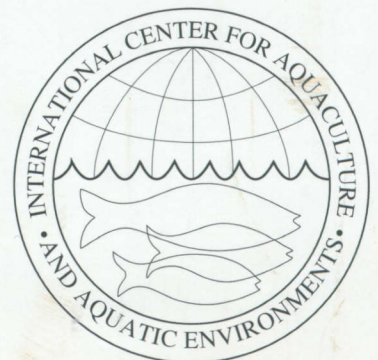




**I**NTERNATIONAL  
**C**ENTER FOR  
**A**QUACULTURE  
**AND**  
**A**QUATIC  
**E**NVIRONMENTS

**AUBURN UNIVERSITY**



Involvement in aquaculture and inland fisheries began at Auburn University in 1933 under the pioneering leadership of Dr. H. S. Swingle. Early work focused on construction and management of watershed ponds that were designed to capture and store rainwater for general farm use, fish production and recreation. These experiences formed the nucleus for an international development program which has been active in more than 95 countries, accruing more than 125 person-years of experience.



**Rural development:** The Center assists with the design, construction and management of aquacultural research facilities as shown in this fish-rice-vegetable facility in the Philippines.

**Aquabusiness:** Catfish production is an important commercial industry in Southeastern United States



The International Center for Aquaculture was created in 1970 to provide technical and socio-economic assistance to developing countries in aquaculture, inland fisheries and living aquatic resources management. During the 1980's, Center activities reflected greater emphasis on the environment and expanded to include coastal marine habitats. In 1991, the Center's name was changed to **International Center for Aquaculture and Aquatic Environments (ICAAE)** to more accurately reflect the broadened scope of its program.

**On the cover:** Cultured carp are produced at an integrated fish-livestock project in Panama.



**Environment:** Changes in aquatic environments are assessed and monitored to improve resource management practices.

**Research:** Biogenetic research enables scientists to develop improved strains of fish.

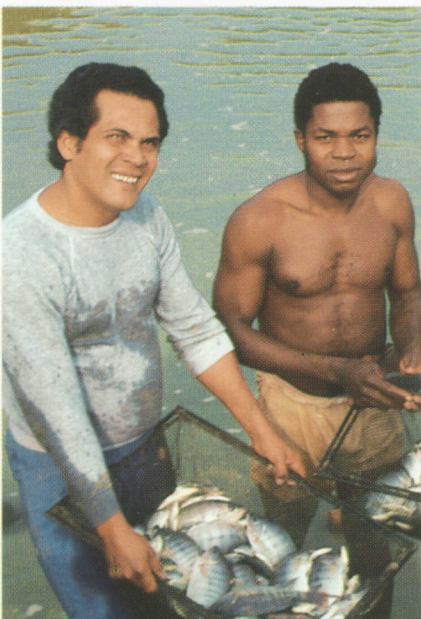


## VISION

The primary purpose of the Center is to improve the quality of life of people by facilitating the sustainable development of aquatic resources. Sustainable development requires that social and economic needs of people be carefully balanced with technological interventions and managerial practices that conserve the environment.

The interdisciplinary approach of the Center is reflected by its Associates, who represent the broad disciplines of aquaculture, fisheries, aquatic ecology, environmental studies, economics, sociology, forestry, engineering, geography and soil science.

**Education and Training: International students harvest fish as part of their research for masters and doctorate degrees.**



**Networking: Dr. Bryan Duncan, Director of ICAAE, discusses aquacultural development strategies with Dr. Roshada Hashim, a visiting scientist from Malaysia.**

## INTERNATIONAL DEVELOPMENT GOALS

The Center, in partnership with the Department of Fisheries and Allied Aquacultures, other Auburn University departments and external collaborators, seeks to accomplish the following goals:

- Improve the nutritional and economic status of people in rural communities by equipping public agencies and non-profit organizations with technologies for sustainable development.
- Promote growth of aqua-businesses through improved technology, managerial practices and market development.

- Maintain and improve aquatic environments by monitoring environmental conditions and implementing appropriate managerial practices.

- Conduct basic and applied research to remove constraints to sustainable development.

