

Development of a Responsible Offshore Aquaculture Industry in the Gulf of Mexico –



Research and Development Strategy

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Development of a Responsible Offshore Aquaculture Industry in the Gulf of Mexico – Research and Development Strategy

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This document presents the outcome of the Offshore Aquaculture Research Retreat on research, outreach, and policy needs to enhance the success of responsible offshore aquaculture development in the Gulf of Mexico hosted by the Gulf of Mexico Offshore Aquaculture Consortium. The Research Retreat was held September 10-11, 2002 in Biloxi, Mississippi. This manuscript and assignment of priorities were developed through consensus of the attendees. This manuscript should be considered a ‘living document’ with research and outreach needs changing as extant issues are addressed and new priority actions identified.

The format of this document is adapted from the Sustainable Flounder Culture and Fisheries (available through the North Carolina Sea Grant College Program) and Sustainable Cobia Culture and Fisheries (available through the Virginia Sea Grant College Program) research and development strategies.



The Gulf of Mexico Offshore Aquaculture Consortium has deployed an Ocean Spar Sea Station aquaculture cage 26 miles south of Pascagoula, MS in the United States Exclusive Economic Zone. The Consortium is a Gulf-wide interdisciplinary research partnership created to develop an offshore aquaculture industry in the Gulf of Mexico that is economically viable and environmentally compatible (Photo by Tim Reid, Mississippi-Alabama Sea Grant Consortium).

Cover Photo by Chris Bridger, USM College of Marine Sciences

Executive Summary

Offshore aquaculture has the potential to decrease the growing national seafood trade deficit through increasing domestic seafood production in the U.S. Exclusive Economic Zone (EEZ). Interest in developing a responsible offshore aquaculture industry in the U.S. EEZ has been increasing in the past decade with much of the research and development effort originating in the Gulf of Mexico (GOM). An open-ocean aquaculture industry in the GOM will likely have to occupy the distant offshore waters of the EEZ owing to water depth constraints experienced closer to shore in state waters. Research and development efforts continue to gain momentum. However, the current learning curve for an offshore aquaculture industry is very steep, with each new activity providing invaluable knowledge of production technologies, economic feasibility of grow-out, and environmental compatibility of an offshore aquaculture industry.

With the establishment of NOAA-funded demonstration sites, and subsequent technology transfer to industry operators, a responsible offshore aquaculture industry in the GOM will soon be possible. Methods of mooring production cages, transporting fingerlings, supporting offshore aquaculture operations, feeding grow-out stock, and eventually harvesting the final product are all being documented and put into practice. Additionally, ongoing research is drawing attention to this developing industry and its economic potential for the GOM region. In the future, funding opportunities for industry development will increase as new policies are created to aid the siting and operations of offshore aquaculture facilities.

Research and Outreach Issues and Priorities

Researchers, extension specialists, individuals from the private sector, and representatives from several government agencies identified and prioritized issues that relate to commercialization of offshore

aquaculture in the Gulf of Mexico EEZ. The issues can be divided into five categories:

- ✓ Policy and Regulation
- ✓ Production Technology
- ✓ Economic Feasibility and Marketing
- ✓ Environmental Compatibility
- ✓ Education and Outreach

In this research and development strategy priority actions are recommended in each category.

Policy and Regulation:

#1. Implement the proposed National Policy Framework for offshore aquaculture.

#2. Work with the various federal agencies and Gulf of Mexico Fishery Management Council to amend existing regulations in order to create an environment conducive to responsible offshore aquaculture industry development.

Production Technology:

#1. Develop an integrated offshore aquaculture production facility for safe and efficient grow-out in the Gulf of Mexico.

#2. Develop hatchery and grow-out techniques for numerous candidate species native to the Gulf of Mexico.

#3. Determine appropriate sites for commercial offshore aquaculture in the Gulf of Mexico.

