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A SUSTAINABLE SHRIMP MARICULTURE INDUSTRY FOR ECUADOR

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Legal and Institutional Issues

Institutional Issues of Shrimp Mariculture in Ecuador

Aspectos Institucionales de la Maricultura del Camarón en Ecuador

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Resumen

Este estudio examina tres elementos principales de la política ecuatoriana en la maricultura del camarón y su base ecológica: control de la construcción y operación de piscinas camaroneras; manejo de la pesquería; y, conservación de los ecosistemas de manglar. En las regulaciones sobre estos tres aspectos es común la falta de claridad en la correlación entre problemas, políticos e implementación, especialmente en relación a la protección ambiental.

El rápido crecimiento de la maricultura del camarón entre 1977 y 1984 planteó el mayor desafío a las instituciones reguladoras de esta actividad. Los requisitos para las concesiones de tierra y permisos de operación inicialmente estuvieron basados en leyes y regulaciones que datan de las décadas de 1960 y 1970. Entre 1984 y 1985, la Dirección General de la Marina Mercante (DIGMER) y la Dirección General de Pesca (DGP) adoptaron nuevas políticas que contienen criterios específicos para la maricultura del camarón, pero para entonces la mayoría de los permisos ya habían sido otorgados.

El proceso para establecimiento de una "camaronera" comprende tres pasos: obtención de la tierra; obtención del permiso de operación; y, evaluación de la maricultura por el Gobierno. El primer paso es el más complejo y puede comprender trámites hasta en siete dependencias diferentes.

La otención del terreno para una camaronera en zonas de playa y bahías es solicitado a la DIGMER, que sigue un trámite para delimitación e inspección del sitio. La concesión es de un máximo de 50 ha para individuos y hasta 250 ha para corporaciones. Cuando una camaronera incluye tierras altas, la extensión puede ser mayor. Los extranjeros pueden obtener concesiones de tierra dentro de la jafa de 50 Km, medidos desde la orilla, con autorización del Presidente de la República. Cumplido estos requisitos, la solicitud se somete a la DGP del Ministerio de Industria, Comercio, Integración y Pesca y al Ministerio de Defensa, para la emisión de Acuerdo Conjunto. La concesión otorgada es válida por 10 años. Si el sitio corresponde a tierras baldías, que son de propiedad del Estado, se necesita la autorización del Instituto Ecuatoriano de Reforma Agraria y Colonización (IERAC). En caso de tierras altas, el Ministerio de Agricultura y Ganadería debe certificar que no son de uso agrícola, aún en el caso de tierras de propiedad privada.

El permiso de operación para la "camaronera" se obtiene en la DGP, presentando una solicitud con el diseño del proyecto. Esta autorización es firmada por el Subsecretario de Recursos Pesqueros. La evaluación de maricultura del camarón por parte del Gobierno incluye la "clasificación" de la empresa, lo cual permite obtener los beneficios que otorga la Ley de Pesca para esta industria. Se debe anotar que muchas construcciones de piscinas son efectuadas sin haber obtenido la autorización legal. Otro problema es la construcción de piscinas en áreas de manglares, habiéndose observado esto inclusive en la Reserva Ecológica de Churute.

En el trabajo se efectúa un análisis amplio sobre las instituciones y regulaciones que controlan a la industria del camarón, incluyendo a la pesquería tradicional que efectúa la flota, los laboratorios productores de larvas, la implantación de vedas de captruas de larvas y adultos del camarón. También, se analiza el marco legal y administrativo para la protección del manglar, anotando que el crecimiento de la maricultura del camarón ha contribuído significativamente a la destrucción del manglar. Según CLIRSEN, se estima que un 11% del manglar fue destruído entre 1969 y 1984.

Entre las conclusiones se mencionan que el Ecuador no carece de los mecanismos básicos para controlar los efectos negativos de la maricultura del camarón en el medio ambiente y que, no obstante las mejoras logradas en la vigilancia durante los últimos dos años, la experiencia es adversa en cuanto a la utilización de los instrumentos legales e institucionales para mantener la base de recursos naturales que sustenta a la industria del camarón.