- Provide undergraduate, graduate and non-degree training in technical and socio-economic aspects of aquaculture, fisheries and related aquatic resources.

- Facilitate linkages and information exchange among people working with living aquatic resources.



**Integrated fish-swine culture is one of several types of fish production systems introduced in Panama.**



**Integrated fish-livestock research is conducted at a governmental station in Burundi.**

## **CAPABILITIES AND ACCOMPLISHMENTS**

### **RURAL DEVELOPMENT**

Development is a process that increases the productive capacity of people and their resources. Through training and transfer of technical skills, people learn to make more efficient use of available resources and learn new ways to solve problems. Improvements in infrastructure and policy increase the efficiency of the development process.

#### **Integrated Fish-livestock Systems in Panama**

The Center designed and implemented a 3-year project to introduce water harvesting and integrated fish-livestock farming technologies among indigenous communities. Significant improvements in family nutrition were demonstrated by increased caloric

and protein intakes in family diet. Participating communities benefited economically from reduced production costs.

#### **Production and Infrastructural Development in Rwanda**

Over a 5-year period, the Center designed and helped implement the National Fish Culture Project that increased fish production four-fold and renovated six fish stations and more than 1,000 ponds. More than 650 new ponds were constructed and 70 aquacultural managers and extension agents were trained.

#### **National Planning in Indonesia**

The Center helped governmental planners establish a national research and development strategy

for fisheries and aquaculture. The plan included research in fisheries and aquaculture, management, marketing, socio-economic impact assessment of new technology and a research review system. Technical seminars and workshops for the public and private sectors were also planned and presented.

#### **Water Harvesting in Asia, Africa and South America**

Technical assistance and training in water harvesting and multiple use of water was provided by the Center to several Private and Voluntary Organizations and their in-country counterparts in 44 countries. During the 5-year project, more than 30,000 people benefitted directly, 4,000 managers were trained and over 1,500 ponds were constructed.



**Above: Production and sale of high value ornamental fish are lucrative businesses in Indonesia. Above right: Channel catfish are harvested at a large-scale aquaculture operation in the U.S. Right: Purchasing patterns of consumers in the marketplace influence the type, amount and form of fish food products.**

## AQUABUSINESS

Given the growing importance of aquabusiness to the international community, the Center is committed to the development of commercial aquacultural enterprises. Benefits include: income, employment, foreign exchange generation, farm diversification and efficient use of natural resources.

### Freshwater Fish Culture in the Caribbean

In Jamaica, the Center designed and implemented a project that developed a profitable tilapia production system and improved marketing techniques. Jamaican entrepreneurs have now begun to export fish and annual production currently exceeds 2,700 metric tons.

### Shrimp Culture in Latin America and Southeast Asia

The Center provided technical assistance to private firms in Ecuador, Dominican Republic, Honduras, and Panama on feasibility studies, financial and economic analyses, water quality management, and improved production technology. Short-term consulting in shrimp health, production systems, training, soils and water quality management were provided in Thailand and Indonesia.

### Fish Culture in Cages in Indonesia

A 3-year research program on cage design, fish stocking density and feeding regimes resulted in improved technology that increased profits from cage culture of fish in large reservoirs.



## ENVIRONMENTAL CONSERVATION AND NATURAL RESOURCE MANAGEMENT

The Center recognizes the critical need for adequate quantities of high quality water for sustained development and is committed to the proper management and conservation of water resources and associated aquatic organisms. There is an intimate link between protecting the natural resource base and improving the nutrition and health of the rural poor. Both must be addressed if either is to succeed.

The Center promotes environmental awareness through training and conducts environmental assessments and monitoring. Areas of concern include impacts of development projects on downstream water quality, measurement and conservation of aquatic ecosystem integrity and biodiversity and socioeconomic aspects of environmental management.

### Environmental Studies in Freshwater Systems in Rwanda

The Center assessed the impact of aquaculture on downstream water quality, surveyed waterborne disease vectors in fishponds and made recommendations to minimize human and livestock health risks. A biomonitoring program for evaluation and conservation of aquatic environments was also developed.