Economic Feasibility and Marketing:

#1. Conduct grow-out trials to estimate the costs and returns of an offshore aquaculture venture for each selected candidate species.

#2. Conduct market analysis of farm-raised products including market saturation values, short-term and long-term pricing structures, and national public acceptance of regional species.

Environmental Compatibility:

#1. Collect data to characterize and quantify the potential impact of offshore aquaculture operations in the Gulf of Mexico.

#2. Characterize the genetic profiles of captive broodstock, the resulting fingerlings, and the wild stock.

Education and Outreach:

#1. Initiate an extensive education and outreach program that targets all concerned stakeholder groups in the Gulf of Mexico.

#2. Establish a commercial-scale offshore aquaculture demonstration program in the Gulf of Mexico.

Further details regarding each category and its priority actions are provided in the following text.

Introduction

Workshop Purpose and Goal

This document resulted from the Offshore Aquaculture Research Retreat held in Biloxi, MS, September 10-11, 2002. Members of the Sea Grant Gulf of Mexico Offshore Aquaculture Consortium (OAC) organized the retreat. Specific objectives of the retreat were:

- 1) to provide an update of the current status of research efforts related to the development of offshore aquaculture in the Gulf of Mexico;
- 2) to assemble researchers, industry representatives, and other interested stakeholders to discuss the progress in offshore aquaculture development in the Gulf of Mexico and to identify specific issues requiring future research attention in order for offshore aquaculture to become commercially viable; and,
- 3) to develop a consensus research and outreach plan of action that addresses obstacles to the development of a responsible offshore aquaculture industry in the Gulf of Mexico.

This document resulted from discussions held during the two-day retreat involving 45 participants with various offshore aquaculture interests. Participants included researchers and extension specialists from several states, including Alabama, Louisiana, Mississippi, and Texas; industry representation; regulatory agency staff; and representation from the National Sea Grant Office and Gulf of Mexico Sea Grant programs.

Problems and Potential

Expansion of U.S. domestic marine aquaculture production will have to occur in the open ocean environment. Unlike other nations that have developed marine aquaculture production, the U.S. lacks the intricate coastline and fjord systems to allow near-shore coastal aquaculture. Additionally, U.S. coastal regions have considerable user conflicts and environmental

stresses associated with huge human population density. U.S. coastal areas with net pen aquaculture industries at present will eventually experience bottlenecks to future expansion due to having reached environmental carrying capacity. Coastal regions might be better utilized to support an expanding offshore aquaculture industry with hatchery and processing facilities. On August 10, 1999, the U.S. Department of Commerce (DOC) approved an Aquaculture Policy to initiate a national investment and promote the development of an environmentally sustainable and economically feasible national aquaculture industry.

The DOC listed specific objectives to achieve by 2025, among them the goals of increasing the value of domestic aquaculture production, increasing aquaculture related employment, developing environmentally sustainable aquaculture technologies and methods, and increasing exports of U.S. aquaculture goods and services. Several U.S. regions have been investigating the feasibility of open-ocean aquaculture to meet these objectives; however, the Gulf of Mexico introduces new challenges to aquaculture development that have yet to be experienced elsewhere in the nation.

Current State of Knowledge and Research

There have been previous offshore aquaculture attempts in the GOM. These experiences have provided invaluable lessons, although none produced large quantities of fish for market or resulted in a commercially viable offshore aquaculture sector in the GOM. Issues associated with leasing and permitting operations in U.S. federal waters and technological limitations of operating in the distant, exposed environment of the GOM have been detrimental to developing offshore aquaculture. In 1999, a regional open-ocean aquaculture research program was implemented in the GOM. This program resulted in the formation of the OAC <<http://www-org.usm.edu/~ooa/index.htm>>, creating a collaborative, Gulf-wide interdisciplinary research

and development plan to develop a responsible – economic, social and environmental – offshore aquaculture industry for the GOM. The OAC plans not only to determine the economic feasibility of an open-ocean aquaculture sector, but also to develop environmentally sustainable practices for offshore operations based on primary scientific data from grow-out trials and subsequent commercialization.