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Introduction

Since 1975, shrimp mariculture has emerged as a major economic activity in the coastal zone of Ecuador, providing a new source of export earning during a period when income from traditional agricultural products and petroleum has faltered. Between 1980 and 1986, the value of production from shrimp farms increased 500 percent, from U.S. $56.9 to $287.9 million. The growth of the industry was accomplished by the rapid conversion of salt flats, coastal lagoons and mangrove habitat into growout ponds for postlarval forms of wild and hatchery-raised shrimp. About 11 percent of Ecuador's mangroves and 39 percent of its salt flats were converted to shrimp farms between 1969 and 1984. As the industry matures in the 1980s, numerous concerns exist about the stability of its future, in part related to the loss of adult and larval shrimp habitat, overharvesting of larvae, deteriorating environmental quality caused by the shrimp industry itself, as well as urbanization and increased agricultural activity.

An Ecuadorian legal and institutional framework was in place to govern the development of the shrimp mariculture industry during its explosive growth. This study examines three central elements of Ecuadorian policy toward shrimp mariculture and its ecological basis in the coastal zone: the siting and construction of shrimp farms, fisheries management and the conservation of mangrove ecosystems.

A persistent theme in all three aspects of shrimp mariculture regulation in Ecuador is the unclear correlations of problems, policies and implementation, especially with regard to protecting the environmental basis for a healthy industry. Ecological concern is a recent one in Ecuador, probably prompted by the dramatic decline in postlarvae stocks in the mid-1980s. Specifically, the variability of wild postlarvae abundance provided evidence that a decline in the productivity of the ecosystem can hurt shrimp mariculture. Most current laws and regulations, however, were not designed with ecosystem management in mind. Attention has been concentrated instead upon allocating shore area uses and collecting lease or title fees. Current policies also provide incentives for development that are irrelevant to mangrove felling, without capability or commitment to either enforce the policy or develop a new one that would provide actual protection to mangrove ecosystems. Also, some external factors, such as the increased abundance of postlarval shrimp during the El Nino years of 1982-83 and 1986-87 temporarily removed natural limitation on shrimp farm productivity. Finally, other factors, including a stagnant economy and the earthquake which cut oil exports in 1987, tend to outweigh consideration of the effects of environmental changes on shrimp production.

Controls on the Development and Operation of Shrimp Farms

The rapid growth of shrimp mariculture in the coastal zone of Ecuador between 1977 and 1984 presented a major challenge for regulatory agencies. During this period, the Merchant Marine and Coastal Directorate for Fisheries (DIGMER) enforced lease and operating permit requirements based on laws and regulations from the 1960s and 1970s. Although in 1984 and 1985 these agencies adopted new policies which contain decision-making criteria specific to shrimp mariculture, the majority of leases and operating permits in effect were issued before these new criteria were put into place.

The laws and regulations that govern the establishment of shrimp farms create a three-step governance process for shrimp farm owners and operators. As Figure 1 illustrates, the first task is to acquire a site for the farm. The site may include areas in the beach and bay zone that must be leased from the Merchant Marine and Coastal Directorate. Vacant upland can be purchased from the National Institute for Agrarian Reform. The use of private upland for shrimp farming requires clearance from the Ministry of Agriculture.

Once the site is acquired, permission to operate the farm must be obtained from the Undersecretary of Fisheries through the General Directorate of Fisheries. Specific criteria for approving shrimp farm applications were adopted only as recently as 1985. When approved, a farm is subject to periodic reviews of its lease and operating permits. From an administrative perspective, the site acquisition process is the most complex of the regulatory procedures and can involve as many as seven different agency departments.

Acquisition of Shrimp Farm Sites

Leases in the Beach and Bay Zone. Portions of many shrimp farms are in the beach and bay zone, which is defined as the zone between the lowest and highest tide marks. Land beyond the highest tide mark is considered upland. The Merchant Marine and General Coastal Directorate (DIGMER) is charged with issuing leases to individuals and corporations seeking to carry out activities in this zone. Leasing is administered through the Beach and Bay Department of the National Maritime Directorate of DIGMER (Regulation D 981, 1963). The Military Oceanographic Institute (INOCAR) was assigned the task of mapping this coastal strip, but so far the boundaries have not been allocated (Padilla, 1986). Currently, the inspectors are charged with marking boundaries on an ad hoc basis. They rely on vegetation to estimate locations of tide lines, and they consult with local residents.

The Roman law and Napoleonic code, upon which the Ecuadorian civil code is based, considered the beach as common property. As a result, permanent use of the beach and bay zone in Ecuador is allowed only under conditions established by the code of maritime police. Figure 2 illustrates the procedure which must be followed to obtain a lease in the beach and bay zone. First, the prospective lessee uses these boundaries to prepare a contour map showing the location of the project. The Beach and Bay Department prepares a report that must include a certificate stating that the petitioner does not hold other leases and that possession of the lease is not subject to dispute.

