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Summary: An Integrated Strategy to Promote a Sustainable Shrimp Mariculture Industry in Ecuador: Findings and Recommendations
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A SUSTAINABLE SHRIMP MARICULTURE INDUSTRY FOR ECUADOR

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Summary: An Integrated Strategy to Promote a Sustainable Shrimp Mariculture Industry in Ecuador: Findings and Recommendations

Stephen Olsen and Eduardo Figueroa

Introduction

The following findings and recommendations are an attempt to extract an integrated management strategy from the papers presented in the volume, the discussions at the Guayaquil workshop in August 1986, and subsequent discussions with governmental agencies and industry representatives in Ecuador. Only if progress is made simultaneously on a number of disparate fronts can the base for a sustainable shrimp mariculture industry in Ecuador be formulated. The priorities we recommend comprise seven elements:

1. Maintain water quality in estuaries and near hatcheries; low growth rates and occasional mass mortalities due to poor water quality are already problems for some hatcheries and growout operations. Development trends in coastal watersheds suggest further reductions in water quality are to be expected unless mitigating actions are quickly taken.

2. Protect and manage the wild shrimp stocks that provide the most abundant and cheapest sources of seed shrimp to the industry. This requires the protection of critical habitats, including mangroves, and safeguards against over-exploitation by both the adult shrimp and postlarvae fisheries.

3. Implement strategic planning to maximize the long-term economic vitality of the industry. Tracking trends in the world shrimp markets, product quality control and forecasting the impacts of declining water quality on the industry are all urgent priorities.

4. Overhaul and simplify the permit system governing the siting and operation of ponds and hatcheries.

5. Critically evaluate the impacts of national policy on the shrimp industry as it is applied through the Fisheries Law.

6. Initiate targeted assistance program to promote information exchange within the industry.

7. Initiate a public education program to help build support for the measures needed to protect the environmental quality that the shrimp industry requires.

Findings and Recommendations

A. Declining Water Quality

Findings

Good water quality is critically important to the success of the cultivated shrimp industry as well as the protection of suitable habitats for juvenile shrimp. A number of development trends are working in combination to reduce water quality in Ecuador's estuaries and coastal waters. Increasing urban development, further industrial growth and the losses of fresh water discharge by river and greater agricultural production brought by dams are all expected to result in further declines in water quality in the years to come. Poor water quality is already having a negative impact on both the productivity of growout ponds and hatcheries. The available, albeit incomplete, data on water quality documents the presence of high concentrations of heavy metals and pesticides, the frequent occurrence of toxic red tides and high concentrations of organics that cause low oxygen levels. Hatchery operators and growers report occasional mass mortalities that they attribute to contaminants in their water supply. Some growers are experiencing blooms of

microscopic algae in their ponds and reduced growth rates may also be attributable to the poor quality of the water they pump from estuaries into their pods.

Recommendations

1. A top priority should be to evaluate the many ongoing monitoring and baseline data collection programs and organize them into a sustainable integrated scheme for monitoring water quality in rivers, estuaries and nearshore waters. This would be the first step in prioritizing problems and then tracing them to their source. The integrated monitoring and research program that should emerge from this process must build upon existing institutions and not duplicate capabilities already in place.

2. The shrimp industry badly needs access to an in-country diagnostic laboratory capable of analyzing water samples for both hatchery operators and growers. Such a laboratory could be developed by building upon one of the existing capably run and well-equipped laboratories already operating in Ecuador.

3. Once the levels of pollution are known, steps must be taken to reduce contaminants known to have adverse impacts on the cultural shrimp industry and wild shrimp stocks. At present the high priorities for immediate attention are pesticides residues, mercury, and the organic loadings from domestic sewage.

B. The Shortage of Postlarvae

Findings

Warm water temperatures in nearshore shrimp spawning grounds and the abundant material-rich runoff from the land that accompany periodic El Niño years bring enormous increases in PL abundance. Thus, the abundance of PLs brought by the intense El Niño of 1982-83 raised unrealistic expectations and spurred the over-construction of ponds. The dry periods between El Niño years dominate and the industry, if it is to be sustainable, must be capable of adjusting to cyclic patterns of high abundance interspersed by consecutive years of relative scarcity. During dry periods a number of man-induced changes to the coastal ecosystem may reduce the abundance of PL. Since wild caught PL will always be the cheapest source of seed for growers and hatcheries are unlikely to offer an alternative source in sufficient volumes for many years to come, it is crucially important to minimize actions that will reduce PL abundance. These actions fall under two major headings: loss of habitats and overfishing.

Loss of Habitat. Research conducted worldwide shows a strong correlation between the area of coastal wetlands and the size of the associate penaeid shrimp stocks. There is already widespread concern that the destruction of mangroves in Ecuador's estuaries must be halted because this is known to be an important habitat for shrimp. Data compiled by CLIRSEN document that 11 percent of the mangroves present in Ecuador in 1969 had been destroyed by 1984. Estimates that consider mangrove habitat, and not stands of mangrove trees alone, suggest that 25 percent of this habitat type has been destroyed. Data do not exist to evaluate whether low water quality in the upper reaches of Ecuador's major estuaries is making large areas of formerly important PL habitat unsuitable, but there is some evidence that suggests that some esteros are much more productive of shrimp PL than others.

