportunity. In that so few students actually come to the University with any type of livestock exposure this experiential learning experience is a vital and necessary component of our undergraduate animal science curriculum. Our overall goal for the department is not just to maintain the status quo of our existing program but also to increase the experiential learning opportunities for all students in the program. We feel that this position is necessary in order for this goal to become a reality. This faculty member would have training in animal care and management. An understanding of the basic principles and approaches to the humane care and use of the animals is essential and would compliment the stress management research that has been a focus of the current animal science faculty. This individual would be expected to initiate research in the area of stress and animal biotechnology in concert with the to be discussed research goals of the department. Additionally, we expect that this specialist would interact closely with the University Veterinarian and Farm Manager and would be integrally involved in the expansion of the equine teaching and research program as well as the continued development of a Cooperative Extension Animal Science outreach program based at Peckham Farm. The areas of teaching would include courses that deal with the creation of a successful environment for housing, feeding and specific care issues of animals in a closed environment including, not only, traditional domestic and companion animals, but also captive exotics in zoological gardens. Lastly, this faculty member would have clear linkages with other animal scientists in the Departments of Fisheries, Animal and

Veterinary Science as well as life scientists in the Departments of Biochemistry, Microbiology and Molecular Genetics; Natural Resource Sciences and Biological Sciences.

2.) Physiology/Endocrinology

One of the major research thrusts of the Animal Science group has been in the area of stress management in domestic livestock under the aegis of the Rhode Island Experiment Station and USDA-CREES competitive grants. This focus on animal stress management is an appropriate research area in that it is a unifying focus in the FAVS department. Stress management has not only been a central concern in recent years to the Animal Science community but it is also vitally important both to the aquaculturists in the department that are optimizing fish production and managing fish health, and also to the fisheries scientists in the department working on by-catch reduction. With considerable USDA research focus directed toward animal stress management and animal welfare, it is likely that funding prospects in this research area will remain bright for years to come. This faculty member would have specialized training in the areas of animal physiology, endocrinology and reproductive biology. An understanding of the basic principles and approaches to the interaction between the aforementioned discipline areas with animal well-being and animal welfare is considered essential. The qualifications of this faculty member would also make him/her an ideal candidate to participate in the Environmental Biotechnology Initiative of the University of Rhode Island. The areas of teaching would include courses that deal with animal anatomy, physiology, reproductive biology and endocrinology. We expect that this specialist would interact closely with the University Veterinarian and Farm manager to optimize the research program as well as interfacing with the outreach program of the department and serving as an advisor to industry. Finally, this faculty member would have clear linkages with other animal scientists in the Departments of Fisheries Animal and Veterinary Science as well as life scientists in the Departments of Biochemistry, Microbiology and Molecular Genetics; Natural Resources Sciences; Biological Sciences and the Graduate School of Oceanography.

3.) Genetics/Biotechnology/Bioethics.

The recent growth and revolution in biotechnological and pharmaceutical industries has opened many new opportunities for individuals with training in animal science. Presently, our Animal Science program graduates are entering professions in larger pharmaceutical companies and upstart biotechnology companies both locally and nationally. We would like to start to shift a portion of the departments focus towards animal biotechnology, making the program central within the CELS Environmental Biotechnology Initiative. This Animal Scientist would have training in biotechnology and bioethics and as such he/she would be expected to participate in the Environmental Biotechnology Initiative of the University of Rhode Island. Although the specific areas of inquiry would be determined by the scientists, we would expect this faculty member to approach research problems using modern, molecular-and cell-based approaches. We expect that this specialist would interact closely with the University Veterinarian and Farm manager. Additionally, the incumbent would be an active participant in the departments outreach program, serving as an advisor to the livestock and biotechnology industries in Rhode Island and the rest of New England. The areas of teaching would include courses in Genetics, Bioethics, a graduate level course in Biotechnological Applications and multi-discipline course in Contentious Issues in Natural Resources and Agriculture.

Last, this faculty member would have clear linkages with other animal scientists in the Departments of Fisheries Animal and Veterinary Science as well as life scientists in the Departments of Biochemistry, Microbiology and Molecular Genetics; Natural Resources Sciences; Biological Sciences and the Graduate School of Oceanography. We also anticipate the opportunity to collaborate with the Philosophy Department on issues related to bioethics.