Purpose and Nature of this Strategy

Though modest efforts have been initiated to determine the feasibility of offshore aquaculture in the GOM, a great deal of research and development is required for commercial realization. This document identifies actions needed in research, policy, and education to pursue this goal.

At the present time, the National Oceanic and Atmospheric Administration, including the National Sea Grant College Program is the primary government funding source supporting offshore aquaculture research in the GOM. Other potential funding sources for related research include Saltonstall-Kennedy Grants, the U.S. Department of Agriculture, the National Marine Fisheries Service, the Small Business Innovation Research Program (which exists within several federal agencies), the Advanced Technology Program in the U.S. Department of Commerce, and state natural resources departments. Private enterprise interest in offshore aquaculture is keen, but investment capital has not been forthcoming in large amounts. However, the proven feasibility and economic potential of an offshore aquaculture sector would likely generate major investment within this decade.

This strategy provides an agenda for integrated public and private investment in research, facility development, and education to establish responsible offshore aquaculture in the GOM. To accomplish this, the strategy contains priority actions in five key areas:

- ✓ Policy and Regulation

- ✓ Production Technology
- ✓ Economic Feasibility and Marketing
- ✓ Environmental Compatibility
- ✓ Outreach and Education

Underlying Principles

In addition to these areas, two underlying principles run through this document and relate to how the strategy should be implemented.

Strong partnerships of many kinds must be formed to develop an offshore aquaculture industry in the GOM. Partnerships must be forged among researchers, policy makers, and key interest groups to expedite development of responsible public policies including implementation of the proposed national policy framework, reasonable timelines for critical milestones towards industry development, and procedures for permitting. Researchers should include economists and marketing specialists so that collected data are appropriate for analysis of costs, benefits, and economic feasibility, and appropriate markets are developed for a diversity of aquaculture products and product forms. Public-private partnerships must be identified, including grow-out and hatchery interests, to (a) finance research and demonstrate commercial viability of offshore aquaculture, and (b) ensure that appropriate levels of technology transfer occur between research and commercial sectors. Finally, research and technology transfer partnerships must be established with other countries where exposed cage culture operations involving candidate species indigenous to the GOM exist.

Research, policy development, and real world applications must be integrated from the outset. Advancement of all priority action areas is crucial for effective strategy implementation. Practical questions must drive research to improve the quality of public and private decisions and investments. Greater knowledge will reduce risks and attract more investment to build a responsible offshore aquaculture industry in the GOM.

Research and Outreach Needs and Priorities

Policy and Regulation

Marine aquaculture is still in the early stages of development in this country and lacks the policy and regulatory framework needed in order for entrepreneurs to plan and for the public to feel their concerns are addressed. Regulations vary greatly among state and federal agencies. When an aquaculturist seeks federal, state or local approvals to establish a new facility, it may be the regulatory agency's first petitioner with such a request. Lack of precedents and general concerns about potential impact lead to lengthy delays in obtaining permits, which may in turn place a heavy burden on fledgling enterprises.

By definition, offshore aquaculture operations will be sited in federal waters of the EEZ. Siting in federal waters requires action by several federal agencies as mandated by public laws that were promulgated for other purposes. Complexities that arise from regulating aquaculture under the existing regulatory framework might include harvest restrictions associated with species-specific Fishery Management Plans designed for management of wild stocks.

Research and Outreach Needs:

Research and outreach should advance understanding of the federal, state, and local policy and regulatory frameworks and point out limitations on the siting and activities of offshore aquaculture. Further research is needed on the extent to which aquaculture activities and sale of products has been addressed in existing regulatory frameworks. Activities requiring review include the transport of fingerlings and final products across state and federal boundaries; harvest requirements associated with existing quotas and size limitations; the need to verify the health of the stock and safety of the final product; and, identification of the stock, potentially through genetic markers, for ownership and final sale. This research will complement reviews of permitting and zoning requirements for offshore aquaculture in the

GOM, and the EEZ as a whole, completed by members of the OAC.