Overfishing. The PL fishery has within a single decade expanded explosively to a massive effort involving as many as 90,000 artisanal fishermen who work all areas of known abundance. Unfortunately, there are no systematic data on this fishery. We do not know the species composition of catches from different areas or during different seasons or what proportion of the catches are of species not utilized by the growers. The fishery, however, is so large that is is capable of having an effect on the species structure and abundance of Ecuador's shrimp stocks.

It is known that mortalities between capture and acclimation to pond condition are high. Fifty percent mortality is a likely overall average. This suggests that measures taken to reduce the

mortality of the PLs already being harvested could result in greater benefits in terms of increased productivity from the industry over all than any other single action.

Recommendations

1. The immediate priority is to reduce the mortality of the captured PL. A well-designed extension program could produce an immediate and significant increase in the numbers of PL available to stock ponds. The Coastal Resources Management Project, utilizing funds provided by the AID Ecuador Mission, is moving immediately to work with the industry and the Instituto Nacional de Pesca to quantify the mortality associated with various handling methods and to implement an extension program for PL fishermen.

2. It should be assumed that the abundance of wild penaeid shrimp stocks during dry years is directly related to area of wetland habitat. Every effort should therefore be made to encourage the effective enforcement of existing bans on the further destruction of mangroves and to safeguard conditions, such as adequate water quality, that make estuaries valuable habitat for juvenile shrimp. Protecting mangrove habitat, rather than mangrove trees alone, should be given careful consideration.

3. Ongoing studies at the Instituto Nacional de Pesca that can lead to the identification of the most productive PL habitats should be expanded and accelerated. If particularly important habitat can be identified they should be protected from both overfishing and biophysical forms of degradation.

4. Related studies should be conducted to produce data on the PL fisheries. The absence of such data makes it impossible to assess the impact of the PL fishery closures implemented in 1985 and 1986. It is also not possible, in the absence of data, to evaluate the optimal timing and location of closures or the likely benefits of other controls over the PL fishery. Given the magnitude of the fishery, however, any measures that reduce fishing effort can only have a beneficial effect on the stocks.

5. An urgent planning priority is to develop demonstration plans for the management of mangroves. It is not feasible to expect that there will be no further destruction of mangroves. Realistic and implementable management strategies that can accommodate the continuing utilization of coastal resources must therefore be developed. In addition, an assessment should be made of techniques to integrate mangroves into shrimp pond operations as a means of stabilizing dikes and alleviating water quality problems. Such techniques could benefit shrimp pond operators while simultaneously replacing lost mangrove habitat.

C. Management of Wild Shrimp Stocks

Findings

Careful attention should be given to managing Ecuador's wild shrimp stocks since these will continue to be the cheapest source of seed to the cultivated shrimp industry while simultaneously supporting an important trawler fishery. Catches of adult shrimp by the trawler fleet have been remarkably consistent for nearly a decade. However, the gradual increase in the number of vessels participating in the fishery have resulted in a very low catch per unit of effort. There have recently been significant changes in the species composition of catches that may possibly be related to large numbers of juveniles removed by the PL fishery. Data being compiled currently of the adult shrimp fishery are inadequate for evaluating the likely impacts of fishery management techniques.

Recommendations

1. The programs already underway at the Instituto Nacional de Pesca with the support of the Mission Brittanica should be built upon to provide the information needed to develop an integrated management plan for the shrimp fishery. The system for collecting catch data

should be expanded. Studies should also be undertaken to determine whether there are distinct shrimp populations and to trace migration patterns. Fisheries data should be correlated with trends on such environmental variables as rainfall and temperature. The management plan should be developed in close collaboration with the fishing industry. It should set clear objectives for management and consider the full range of management techniques including closed seasons and grounds, and a limited entry program. This plan must be integrated with steps taken to protect prime PL habitats in estuaries.

2. The by-catch incidental to the shrimp trawler fishery produces volumes and sizes of fish that should be evaluated for better utilization including export markets and a source of raw material for shrimp feed mills.

D. Measures to Safeguard the Economic Vitality of the Industry

Findings

Ecuador's success with shrimp mariculture is the envy of other countries hungry for foreign exchange and with land suitable for shrimp production. Ecuador can expect increasing competition in the future. Several nations in South Asia and Southeast Asia have long traditions in mariculture and are moving rapidly to expand their production of shrimp for export markets. It is also conceivable that technological breakthroughs could make shrimp production in controlled environments economically feasible in non-tropical countries. Although new producers must overcome numerous hurdles to develop the necessary infrastructure and establish markets, it is not unlikely that competition from growers in other countries could place Ecuadorian producers in a future cost price squeeze.