An individual is allowed to lease a maximum of 50 hectares of the beach zone, while corporations are permitted to lease up to 250 hectares. Since a shrimp farm could include both beach and bay zone and uplands, its total size can be greater than the limits set in the lease. Alien citizens and corporations must also obtain authorization from the joint chiefs of staff and the president of the republic. This applies to all foreign-owned land within the 50 kilometer belt inland from the shoreland.

After these requirements are met, the application for a lease is submitted to the General Directorate for Fisheries, as well as the Ministry of Industry, Commerce and Fisheries (MICIP), and the Ministry of Defense. Once the General Directorate for Fisheries issues a favorable report, the two ministries issue a joint agreement (acuerdo) which is published in the official register. The lessee can then make arrangements to begin paying the annual lease fee. The lease is valid for ten years and is renewable.

According to the code of maritime police, an annuity must be paid for every kind of permanent use of a beach and bay zone. Since beach and bay use was mainly for piers and docks, the usage areas were reckoned in square meters, as were its annual rates. The annuity per square meter was quoted at one-half sucre, about three cents. With the advent of the shrimp pond industry, the reckoning had to be done in hectares. The price of the annual fee at the current rates would have been (5.00 x 10,000 meters) 50,000 sucres or U.S. $300 per hectare.

The first official acknowledgment of the increasing rate of shrimp pond construction in Ecuador came with a reform to the code of maritime police (P.S. 482, 1975), reducing the amount which had to be paid for shrimp pond construction in the beach and bay zone.

Obtaining a Title to a Vacant Upland Site. By law all vacant land in Ecuador is the property of the state and is under the control of the Ecuadorian Institute for Agrarian Reform (IERAC). This agency is able to dispose of upland that, according to legal standards, is not performing its "social function." The IERAC executive director is empowered to award property rights in upland areas when the grantee pays its estimated commercial value. Also, under certain conditions it is possible for peasants' cooperatives and for private persons, in that order, to also claim vacant land and receive an IERAC grant. IERAC also has the power to expropriate land and grant it to third parties. Prior to issuing a grant for the upland area, a certificate must be acquired from the provincial agriculture and livestock directorate in the Ministry of Agriculture stating that the land is not fit for agricultural purposes.

For general agricultural land, rights can be obtained at a cost of 3,000 to 5,000 sucres per hectare. This is a one-time payment because it is made to buy the land. A special procedure was enacted in 1984 for land grants for shrimp farming with new minimum prices established (A. IERAC, 23 October 1984, Creacion de la Unidad Ejectora de Tierras para Acuacultura). Its main objective was to charge higher prices, more in keeping with shrimp farming incomes. If for general agricultural land, rights were in the range of 3,000-5,000 sucres per hectare, land for shrimp farming cannot be granted for less than 50,000 sucres ($100 U.S.) per hectare (Art. 5, A. 23 October 1984). IERAC's 1986 grant program estimated that almost 436 million sucres would be collected through shrimp farm land grants during the year (IERAC, Plan Anual Operativo, 1986, 48).

Private Land. Sites for privately owned shrimp farms must also be certified by the Ministry of Agriculture as unfit for agriculture before a shrimp farm operating permit can be granted from the General Directorate for Fisheries. However, when the lot for the shrimp farm is to be purchased or incorporated from a larger holding, effectively causing a property subdivision, a permit from the IERAC is required in addition to the certificate from the Ministry of Agriculture.

Shrimp Farm Operating Permits

Every shrimp farm must obtain an operating permit from the General Directorate for Fisheries. The petitioner must first demonstrate the possession of a lease (the joint acuerdo), an IERAC grant, or a certificate from the Ministry of Agriculture (for private lands). Under new rules published in 1985, the petitioner has to provide a very detailed map of the farm project, showing the design of wall sections, pump stations, water channels and rights-of-way. The minimum distance between the shrimp farm and an agricultural area is 500 meters. Nursery ponds must be at least 4 meters away from an agricultural area.

The director general of fisheries has 15 days to issue a report on the project. In the case of a favorable report, the documents are sent to the undersecretary for fisheries resources. In this office, the acuerdo of authorization for fisheries activities is drawn up and signed by the undersecretary. The last step in this procedure is the publication of the acuerdo in the official register (Figure 3).