Facilities

The Peckham Farm Animal Center is the centerpiece of the animal science programs experiential learning for the students, it is critical that the farm receives an infusion of funds that would enable us to modernize the existing farm with new fencing, waterlines and run-in sheds for the animals that currently reside on the farm and new animals that we hope to bring onto the farm. Also, the farm machinery needs upgrading, including a tractor, manure spreader and hay mower to in an effort to get the farm moderately self-sufficient in pasture and winter feed production. We intend to expand the equine program. As part of our experiential learning curricula we have recently instituted a hands-on laboratory for a general education animal science course that enrolls 500 students per semester. All 500 students come down to the farm over a two to three week period. Currently, we are totally at the mercy of the weather, as we have no indoor facility whatsoever to accommodate the students when they come down to the farm for their labs. We are therefore proposing the addition of an economical, foundationless structure that would not only be extensively used by instructors for their livestock classes, but would also be utilized by student organizations, state cooperative extension and the general public. Peckham Farm is the ‘peoples farm’, therefore on any given day you can see members of the community visiting the farm with their families as well classes from neighboring schools being given tours. With our goal of expanding the outreach component of the animal science program we are expecting there to be a much bigger public presence and therefore it is critical that the University Farm looks like the cutting edge research and outreach facility that we envision it to be.

The URI Tick Lab operated by Dr. Elyes Zhoiua has been a visible part of the AVS outreach effort for two years. However, recent successful negotiations with the RI Department of Environmental Management to place a mosquito laboratory within the College suggests that a better method of managing the Tick Lab may be to combine efforts with the mosquito laboratory to form a combined Mosquito/Tick Vector Borne Disease Lab with DEM/CELS partnership. The combined lab would be housed in the PLS Department, and specifics of the plan for the lab are outlined in the PLS Strategic Plan. FAVS faculty (Whitworth and others) will continue on collaborative research and outreach in the vector borne disease arena, especially in the area of parasite induced stress responses in animals.

Permanent Staff position for Peckham Farm.

With the department’s goal of expanding experiential learning opportunities for students, development of an equine program and revitalization of the research program, the demands on the Peckham Farm work force will increase exponentially. Currently our farm manager, David Marshall, runs the farm with a tenuously funded part-time assistant manager and sporadic help from work-study students. Currently, there is a dire need for the temporary part-time assistant manager position to become a permanent part-to-full time position due

to the 24/7 “on-call” coverage requirements for any livestock operation. Historically there have been two full time positions allocated to Peckham Farm. It has only been in the last few years that the labor situation down at the farm has been reduced to its’ current state. It will be impossible to expand the program as we envision without a stable work force in place to keep the farm in good repair and the animals well cared for.

Aquaculture and Fisheries Science:

Proposed Faculty hires

To develop the research capabilities in the aquacultural and fisheries sciences, strategic faculty hires are planned, including a marine fisheries ecologist focusing on temperate water marine species. Marine fisheries have a huge economic impact on the state of Rhode Island. Recreational fisheries contribute in excess of \$150 million and the commercial fisheries contribute in excess of \$700 million annually to the state economy. Graduates of the URI aquaculture and fisheries science program participate in all levels of the fisheries in the region, from harvesters and aquaculture producers, to scientists, to resource managers.

Research opportunities in the area of fisheries science remain robust, particularly in the area of understanding of the relationship between standing stock of fish and that of reproduction and recruitment. These classical concerns of fisheries biologists have been reinvigorated by new developments in the field of molecular genetics, which can allow identification of discrete spawning stocks or fish sub-populations or tracing fish cohorts from hatch to adulthood through either phenotypic or genotypic markers. This would be leading to the practical goal of better fisheries management, as well as a quantum leap in our understanding of the problems of marine fisheries ecology.

The Marine Fisheries Population Geneticist/Ecologist would hold minimally a Ph.D. in Fisheries Science or closely allied field and would be trained in the techniques of protein and nucleic acid electrophoresis, other relevant molecular techniques as well as the methods of classical fish population biology. The successful new faculty member would be expected to develop a research program investigating the relationship between distinct fishery stocks and fishery recruitment and production. There would also be expectations of work in the general area of trophic interactions. There continues to be considerable funding available for research in this area from NOAA/NMFS, and elsewhere. The incumbent will also be expected to contribute to the Environmental Biotechnology Initiative of AES/CE and the Sea Grant funded fisheries outreach program working with commercial fishermen and fisheries managers in Rhode Island. The area of teaching of the proposed new faculty member would be in the area of genetics and fisheries ecology. The successful candidate would be expected to teach *AFS 476 Genetics of Fish*, *AFS 510 Applied Problems in Fisheries Ecology*, and develop undergraduate and graduate courses based on his/her expertise. As an expert in the techniques of molecular genetics as applied to fisheries problems, there is a potential for considerable collaboration throughout CELS and the University. In addition to being active with the Environmental Biotechnology Initiative, there is potential for collaboration with animal population biologists in the Department of Natural Resources Science, Biological Sciences and the Graduate School of Oceanography.