Priority Actions:

#1. Implement the proposed National Policy Framework for offshore aquaculture.

The U.S. currently has no overarching regulatory framework to govern offshore aquaculture in the EEZ. Implementation of the proposed National Policy Framework for offshore aquaculture will alleviate many of the concerns voiced about the existing regulatory environment, which is seen as a detriment to offshore aquaculture development and growth. Adoption of the proposed framework will provide a credible regulatory regime that serves the needs of a developing offshore aquaculture industry. Examples of benefits include promotion of a decision-making process that is efficient, coordinated, and predictable; creation of a joint state/federal permitting process; creation of leases to give the aquaculturist exclusive rights to occupy the selected site; and, creation of a NOAA Office of Offshore Aquaculture to oversee the developing offshore aquaculture industry in the EEZ.

#2. Work with the various federal agencies and Gulf of Mexico Fishery Management Council to amend existing regulations in order to create an environment conducive to responsible offshore aquaculture industry development.

Aquaculture facilities operating within the EEZ will be subject to federal agencies and regulations. Agencies include the Environmental Protection Agency, Army Corps of Engineers, U.S. Coast Guard, National Marine Fisheries Service, and the regional Fishery Management Councils. Candidate species for offshore aquaculture will likely be covered under existing Fishery Management Plans (FMP) associated with wild fishery harvests and size limitations. Such FMPs were not written with aquacultural production nor consumer-driven harvest criteria

in mind. Amending existing FMPs to accommodate commercial offshore aquaculture operations and harvests is essential for industry development and expansion.

Production Technology

Aquaculture sites in the GOM will be well offshore, where they will experience more severe weather conditions, total exposure to natural elements, and increased distance from shore compared with coastal operations. Offshore aquaculture operations have all the logistical challenges of both remote coastal and exposed near-shore aquaculture, but on a much higher scale of difficulty. Operators require large capacity facilities and infrastructure in order to achieve necessary economies of scale in fish production. In addition, dependable and robust husbandry practices are required to ensure a stress free, healthy stock that is growing at a uniform rate. Routine operations, such as treating fish for diseases and size grading, may be difficult in this exposed offshore environment. Finally, owing to extreme remote conditions, offshore aquaculture will require innovative technologies to allow appropriate levels of feeding, long-distance communication, and carefully planned levels of response in emergency situations. Commercial offshore aquaculture has been slow to develop in the GOM because of these complexities.

Research Needs:

Key areas identified in production technology that need study include:

- ✓ containment system design
- ✓ candidate species selection
- ✓ grow-out site selection
- ✓ determination of appropriate production and health management strategies
- ✓ development of suitable offshore aquaculture support vessels.

Many questions remain regarding the appropriate system for economic grow-out of candidate species in the offshore environment. Research to address these needs should focus on the holistic design of production technology that takes farmer safety into consideration while allowing efficient grow-out of high-quality, reliable, aquaculture products.

Priority Actions:

#1. Develop an integrated offshore aquaculture production facility for safe and efficient grow-out in the Gulf of Mexico.

Strategies and technologies are needed to support commercial-scale operations in the exposed, hostile, and distant offshore environment. Holistic production strategies must consider and integrate mooring designs, feeding technologies, vessel support, storm avoidance, feed storage capacity, and farmer safety.

#2. Develop hatchery and grow-out techniques for numerous candidate species native to the Gulf of Mexico.

Closing the life cycle of numerous candidate offshore aquaculture species that are native to the GOM will be critical for industry success. Issues include (a) establishing broodstock husbandry practices for consistently high fertilization rates, hatch percentage, and survival rates through first feeding; (b) determination of optimal rearing conditions for larvae and fingerlings until they are moved to grow-out cages; and, (c) grow-out trials for each candidate species to determine growth, survival, and feed conversion ratios.