Under the new 1985 regulations, mariculture permit holders are obliged to allow for official inspections whenever the authorities see fit, to protect the ponds' adjacent mangroves and agricultural areas, to prevent pollution of the site, to keep records on farming and sales records, and to provide for natural or artificial nursery ponds, and to comply with the forestry law, maritime police code, their regulations and related laws. In September 1985, issuance of permits for new ponds was suspended.

Assessment of the Governance of Shrimp Mariculture

Shrimp exports have become a vital part of the Ecuadorian economy. Agricultural exports from Ecuador peaked in 1978, and have declined steadily since then (Figure 4). Events such as the 1982-83 El Nino adversely affected banana crops, and the prices of sugar, coffee and cacao fell. Shrimp farm exports began to increase, due both to massive investments and the unusual abundance of shrimp postlarvae. This growth in shrimp exports took place during a time of economic crisis in Ecuador, which in 1983 saw the gross domestic product decline in real terms by 3.0 percent over the previous year. In addition, disbursed external public debt grew from $.4 billion in 1975 to $6.3 billion in 1983. Debt service on those loans jumped from $50 million to $870 million in the same time period. It is within this context of economic crisis that the regulation of shrimp farms has taken place.

The volume of applications for approvals of every type increased dramatically after 1978. In addition, many shrimp farms were constructed before required permissions were obtained as farm owners rushed to take advantage of the abundant supply of postlarvae and the promise of huge profits. During the mid-1980s, revisions were made to some of the laws and regulations pertaining to shrimp mariculture. For example, a new set of rules was published in 1985 covering the procedures and review criteria to be used by the General Directorate for Fisheries in evaluating requests for "classification" of enterprises to take better advantage of the benefits of the fisheries law. A basic problem for regulatory agencies has been bringing all of the shrimp farms under their respective jurisdictions into conformance with the leasing and operating permit procedures.

From a public policy perspective, however, an equally important concern is to identify the objectives of the regulatory effort. The historic reason for the leasing procedure was to assure that the use of the communal beach and bay zone was in the public interest. The IERAC role in the granting procedure is to make sure that public land is sold to private individuals in accord with the priorities set by the law of agrarian reform. In both cases, the objective of raising revenues through lease fees and titles is central to the regulatory activity.

Leased and Nonleased Development in the Beach and Bay Zone. The amount of area leased for shrimp mariculture increased dramatically, beginning in 1979 (Figure 5). Because the industry grew so rapidly, many farms did not obtain leases prior to their construction, circumventing review by the Merchant Marine and Coastal Directorate and the need to pay the annual lease fees. The Center for the Integrated Survey of Natural Resources (through remote sensing), CLIRSEN, and DIGMER have been working jointly to identify unauthorized farms in beach and bay zones. Studies to date using aerial photographs show that there may be 60 farms in the Guayas Gulf illegally occupying beach and bay zone areas. Of these, ten have a surface area of up to 200 hectares each. Without site inspections, it is not yet possible to say that every identified farm is actually within DIGMER jurisdiction, i.e., in the beach and bay zone (Cevallos, 1986).

The limited number of DIGMER personnel available makes it difficult to handle new applications for leases as well as keep track of development activity. The mariculture development of the late 1970s and early 1980s was unprecedented in volume and geographic scope. It became common to make the inspections in airplanes provided by anxious prospective lessees because many of the proposed pond sites were located in remote areas which can be reached only by air or water. The flood of applications has subsided, and most of the available sites in central and southern Ecuador are now occupied. However, construction of approved and as yet unauthorized farms continues throughout the coast.

The Granting of Titles in Vacant Upland Areas. The definition of vacant upland, which falls under the jurisdiction of the Ecuadorian Institute for Agrian Reform (IERAC), is essentially negative. That is, IERAC governs land not in the beach and bay zone, though definitions of this zone are sometimes inconsistent. For example, salt flats next to mangroves are generally regarded as in the beach and bay zone even though they may not be covered by the highest tides; diked ponds which no longer experience tidal influence are also considered part of the beach and bay zone. Fortunately, IERAC usually does not claim these areas.