A second potential new faculty member would be in the area of Marine and Estuarine Community Ecology. One of the most influential papers in Fisheries Science in recent times (Jackson et al., 2001 Historical overfishing and the recent collapse of coastal ecosystems. *Science* 293:629-638) suggests that human fishing operations affect entire ecosystem function, suggesting that the paradigm of the single species fisheries management scheme is completely ineffective at maintaining proper ecosystem function. This suggests that future fisheries management must consider ecosystems and trophic interactions to be effective. Thus Ecosystem Community Ecology has become an important scientific discipline guiding the new paradigm of fisheries management. FAVS desires to position itself at the center of this revolution by hiring a Fisheries Scientist with background in temperate coastal and estuarine community ecology and trophic analysis.

The Marine Fisheries Community Ecologist would hold minimally a Ph.D. in Fisheries Science or closely allied field and would be trained in the techniques ecosystem trophic analysis as well as the techniques of classical fish population biology. The successful new faculty member would be expected to develop a research program investigating the relationship between fishery stocks and ecosystem structure and function. There continues to be considerable funding available for research in this area from NOAA/NMFS, and elsewhere. The proposed new faculty member will also be expected to contribute to the Environmental Biotechnology Initiative of AES/CE and the Sea Grant funded fisheries outreach program working with commercial fishermen and fisheries managers in Rhode Island. The area of teaching of the proposed new faculty member would be in the area of fisheries ecology. The successful candidate would be expected to develop and teach undergraduate and graduate courses based on his/her expertise. As an expert in marine community ecology as applied to fisheries problems, there is a potential for considerable collaboration throughout CELS and the University. In addition to being active with the Environmental Biotechnology Initiative, there is potential for collaboration with animal population biologists in the Department of Natural Resources Science, Biological Sciences and the Graduate School of Oceanography.

A third potential new faculty member would be in the area of piscine pathology and preferably with training in virology. Successful fish farming is now limited by problems of disease creating a great need for students to master the basic principles of disease in aquatic animals. Diseases caused by viruses, bacteria and parasites are common and cause serious losses of fish stocks. A thorough understanding of etiological agents, the pathogenesis, antigenicity, epizootiology, and the inter-relationship of stress-related and environmental factors surrounding bacterial diseases are essential for successful stock management and control. Additionally, the fishing and aquaculture industries, the environmental advocacy community and Rhode Island state agencies (CRMC and DEM-Fish & Wildlife) have expressed a need for the capability of fish disease diagnosis and treatment within the state to support our lucrative fishing industries and to advise on aquatic animal quarantine issues. DEM has been providing partial support for aquatic disease diagnosis and epizootiological services. To maintain technical leadership in the Marine and Environment focus area and in the Environmental Biotechnology Initiative, a faculty finfish disease specialist is essential. On December 31, 1998, our aquatic resources veterinarian retired. We feel that this void remains essential to fill.

The proposed faculty member would hold minimally a M.S. degree (thesis) in a relevant field and a DVM, VMD or Ph.D. degree. We expect the successful candidate to have training in diseases of finfish, with emphasis on pathogens affecting species of commercial importance to aquaculture. An understanding of the basic principles and approaches to aquaculture is essential. The successful disease specialist would engage in research as it relates to health management of cultured fishes, emerging diseases of cultured fish and development of molecular diagnostic assays for pathogens and/or novel methods of vaccinating fish or treating disease. The areas of teaching would include courses that deal with fish health and disease. We are revising our undergraduate aquaculture curriculum to include six required core courses, one of which is *AFS 302-Aquaculture Health Management* (proposed course). Further, this faculty member would contribute to the instruction in that course as well as teach existing courses in cooperation with other aquaculture faculty, e.g., *AFS 401 (Pathobiology)*, *AFS 400 (Diseases of Cultured Fish)*, *AFS 555, 556 (Pathology Rotation)*. Successful recruitment of a finfish disease specialist with experience in aquaculture would provide us the opportunity to continue a novel teaching and research program in an essential and rapidly developing area. Further, the selected faculty member would engage in fish health outreach programs and maintain the university aquatic disease diagnostic laboratory, serving as an advisor to industry. Finally, this faculty member would have clear linkages with aquatic animal specialists in the Departments of Fisheries Animal and Veterinary Science; Biochemistry, Microbiology and Molecular Genetics; Natural Resources Sciences; Biological Sciences and the Graduate School of Oceanography. We also expect that the finfish disease specialist would interact with the University Veterinarian and the current shellfish disease specialist. The successful candidate would be expected to participate in the Environmental Biotechnology Initiative of the University of Rhode Island.