### Fisheries Stock Assessments in South America, Asia and Africa

The Center designed and implemented fisheries stock assessment programs for rivers in Colombia, Indonesia, and Niger, and for lakes and reservoirs in Brazil,

Guatemala, Honduras, Nicaragua, Peru, Tunisia, Kenya, Uganda and Zaire. Stock assessment surveys and gear selection studies provided social, economic and biological information for optimizing benefits from the fisheries.



**Above: Rwandan technicians monitor water quality in fish ponds. Right: Harvest information collected from fishermen is used to develop a river management strategy in Colombia.**



## RESEARCH

The Center has a long history of conducting basic and applied research to facilitate aquatic resource development. In many countries advancements in aquaculture are constrained by inadequate production technologies and a degraded natural resource base. Faculty and staff of the Center have spent many years in international research activities to develop and extend

appropriate fish production technologies that are economically and environmentally sound.

### Aquacultural Pond Dynamics in Africa and Latin America

In collaboration with host-country agencies and other U.S. Universities, the Center designed and implemented the Pond Dynamics/Aquaculture Collaborative Research

Support Program having projects in Honduras, Panama and Rwanda. Since 1983, the Center has provided more than 15 person-years of research assistance. Research concentrated on the development of fish and shrimp production systems and on elucidation of the biological, chemical and physical processes that influence pond production.

### Research and Facilities Development in Brazil

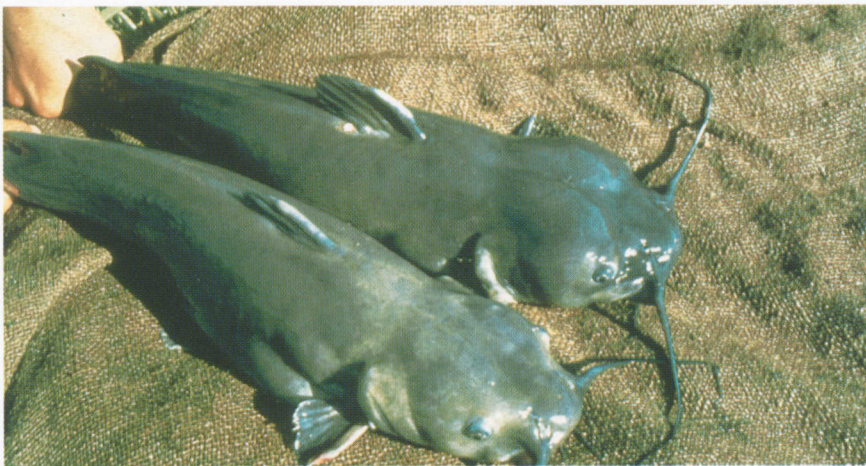
Through the long-term placement of its personnel in Brazil, the Center assisted the government in the design and construction of the largest freshwater aquaculture experiment station in South America. Research was conducted on the aquaculture potential of native fishes, development of fish culture technologies, and management of native and introduced fish populations in water storage reservoirs.

### Research and Facilities Development in the Philippines

Fifteen person-years of technical assistance were provided by the Center for the development of aquacultural research facilities and related development and extension programs. Freshwater and brackish-water research and training centers were designed and constructed. Research developed new technologies and extension strategies for integrated fish-rice production, polyculture, cage culture, fish health, fish reproduction and fish nutrition.



**A technician analyzes water quality for fish culture in Honduras.**



**Selective breeding and genetic research for catfish have resulted in faster maturing hybrid strains, more efficient growth and improved meat yield.**