However, a 1985 report by the National Forestry Directorate (DINAFOR), contends that it has been a practice for IERAC to grant areas for shrimp farm construction in national forestry domains, specifically the Reserva Ecologica Manglares de Churute. Although construction of shrimp farms located directly in mangrove areas has been expressly forbidden since 1978, allegedly, less strict inspection procedures in the IERAC provide the opportunity for individuals wishing to avoid obtaining a lease from DIGMER to obtain a title to the area by claiming that it is upland (Alarcon, 1986).

Authorization of the Operation of Shrimp Farms. Like DIGMER and its leasing procedures, the General Directorate of Fisheries has seen a tremendous increase in applications for operating permits, and a dramatic rise in the area which it must now supervise. Figure 6 shows the surge in authorizations that started in 1977. By 1980 the workload was four times greater, and in 1981 ten times greater than in 1977. As of 1985, 942 shrimp farms covering 94,352 hectares had been authorized.

According to some sources, most shrimp farms are operating without one or more of the required permits. In a recent publication, Horna is quoted as stating that in 1985 just 10 percent of the shrimp farms were operating legally, 20 percent had initiated permit procedures, and a full 70 percent in every size class were operating illegally. Even if all 60,000 hectares of ponds completed in the first half of 1986 were illegal, it would amount to only 38 percent of the total of authorized and constructed ponds in Ecuador (Maugle, 1986). However, the percentage of farms that started operations prior to receiving their operating permit is not known.

Recognizing the problem of failing to account for all farms in the regulatory process, the General Directorate of Fisheries has pressed unauthorized farm operators to apply for operating permits. In 1984, it issued an order requiring shrimp processing and packing plants to demand that their suppliers provide invoices which are imprinted with the number and date of the acuerdo of authorization. In the same regulation, a deadline was established for compliance by March 31, 1985, but was extended to June 30, and then to August 15. In September 1985, the issuance of permits for new shrimp ponds was suspended, but it was left to the discretion of the General Directorate of Fisheries to grant permits for ponds already constructed illegally, with a deadline of September 30. In March 1986, a new term for authorizing the illegal farms was set for April 30, 1986. This deadline also passed. In April 1987, the enforcement of the prohibition was postponed indefinitely following a year of declining oil revenues in 1986 and an earthquake that destroyed the oil pipeline that brought crude oil from eastern Ecuador to the coast for shipment.

In view of the fact that the specific regulations for shrimp mariculture were only published in 1985 and that, technically speaking, new farms cannot be constructed, it is difficult to determine what decision criteria were employed during the previous period when most shrimp farms were authorized and constructed. LiPuma and Meltzoff (1986) contended that, "Besides diligence and persistence, the key to quick approval can be a series of unofficial payments given to members of the various government agencies."

In many cases, the prohibition on cutting mangroves has proved to be ineffective. Since economic and social circumstances strongly favored expansion of the shrimp mariculture industry, the prohibition on new pond construction proved to be a crude and inappropriate tool for assuring the long-term stability of the shrimp farm industry.

Fisheries Administration and Institutions

The National Council for Fisheries Development was established by the fisheries law. The Council, based in the port city of Guayaquil (Ley de Pesca y Desarrollo Pesquero, as amended by D.S. 2963), is charged with the establishment of the fisheries policy in the entire country. It has seven members: the minister of industries, commerce, and fisheries, or the undersecretary for fisheries resources, the minister of foreign affairs, the minister of finances and public credit, the minister of agriculture and livestock, the general secretary for planning of the Council for National Development (CONADE), the general director of the Merchant Marine and Coastal General Directorate (DIGMER) and a representative for the private fisheries activities. Official advisors to the Council are the directors of the Industrial Development Center (CENDES), the general director for fisheries (INP) and the director for integration of the Ministry of Industry, Commerce, Integration and Fisheries (MICIP), or his permanent deputies. All binding decisions of the Council are issued as "Resoluciones CNDP."

The Undersecretary of Fisheries Resources (Subsecretaria de Recursos Pesqueros) and the National Council for Fisheries Development have been in Guayaquil since 1978 (Decreto Supremo, 2963). The undersecretary heads the National Council, is in charge of the execution and enforcement of the fisheries laws and bylaws, and works out the programs and plans of projects to be approved by the Council. Since 1985 (amendment of the fisheries law, D.L. 03), the Council authorizes starting operations of fishery firms (permit) and grants "classifications" for the "A" and "B" tax and tariff exception categories.