More than 90 percent of the shrimp currently produced by growers in Ecuador is exported to the United States. The industry now enjoys a reputation for consistent high quality. One port quality shipment of the discovery of contaminants in shrimp grown in Ecuador could jeopardize this market. The growing water quality problems in Ecuador, and the treatments administered to shrimp to counteract disease must be carefully monitored as possible sources of contamination.

It is currently impossible to monitor the economic health of the industry because the data base is inadequate. It is not possible to trace trends, identify bottlenecks and prioritize needs for extension services and research.

Recommendations

1. The shrimp growers, through one or more of their trade organizations, should monitor trends in world markets and be in a position to advise their members on developments in world production and markets.

2. The shrimp growers, working in association with government, should strengthen a program to monitor and certify the quality of all shipments of shrimp to foreign markets.

3. A program to gather and analyze basic economic data on the industry should be designed and implemented.

4. A study should be made of the economic impacts of present and potential future water pollution conditions on the cultured shrimp industry.

E. Governmental Involvement in the Industry

Findings

The existing permit system for granting concessions in government controlled "tierra baja" and authorizing the construction and operation of shrimp ponds is highly complex and is a major expense for applicants in both time and money. One grower at the workshop commented, "It is far

easier to successfully raise any variety of shrimp than to obtain the necessary permits." It is also not at all clear what benefits, in terms of protection of critical habitats, appropriate siting and constructive practices of safeguarding the public trust, accrue from the existing system. The complexity and expense of the existing system does explain whay it has been ignored by many participants in the industry.

Shrimp mariculture is governed by a number of laws and governmental policies, the most important of which is the Fisheries Law. The laws were designed to govern activities that differ in many important aspects from the shrimp culture industry. The Fisheries Law favors large scale vertically integrated companies. It is questionable whether the application of this policy to the shrimp mariculture industry is in the best interest of either the industry or the nation. Current incentives to promote hatchery development may be ill-founded.

Recommendations

1. The permit system should be overhauled and greatly simplified. The first step should be to define the objectives for the system and then to design a process that assures the participation of the necessary governmental agencies in a coordinated and timely manner. A one-stop permit process would be preferable to the existing sequential approval process. The evaluation and disposition of permit applications should be based on criteria designed to minimize impacts on important habitats and foster good construction practices.

2. Governmental policies that shape the shrimp industry should be critically studied. It may be appropriate to consider legislation designed specifically to govern shrimp mariculture. In particular, policies designed to encourage large-scale vertically integrated operations, and restraints placed by various regulations, should be re-examined. A diversified industry that includes a large number of small-scale businesses may bring greater benefit to Ecuador and be better able to respond to changes in world markets than an industry dominated by a few heavily capitalized large operations.

F. Technical Assistance

Findings

The shrimp growers and hatchery operators working today in Ecuador are among the best in the world. The industry, however, has grown in a gold rush atmosphere and a number of adjustments must be made if it is to successfully stabilize. Generally speaking, there is good communication among hatchery operators and the best worldwide expertise is available to them. However, there is a real need for a carefully targeted extension and research program for the growers. Here information exchange has been stifled by an atmosphere of intense competition and secrecy among growers. Priorities for extension include assistance in monitoring water quality and setting pumping rates, in feeding and in the design of ponds.

Recommendations

1. An extension program targeted on specific aspects of shrimp culture should be designed and implemented in close coordination, and with the active support of the industry. Such a program could be supported by a levy imposed on all exports.

2. Greater support should be given to the hatchery technician training program offered by the Polytechnic Institute of the Coast (ESPOL). The absence of trained personnel to operate hatcheries is an urgent problem that must be addressed.

G. Public Education

Findings

There is little appreciation among governmental officials and the public at large for the interrelationships among human activities that alter the environment and the quality of services that the environment can sustain. In the absence of an appreciation for these relationships it will be difficult to obtain the public support necessary to make environmental management programs a success. A recurring theme at the workshop was the need for broad dissemination of information on the conditions and problems affecting the quality of the ecosystems that support shrimp mariculture. It was also frequently repeated that governmental policies and programs need to be prepared with great participation from those who will be affected by governmental programs particularly when their cooperation is a prerequisite to the successful implementation of such policies and programs.

Recommendations

1. A commitment should be made to public education on environmental matters. It should be targeted on priority issues and seek to inform society at large to the need for controls over activities that degrade the resource base upon which all depend.

Next Steps

The effective implementation of an integrated strategy for sustainable shrimp mariculture will require both commitment and a concentrated effort on the part of the industry, government, and the research community. The planning, research and policy development outlined here will also require a significant commitment of funds. However, much is already being done and a major challenge lies in the coordination of existing programs and institutions. The Coastal Resources Management Project could, if judged appropriate by all concerned, assume primary responsibility for coordinating the implementation of the initiatives proposed. This would include periodic evaluations of progress and re-examination of priorities with all the participants. Although shrimp mariculture is only one of the topics that the coastal management project must address, it is sufficiently important to justify a major commitment of funds and energy.