#3. Determine appropriate sites for commercial offshore aquaculture in the Gulf of Mexico.

Like any aquaculture industry, offshore aquaculture will benefit from thoughtful site selection. Offshore enterprises should be sited in areas that meet optimal biological criteria for species grow-out and minimize user conflicts with other established groups. Careful site

selection may also ensure the development of offshore aquaculture zones or parks to expedite industry development.

Economic Feasibility and Marketing

Gulf of Mexico wild fishery harvests are placing increasing pressures on targeted fish stocks. National seafood consumption and recreational fishing activities are expected to rise continually and increased pressures will undoubtedly cause wild stocks to diminish. Production from aquaculture facilities in the GOM will alleviate over-fishing pressures and ensure both sustainable fishing practices and consumer demand for high quality seafood products are met. Part of any strategy to enhance availability of seafood products, therefore, must be a systematic analysis of market characteristics, demand/price variables, and ways to achieve optimum combinations of those variables.

Research Needs:

To determine economic viability of offshore aquaculture, research should be undertaken to:

- ✓ verify simulation model assumptions
- ✓ integrate elements of risk in developed models in order to perform additional sensitivity analyses and the impact of foreign competition
- ✓ conduct regional economic impact analysis
- ✓ develop economic-environmental trade-off models.

A clearer understanding of the levels of risk involved in offshore aquaculture production and how these match up with potential returns to investors is needed. Private investors, venture capital groups, and banks are reluctant to make investments in an industry with little or no track record and no risk or return research available.

Marketing research is also required, especially for candidate species with little or no commercial market exposure. Marketing research should include:

- ✓ development of a marketing plan that includes each candidate species for offshore aquaculture in the GOM
- ✓ determination of processing yields and costs, sensory evaluation, and chemical analysis for each species at the conclusion of grow-out trials
- ✓ development of new markets for a competitive offshore aquaculture sector using techniques such as direct marketing.

Priority Actions:

#1. Conduct grow-out trials to estimate the costs and returns of an offshore aquaculture venture for each selected candidate species.

Economic feasibility can be estimated by developing risk-return models for offshore aquaculture ventures. Verification of economic models can only occur following collection of appropriate data regarding costs and returns from offshore aquaculture grow-out trials. Initiation of commercial-scale demonstration sites to collect necessary data is therefore critical for the development and expansion of an offshore aquaculture sector in the GOM.

#2. Conduct market analysis of farm-raised products including market saturation values, short-term and long-term pricing structures, and national public acceptance of regional species.

Offshore aquaculture may cultivate numerous species for commercial production, some of which may currently have no commercial value and limited recreational market value. Understanding existing and potential markets that might develop from candidate species will enhance the economic feasibility of offshore aquaculture. Additionally, determining consumer acceptance of offshore-

raised fish will assist in developing appropriate business plans. Consumer acceptance depends on type and quality of products, which research can identify.

Environmental Compatibility

It is essential to develop offshore aquaculture production systems in a responsible and environmentally compatible manner. Waste materials must not exceed the assimilative capacity of the natural environment, aesthetic considerations should be included in facility design and location, and the genetic structure of natural stocks must not be compromised.

Research Needs:

The offshore environment has attributes that differ from those experienced in coastal and exposed near-shore aquaculture operations throughout the world. Because of this, management and regulatory decisions based on data from other regions are of limited use. Data must be collected on the types, quantities, and fate of wastes produced from offshore aquaculture facilities in the GOM. Offshore aquaculture broodstock management practices should also be employed that minimize the potential for genetic alteration if escapement should occur.

Priority Actions:

#1. Collect data to characterize and quantify the potential impact of offshore aquaculture operations in the Gulf of Mexico.