The General Directorate of Fisheries (Direccion General de Pesca) administers, directs and controls the fisheries activities in the country. Among its duties are to inspect the fisheries firms to make sure that they carry out the law and, in case of infringement, to act as judge; also, to grant fisheries registration for national foreign vessels and yearly fisheries permits. Statistical data is collected in the Direccion General de Pesca.

Fisheries Law and Regulation

Code of Maritime Police. The code of maritime policy regulates the uses of the coastal zone and empowers the Merchant Marine and Coastal Directorate to apply sanctions to individuals acting in contravention to its mandates. This code regulates the use of beach and bay zone through a leasing system along with Reglamento de Tramites de la Marina Merchante y del Litoral and the regulation of aquaculture.

Ecuador's fisheries law dates from 1974. Its main features are the degree of control it keeps on the fisheries industry and the incentives it provides. With such incentives the law meant to encourage large vertically integrated enterprises such as canning and fisheries corporations. Such enterprises were thought to be the most likely to succeed in Ecuador and, therefore, better for the country. Consequently, the larger and more vertically integrated a corporation is, the more incentives it receives in the law.

Those firms that qualify are granted the status of "classified" enterprises and receive benefits according to the degree of their vertical integration. There are three categories: Special, A and B. The "Special" category applies to enterprises that harvest and process their own products at sea, incorporating high technology and investments. Firms that are not vertically integrated, such as those that work only in processing, fit into the "B" category. Finally, category "A" are those enterprises that are judged by the undersecretary of fisheries resources to be making an important contribution to the development of the industry, even if they are not highly vertically integrated or working at sea. The incentives to these enterprises comprise a whole range of tax and tariff exceptions and tax deductions on investments.

For those not able to sustain the necessary investments, the fisheries law (Art. 24) and its regulations (D.S.759, 1974, Chapter VI) offer the alternative of association with other enterprises in joint ventures whose terms were carefully spelled out (D.S. 759, Art 39). The resulting joint venture must include vessels, technical equipment, cold storage and land-based processing plants as with every other classified fisheries enterprise (Art. 26).

The law divides fisheries activities into the following steps: (1) extractive phase (catch), that can be (a) industrial, (b) artisanal, (c) scientific research, and (d) sport fisheries; (2) processing; and (3) commercial. For every one of these phases it establishes rules and authorizations, and gives ample power to administrative institutions on matters such as harvest closures, inspection, gathering of information, zoning, and prohibitions on constructing dams or palisades in rivers, estuaries and creeks, that could adversely affect aquatic species.

Shrimp Farming. During the first years of the shrimp mariculture industry, the fisheries law was enforced without consideration for the needs of this activity. Aquaculture regulation (Reglamento para la cria y cultivo de especies bioacuaticas) was enacted in 1985, but it concerned itself basically with lease procedures for the beach and bay zone.

Only in the last few years have specific regulations for shrimp mariculture been issued. One such regulation (R. 131-84-CNDP, 1984) from the National Council for Fisheries Development, set policies for enterprise classification and shrimp exportation. Another (D.E 1142, 1985) sets new regulations for granting classifications and reclassifications of fisheries enterprises in categories A and B. A third (Regulation R. 131-84-CNDP) awards benefits through classification and allows shrimp pond owners to form joint ventures with packing plants. Such category A enterprises must have a cold storage plant with a capacity for at least 30 metric tons of raw products. Since the shrimp are caught alive from the mariculture pond and may arrive alive at the packing plant, it is clear that cold storage is not an important element for the shrimp farm business as it is for the sea fisheries, where several days pass between catching and landing, and arrival at the packing plant.

Recent reforms in the fisheries law (D.L. 03, 1985), and its regulation (D.E. 1312, 1982), a new regulation for aquaculture (D.E. 1062, 1985), and several others have greatly simplified procedures for the shrimp farm business. However, shrimp mariculture has grown dramatically without the need for such development incentives.

Hatcheries and Larvae. Semacua, a business subsidiary of Empacador Shayne in Guayaquil, started construction of the first Ecuadorian shrimp larval hatchery as far back as 1979, in Anconcito. It received authorization from the Ministry of Natural Resources (today Ministry of Energy and Mines), that was in charge of fisheries affairs before these were transferred to MICIP. The hatchery's permit was granted according to the fisheries law because, although neither the law nor its regulation mentioned artificial reproduction, the hatchery business was considered an exploitation of aquatic resources and a fisheries activity.