# Worldwide Activities of the International Association for Great Lakes Aquatic Environmental Science



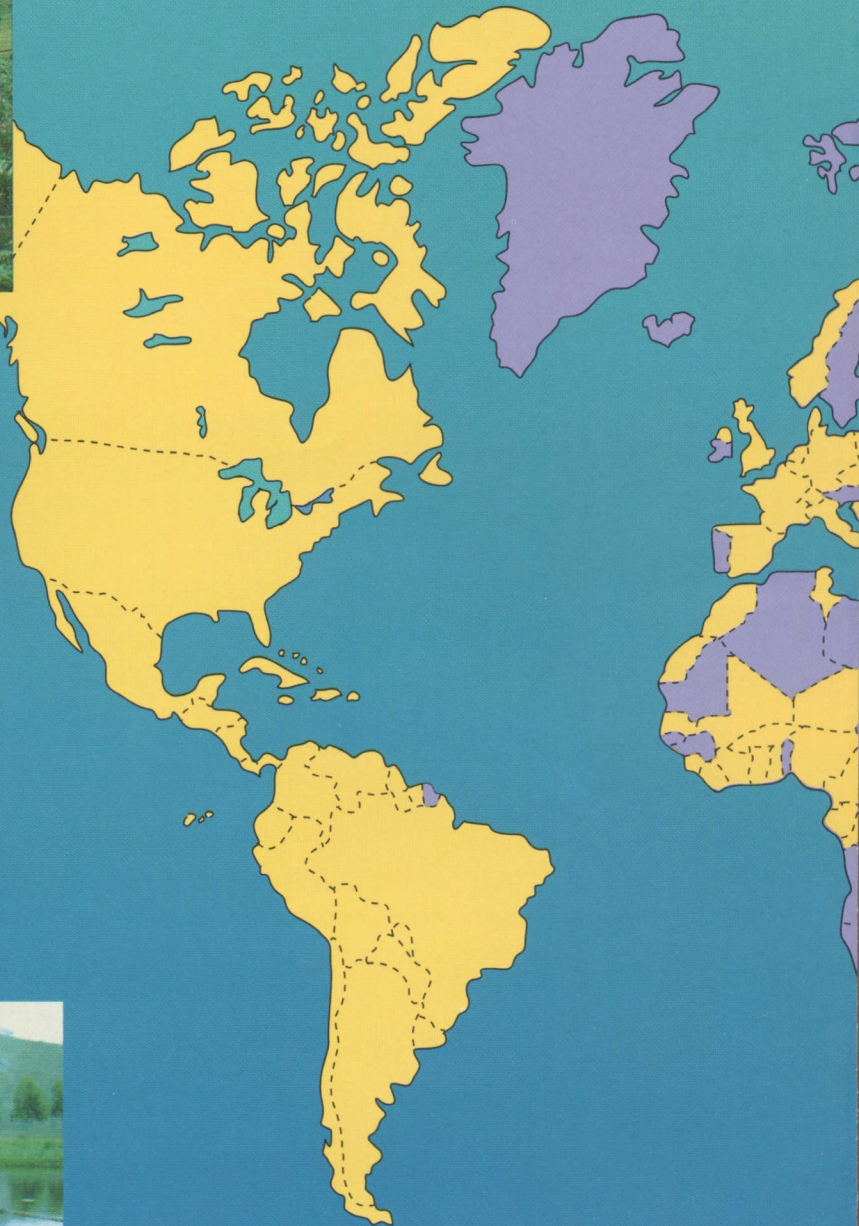
Guatemala:  
Integrated fish-chicken-vegetable farm



Brazil:  
Analysis of pond water



Rwanda:  
Gardens irrigated with pond water



Catfish



Oysters



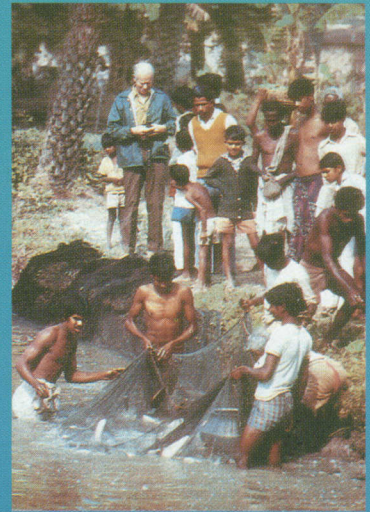
Shrimp



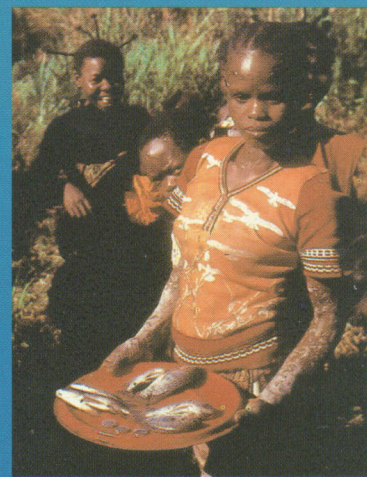
# ional Center for Aquaculture and ronments