While initial design criteria and site permitting evaluation will likely be based upon data from existing culture operations for other species and locations, the emerging Gulf of Mexico offshore aquaculture industry will need its own environmental data and waste management techniques. Prior to data collection, environmental methodology must be identified to ensure selected data can be obtained in a cost-effective manner that will allow direct comparisons across the region. Data must be generated for both the water column and bottom

habitats to determine potential impacts from offshore aquaculture (e.g., dissolved oxygen, nutrients, circulation patterns, algal blooms, and benthic community structure). Also, information regarding potential ecological modification (e.g., species alteration and migration, food web changes, and effects of the facility acting as an artificial reef) from siting offshore aquaculture operations is needed to guide future expansion of an offshore aquaculture industry. Collected data will support impact assessment modeling, creation of best management practices, and mitigation measures.

#2. Characterize the genetic profiles of captive broodstock, the resulting fingerlings, and the wild stock.

Developing a suite of hypervariable genetic markers (i.e., microsatellites and mitochondrial DNA) for each candidate species will be essential for all future genetic characterization. Genetic improvement of the broodstock will ultimately ensure that (a) the offshore aquaculture industry maintains profitability and (b) relies on accurate genetic characterization. Genetic profiling of the broodstock individuals will also be essential for establishing legal ownership of fingerlings and final products and registry of broodstock may become essential industry documentation. Finally, the genetic composition of the wild stock of each candidate species should be determined and used for broodstock selection to minimize genetic risk (i.e., negative impact on wild stock genetic diversity) from aquaculture escapement. Genetic substocks in the wild population are most vulnerable to genetic change. Species with substocks would therefore benefit from determining the genetic range for each species followed by appropriate broodstock selection (i.e., a species that is genetically similar over its range will not be affected to the same degree from fingerlings resultant from broodstock selected anywhere within the species range).

Education and Outreach

In the United States, decision makers, the business community, and the general public lack

knowledge about aquaculture, and offshore aquaculture issues and opportunities in particular. Throughout the world, cage culture industries have been in operation for quite some time, but U.S. audiences need targeted education and outreach to realize the potential of this emerging industry.

Outreach Needs:

State and local decision makers, entrepreneurs, and the general public have varying information needs and concerns about cage culture operations, the status of the technology for operating offshore in the EEZ, environmental concerns, and measures to address them. A two-way dialogue can identify and address the questions and concerns of policy makers and the general public.

Additionally, technical assistance, technology transfer, and outreach programs will have to be initiated as an offshore aquaculture industry develops in the GOM. Research findings regarding offshore aquaculture should be passed along to enable aquaculturists to produce the highest quality product at the most affordable price. Lending agencies and capital investors should be educated about the real risks and potential gains of offshore aquaculture. As with decision makers and the public, this educational process should work both ways, with aquaculturists, financiers, and others involved in the development of a successful industry communicating their specific questions and concerns to the research community.

It is also important to reach out to environmental and other interest groups that have concerns about the potential impacts of intensive farming in the GOM. The research, legal, technological, policy, and environmental issues raised by offshore aquaculture can be addressed only with open and candid exchange among all parties. To this end, it is also very important to properly educate the mass media about the operations, concerns, and potential of offshore aquaculture so that the general public and all other stakeholders receive accurate and balanced information. Finally, forming partnerships with other countries actively

involved in developing offshore aquaculture could be valuable as a way to exchange information and learn from one another. Information sharing will minimize duplicative research efforts and ensure a responsible offshore aquaculture industry is developed in the GOM in a timely manner.

Priority Actions:

#1. Initiate an extensive education and outreach program that targets all concerned stakeholder groups in the Gulf of Mexico.