The final proposed positions in the Aquaculture and Fisheries Science program area is for an Aquaculture Systems Specialist. Aquaculture is composed of a variety of disciplines that range from the study of the basic biology of finfish and shellfish to design of rearing units. Faculty in the Department of Fisheries, Animal and Veterinary Science at URI have expertise encompassing many of these areas including: development of culture techniques, fish nutrition, fish physiology/molecular biology and finfish diseases (a position we hope to fill). However, one area in which the department is deficient is in the area of aquaculture systems. In the mid 1900s traditional agriculture practices in the U.S. were transformed by the vision of agriculture engineers seeking to increase productivity through efficiency and mechanization. Aquaculture is at a similar juncture in which efficient use of dwindling water supplies, rearing space or open ocean regions is critical for continued development.

The proposed new faculty member would hold the Ph.D. degree in aquaculture systems, engineering or other relevant field and address problems associated with rearing large numbers of aquatic organism at high densities in limited quantities of water. Research priorities would primarily focus on intensive land-based aquaculture and include the physical engineering of fish culture systems. The systems specialist would be expected to provide research leadership in the design and development of. 1) hatcheries and “grow-out” systems, 2) water treatment systems and pumps, 3) technology for recirculation and reuse of fresh and/or saltwater, 4) physical methods for transfer and harvest of fish and 5) quantification of biomass. The addition of an aquaculture systems specialist to the

department would enhance and complement the existing Aquaculture program. This faculty member would enable us to offer key courses in aquaculture systems. We are revising our undergraduate aquaculture curriculum to include six require core courses, one of which is AFS 303-*Aquaculture Systems* (proposed course). This faculty member would develop the course as well as teach AFS 584-*Advanced Aquaculture Systems* to graduate students. Additional courses might focus on *Open Ocean Aquaculture or Marine Netpens and Sea Cages*. These courses are critical to our goal of providing students with a comprehensive education in finfish and shellfish aquaculture, one of the few programs in the Northeast. Successful recruitment of a systems specialist with experience in freshwater and/or marine aquaculture would afford us the opportunity to implement a novel teaching and research program in a currently undeveloped area. Further, the incumbent would have clear linkages with water resource specialists in the Departments of Natural Resources Sciences and Civil and Environmental Engineering; with aquaculturists in the Departments of Fisheries, Animal and Veterinary Science; Biological Sciences and the Graduate School of Oceanography and with water policy specialists in Departments of Environmental and Environmental and Natural Resource Economics and Marine Affairs.

Staff positions in Aquaculture and Fisheries Science

At the end of the 2003 Academic year Professor Richard Wing will be fully retired from the Department. However, there will be the need for management of major equipment assets of the department such as the R/V *Captain Bert*, maintenance of the machine shop and woodworking shop and assisting in the offering of hands-on courses in fisheries and aquaculture technology. The department feels that these practical skills in marine technology are a unique and important feature of the URI Aquaculture and Fisheries Program that allows our graduates a very competitive edge in the job search after graduation. However instead of a tenure track faculty position, the Department proposes filling the position by a full-time staff member at the Staff Level-10 parallel to the Farm Manager Position at Peckham Farm (Marshall) and the Aquaculture Center Manager's Position (Wentworth) who have similar responsibilities in their respective assignment areas within the Department. Responsibilities of the proposed staff position in Fisheries would include management of the R/V *Captain Bert* and other small boats, oversight of the machine shop and carpentry shop operations, teaching of small boat course, engine maintenance and seamanship courses. The proposed staff member would also be expected to coordinate with fisheries research and outreach staff with their equipment needs for program delivery. Also expected would be coordination with the Managers of the Freshwater Aquaculture Center and Peckham Farm for resource sharing and mutual backup.

At the end of January 2002, Ms. Sheila Polovsky our histopathology laboratory technician will be retired from the Department. In light of the departmental plans to expand our presence in the area of aquaculture biotechnology and aquatic pathology, we propose a replacement technician potentially at the Staff level-7 to 9 trained in the skills of histopathology, gel electrophoresis, Southern and Western blotting and HPLC. This staff person would be expected to provide research technical support to Drs. Terry Bradley, Marta Gomez-Chiarri and the proposed finfish pathology and fish ecology faculty members in their research needs, as well as providing support for Dr. Gomez-Chiarri's outreach

program in the annual shellfish disease surveys. The proposed staff member would have with partial funding from RIAES, the RIDEM Shellfish Disease Program and the individual research grants to active FAVS research PIs.