Indonesia:  
Processing tiger prawns for export



India:  
Harvesting polycultured carps



Zaire:  
Increased income, food and employment  
from sale of farm raised fish



Tilapia

Freshwater crayfish

Carp

## EDUCATION AND TRAINING

Auburn University's programs in freshwater and marine aquaculture, fisheries and related social sciences are comprehensive and flexible to meet the individual needs of students and researchers. Undergraduate and graduate degree programs are offered on-campus while non-degree training is provided both on- and off-campus. Nearly one-half of the graduate students are from developing countries and 400 graduate degrees have been conferred on international students from more than 40 countries.

The Aquaculture Training Program, begun in 1976, is an annual 4-month program designed for international participants. It is a practical and comprehensive study of aquaculture and people from nearly 60 countries have received training through it.

The Center also offers training in Assessment and Management of Aquatic Environments. This course emphasizes a holistic view of watersheds, includes the latest techniques in bioassessment and is integrated with



**Above: Extension agents and fish farmers attend an aquaculture short course as part of a continuing education program in Panama. Below: Fish harvest data are recorded for analysis by university students in Brazil as part of their training.**

water quality and fisheries management principles. It also includes basic computer training which allows participants to manage, analyze and present environmental information.

Specialized short courses for on- and off-campus training have benefitted many countries in Africa, Asia and Latin America. On-campus courses are tailored to meet special needs of international participants. Off-campus training in countries other than the U.S. can be conducted in several languages.



### Degree Programs

- Bachelor of Science
- Master of Aquaculture
- Master of Agriculture
- Master of Science
- Doctor of Philosophy

### Non-degree Programs

- Aquaculture Training Program
- Assessment and Management of Aquatic Environments
- Specialized shortcourses
- Visiting scientist program

## NETWORKING

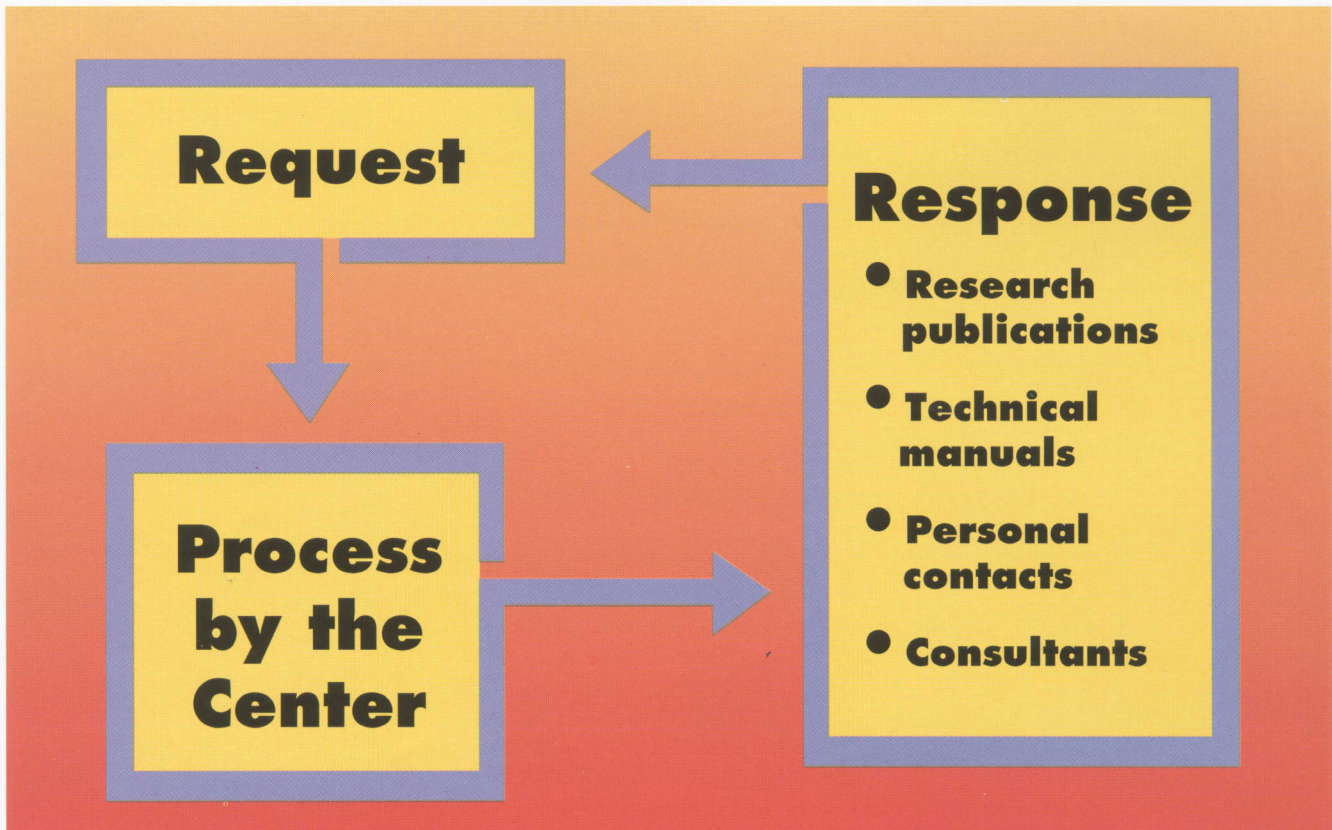
A major constraint in many developing countries is limited availability of technical information and professional contacts. As the number of trained professionals increases in developing countries, the need for improved networking will also increase. The International Aquaculture Network was developed by the Center to provide services to a diverse group of professionals working with aquatic resources. Networking services provide people with appropriate research, education and extension