A needs-based education and outreach program will lead to responsible industry development by ensuring the key stakeholders are informed of research efforts and policy changes affecting offshore aquaculture in the GOM. This program should include a variety of educational media including the internet, public aquarium exhibits, workshops, extension bulletins, and state seafood promotion boards. Several aquaculture related topics should be emphasized, including the basics of aquaculture, sustainability, economic development, supply availability, and product safety.

#2. Establish a commercial-scale offshore aquaculture demonstration program in the Gulf of Mexico.

An offshore aquaculture demonstration program can serve as the principle means of transferring research findings to the public and private sectors. An integrated program, with demonstration facilities at a number of locations throughout the GOM, should be established to convey information on permitting processes, siting needs, system design and maintenance, production scale, waste management, and grow-out procedures. This program, through its various activities and sites, can in turn provide feedback on additional research needs as identified by the developing offshore aquaculture industry, the regulatory community, and other participants in the program.



The Gulf of Mexico Offshore Aquaculture Consortium opened a public aquarium exhibit at the University of Southern Mississippi J.L. Scott Marine Education Center and Aquarium during the Offshore Aquaculture Research Retreat evening reception on September 10, 2002. The exhibit includes a model of the Consortium's offshore aquaculture research cage, signage describing offshore aquaculture technology and candidate species native to the Gulf of Mexico, and flat-screen monitors illustrating offshore aquaculture operations and a live video feed of the cage via 'Cage Cam'. The University of Southern Mississippi, ChevronTexaco, and Sea Grant sponsors the exhibit (Photo by Carole Williams-Keenze, ChevronTexaco).

Gulf of Mexico Offshore Aquaculture Research Retreat

Isle of Capri Casino Resort, Biloxi, Mississippi, 10-11 September 2002

Tuesday, Sept 10, 2002

Welcoming Remarks ~ Vernon Asper (USM) and LaDon Swann (MASGC)

Overview and Retreat Purpose ~ James McVey (NSGO) and Chris Bridger (USM)

Offshore Aquaculture Research Updates

Legal/Regulatory ~ Kristen Fletcher (Mississippi-Alabama Sea Grant Legal Program)

Engineering ~ Cliff Goudey (Massachusetts Institute of Technology)

Marketing ~ Ben Posadas (Mississippi State University)

Environmental Monitoring and Modeling ~ Chris Bridger and Ralf Riedel (USM)

Genetics ~ John Gold (Texas A&M University)

Economics ~ Ben Posadas (Mississippi State University)

Outreach ~ Tim Reid (Mississippi-Alabama Sea Grant Consortium)

Question/Answer period for any speaker in the morning session

Lunch

Other Developments and Species Updates in the Gulf of Mexico

Red Snapper ~ Jeff Lotz (USM) and Ron Phelps (Auburn University)

Cobia ~ Jeff Kaiser (University of Texas FAML)

Offshore ~ Chris Bridger (University of Southern Mississippi)

Good Streak Marine (Lift-boat Design for Offshore Aquaculture Logistic Support) ~ Steve Quantz

Florida Offshore Aquaculture (Project Update) ~ Jody Symons

Risk Assessment ~ Larry McMaster (USDA – Risk Management Agency)

Ocean Spar Technologies ~ Kurt Swanson

Question/Answer period for any speaker in the afternoon session

Reception held at the USM J.L. Scott Marine Education Center & Aquarium ~ opening of the offshore aquaculture public aquarium exhibit

Wednesday, Sept 11, 2002

Facilitated Discussion ~ Morning-long discussion among attendees to identify research and outreach needs for the development of a responsible offshore aquaculture industry in the Gulf of Mexico and prioritize actions required to ensure industry development becomes reality.

(Mark LaSalle, Mississippi State University)

Lunch

Legal/Regulatory Workshop ~ Facilitated discussion on the issues and solutions/actions required for the proposed National Policy Framework for offshore aquaculture in the U.S. EEZ

(Kristen Fletcher, Mississippi-Alabama Sea Grant Legal Program and Ralph Rayburn, Texas Sea Grant College Program)