Facilities & Major Equipment Planning for Aquaculture and Fisheries Science

The part of the aquaculture research operations of the department is expecting to move to the new Luther Blount Aquaculture Laboratory in the late Fall of 2002, given the planned March 2002 groundbreaking. This new state of the art building at the Narragansett Bay Campus will greatly aid our efforts in marine aquaculture research. The Freshwater Aquaculture Center at East Farm will be maintained, because it remains a perfect venue for salmonid (trout and salmon) hatchery and nursery operations. A key problem of the Freshwater aquaculture is the volume of water consumed and the price of the water paid by the University Central Administration. One recent estimate put the water usage by the building at about \$80,000 per year, making that building alone the single largest water user in the Kingston Water District. The water system is a high volume flow-through system that is essentially 1950s technology. For approximately \$125,000 using current water reuse technology, it is possible to cut water consumption by 60%, thus providing about a 2-year payback on the cost of the new water system on water bill savings alone. In addition to cost savings, the Department is eager about revamping the water system at East Farm for the reason of Outreach Education. Water resource availability is one of the key roadblocks to inland aquaculture development in the state, so profligacy in water usage by the exemplary demonstration facility may be perceived as modestly hypocritical.

In about a year and a half, the manager of the URI R/V *Captain Bert* cost center will retire from the Department, making for a challenge in the management of that very important cost center. The R/V *Captain Bert* cost center is one of the few cost centers on campus not operating with any administrative subsidies, and the boats/facilities supported by the account are maintained at an absolute state of the art level of technical sophistication and readiness, with system backups. This level of facility excellence is tribute to the entrepreneurship and dedication of Professor Wing. Assuring that the vessel cost center is in very capable hands upon the retirement of Professor Wing is among the Department's top priorities. The Department urges the creation of a Fisheries Facilities Manager position as outlined in the Staff Positions section above.

B. Timeline. *The timeline should be set up with 5- and 10-year benchmarks. Considerable detail earlier in the timeline is also necessary.*

FAVS Departmental Planning Timeline

By Year 1

- Increase experiential learning component in courses
- Fill at least one faculty vacancy in Animal and Veterinary Sciences
- Hire full or part-time assistant farm manager
- Continue rehabilitation of Peckham Farm
- Begin expansion of equine program
- Transfer responsibilities of Tick Laboratory to the PLS/DEM Mosquito-vector borne disease lab.

- Begin outreach program at Peckham Farm for targeting the adults and youth of the state
- Develop strong linkage with 4-H staff and Rhode Island Cooperative Extension at Peckham
- Fill at least one Faculty Vacancy in Fisheries Science in the field of temperate fisheries ecology
- Begin research operations at the Luther Blount Aquaculture Center
- Begin water system rehabilitation at the Freshwater Aquaculture Center
- Institute new core curriculum in Aquacultural Science integrating more experiential learning and capstone experiences
- Begin search for Fisheries Facilities Manager/Vessel Manager staff replacement for Professor Wing

By Year 5

- Two additional hires in Animal and Veterinary Science allowing:
 1. Research programs in biotechnology, stress and welfare and equine will be fully operational resulting in an increase in graduate student numbers and outside funding support
 2. Curriculum offerings will be expanded to reflect the changing nature of the animal science field.
 3. Full scale outreach program
- Multi-purpose pavilion will be constructed and in use to enhance the hands-on work with animals with an emphasis on indoor equine activities as well as large scale general education experiential learning modules and state 4-H club activities.
- Expansion of internship opportunities, partnerships and cross-departmental programs.
- Complete improvements on Aquatic Pathology laboratory
- Hire histopathology/biotechnology support staff individual
- Three additional faculty hires in Aquaculture and Fisheries Science to include the fisheries population geneticist, the finfish pathologist and the aquaculture systems engineer.

By Year 10

- One faculty (AVS) will retire and expansion of graduate and undergraduate programs will necessitate the hiring of two new AVS faculty.
- Teaching program will be regionally prominent and nationally recognized
- Research programs in stress, animal well-being and animal biotechnology will have returned to international prominence.
- Two faculty (AFS) will retire and expansion of graduate and undergraduate programs in Fisheries Science will necessitate the hiring of two new AFS faculty.

C. Review. *An initial review will be performed internally by all Department Chairs within the College. Detailed, external reviews of the complete strategic planning document by interested, informed and relevant parties (alumni, peers at other institutions, etc.) may be sought at a later date.*