**The Center's International Aquaculture Network uses a computerized biographical database to provide people with expertise, information and other resources.**

materials and facilitate linkages between professionals from various disciplines. The Center maintains a computerized database containing

biographical data on active professionals.



**The Center provides people with appropriate research, education and extension materials and facilitates linkages among professionals with shared interests.**

## PERSONNEL

Associates of the Center are faculty, professional staff and affiliates of Auburn University. All have international experience, and many have foreign language skills. Associates include holders of distinguished university professorships and internationally recognized experts.

**C. BAILEY** (Ph.D.) Sociology of marine fisheries and coastal zone management

**D.R. BAYNE** (Ph.D.) Reservoir ecology; aquatic plant management

**A. J. BOCEK** (M.S.) Aquaculture; management information systems

**C.E. BOYD** (Ph.D.) Water quality management for aquaculture

**Y.J. BRADY** (Ph.D.) Fish health management

**J. CRANCE** (M.S.) Station Chief, USFWS, National Ecology Research Center - Auburn

**W.D. DAVIES** (Ph.D.) Eminent Scholar for Agriculture and Environment; fisheries

**W.G. DEUTSCH** (Ph.D.) Environmental assessment; aquacultural/environmental training

**B.L. DUNCAN** (Ph.D.) Director, ICAAE

**R. A. DUNHAM** (Ph.D.) Fish genetic engineering

**R.K. GOODMAN** (M.S.) Aquacultural facilities management

**B.W. GREEN** (Ph.D.) Aquacultural production systems

**J.H. GROVER** (Ph.D.) Aquaculture; academic programs and institutional development

**R.L. GUTHRIE** (Ph.D.) Associate Dean, College of Agriculture; Assistant Director, International Programs

**B. F. HAJEK** (Ph.D.) Soil science for aquaculture

**T.R. HANSON** (M.S.) Aquacultural economics; farm management

**L.U. HATCH** (Ph.D.) Aquacultural and natural resource economics

**D.R. HICKS** (Ph.D.) Geographic information systems; remote sensing

**J.W. JENSEN** (Ph.D.) Extension specialist for aquaculture and marketing

**C.M. JOLLY** (Ph.D.) Aquacultural economics and marketing

**W. D. KELLEY** (Ph.D.) Forestry; natural resource management

**R.T. LOVELL** (Ph.D.) Fish nutrition; processing technology

**L.L. LOVSHIN** (Ph.D.) Aquaculture/agriculture integrated systems; aquacultural training

**S. P. MALVESTUTO\*** (Ph.D.) Fisheries and biometrics; training specialist

**J.E. MARION** (Ph.D.) Dean, College of Agriculture

**J.Y. MEVEL\*** (Ph.D.) Aquacultural facilities design and construction

**J.F. MOEHL** (Ph.D.) Aquacultural production systems

**J.J. MOLNAR** (Ph.D.) Alumni Professor; rural sociology

**D.D. MOSS** (Ph.D.) Emeritus; international aquacultural programs

**K. C. McNABB** (Ph.D.) Forestry; silviculture and forest regeneration

**P.F. PARKS** (Ph.D.) Vice-President for Research

**R.W. PERRITT** (Ph.D.) Geography; environmental management

**R.P. PHELPS** (Ph.D.) Fish hatchery technology; aquacultural training

**J.A. PLUMB** (Ph.D.) Fish health management

**T.J. POPMA** (Ph.D.) Aquacultural production systems; aquacultural training

**R. P. PRETTO** (Ph.D.) Adjunct; tropical aquacultural systems; extension

**W.A. ROGERS** (Ph.D.) Fish health management

**D.B. ROUSE** (Ph.D.) Crustacean and molluscan aquacultural production systems

**H.R. SCHMITTOU** (Ph.D.) Emeritus; aquacultural production systems

**E.W. SHELL** (Ph.D.) Department Head, Fisheries and Allied Aquacultures

**R.O. SMITHERMAN** (Ph.D.) Aquaculture and fish breeding

**P. D. STARR** (Ph.D.) Sociology; project planning and administration

**D. STREET** (Ph.D.) Economic development; resource economics

**D. R. TEICHERT-CODDINGTON** (Ph.D.) Aquacultural production systems

**K.L. VEVERICA** (M.S.) Aquacultural production systems

**E.C. WEBBER** (Ph.D.) Aquatic ecology; environmental assessment

**K.H. YOO** (Ph.D.) Agricultural engineering and water harvesting

\* Affiliates



**Auburn University's Fisheries and Aquaculture Experiment Station includes research ponds and lakes, fish health and nutrition laboratories, hatchery facilities, classrooms, equipment and support personnel.**

## **FACILITIES**

The Department of Fisheries and Allied Aquacultures at Auburn University has one of the largest research facilities in the world. Water is harvested from several watersheds and managed to supply an extensive network of experimental and fish production ponds. Facilities include:

### **Building Complex**

- Classrooms
- Administrative offices
- Laboratories
- Computer network

### **Experiment Station**

- 900-hectare fisheries research unit
- 100 hectares of ponds and reservoirs
- Hatchery facilities and classroom
- Genetics research building
- Processing building
- Marketing building
- Fish disease laboratory
- Nutrition research building
- Fisheries biology building

# **INTERNATIONAL CENTER FOR AQUACULTURE AND AQUATIC ENVIRONMENTS**

## **• Services and Expertise •**

- Policy and program review
- Project feasibility studies, design, assessment and evaluations
- Project implementation and management
- Economic, financial and social analyses
- Research design and implementation
- Education and technical training
- Curriculum design
- Technology transfer and extension
- Basic and applied research and data analysis
- Networking with people and information
- Freshwater fish and crustacean production systems
- Marine fish, shrimp and oyster production systems
- Integrated fish-livestock and polyculture systems
- Selective breeding and genetic engineering
- Facility design
- Natural resource management
- Water harvesting and watershed management
- Environmental assessment and monitoring
- Fisheries stock assessments and management
- Fish reproduction and hatchery management
- Health management and nutrition of aquatic species
- Computerized database management

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AND AQUATIC ENVIRONMENTS  
AUBURN UNIVERSITY**

*Auburn University offers its programs to all persons without regard to race, color, sex, or national origin.*