A current law (Regulation A. 123, 1985) controls hatchery activities as the production of aquatic species in laboratories involving the processes of maturation, breeding, spawning, birth, larval stage, growth and feeding. This regulation also applies to catching fecund and adult aquatic species in their natural environments (Art. 1, A. 123, 1985), even in closed seasons (A. 957, 1985) when a pass is required from the undersecretary of fisheries resources.

Today a permit for installing a hatchery must be sought from the undersecretary of fisheries resources. The application must be accompanied by a technical and economic feasibility study. The general director of fisheries may either approve the application or reject it; the permit is granted through an acuerdo (Ch. II, A. 123, 1985).

A resolution (131-84-CNDP) of the National Council for Fisheries Development allows hatcheries to obtain a classification so they can import equipment with a tariff exemption, as well as granting a 50 percent tax credit on certain investments. It also awards classification to shrimp farmers who install a hatchery, giving them permission to export their products. Shrimp farmers who have acquired classification because of projected construction of a shrimp packing plant can later swap this project for a hatchery and still keep the classification.

Lastly, a MICIP regulation (A. 22, 1986), lists the Ecuadorian products that may not be exported, including all species of shrimp seed, larvae and gravid shrimp females. It is possible that this prohibition

could be interpreted as amending Article 9 for hatcheries laboratories (A. 1234, 1985), which gives jurisdiction to the undersecretary of fisheries resources "to resolve special cases in this matter."

Hatcheries activities need legal authorization, but that is not the case for catching larvae in its natural environment, which are freely exploited except under circumstances where the exportation is forbidden (A. 071 and 135, 1985 and A. 22, 1986). Larvae import is tariff-free (D.E. 964, 1985).

Closures. More attention is currently paid to better-known phenomena of shrimp population dynamics. There is, for example, a regulation (D.E. 1336, 1985) for closures of shrimp fishing for postlarvae, mature females and adults. Different time of year are specified for closures according to the estimated cycles of shrimp development and the regulation forbids all shrimp fishing in the entrances of the estuaries. The regulation by law (A. 957, 1985) gives hatcheries the right to catch fecund females and mature males during closed season for reproduction purposes. Finally, the regulation addresses the need for studies of the possibility of establishing shrimp hatcheries to repopulate the seas.

A framework for enforcing the closure of fisheries for postlarvae, juveniles, mature and fecund shrimp catch was enacted by regulation E.D. 1336, 1985. It provisionally established June 1 to July 31, 1986, as a closed season for postlarvae and adult shrimp. Additionally, regulation A. 262, 1986 prohibits catching shrimp postlarvae in certain zoned beach areas; there are other beach areas where shrimp postlarvae fishing is forbidden during the weekend.

To summarize, closures can be classified as follows: permanent closures as exist in the entrance of estuaries, for postlarvae at certain beaches, and for postlarvae at other designated beaches during the weekend. Periodic closures affect the shrimp trawling fisheries, with the exception of deep sea trawling, and catching postlarvae and adult shrimp, with the exception of authorized hatcheries.

Assessment of the Legal and Administrative Framework of Fisheries Management Pertaining to Shrimp Mariculture in Ecuador

The rationale behind the fisheries law scheme was that the most viable fisheries businesses in Ecuador were exporters and their natural market was the United States. Exporting to the United States required high volume and quality. High volume was reached with big investments, and high quality was only guaranteed for business that complied with strict government-enforced controls of the entire industrial process.

The ambitious goals of the law were never reached. Unfortunately for the canning industry, the big enterprises never materialized. Some enterprises went out of business leaving only two major firms, with the rest being medium-sized firms. Moreover, at no time did a substantial bulk of canned products go to the American markets. Instead, they went mostly to partner countries in the Andean Pack (Andean common market), principally Venezuela, despite the resistance of competing Venezuelan national industries, official harassment and red tape. Additionally, a strong cooperative movement never took hold in the Ecuadorian fisheries. Nor has the artisanal port facilities system materialized.

The shrimp fleet has historically been, and still is, the biggest in Ecuador. In 1975 it accounted for 59.8 percent of the fisheries fleet, though this percentage has been decreasing. In 1982 it represented 50 percent of the total fisheries fleet of 460 vessels in Ecuador (CENDES, 1983, 151). Unlike the fish canning industry, offshore trawl shrimp fishery exports to the United States commenced in 1954 (McPadden, 1985) and continues to keep that country as its natural market. Perhaps this is because the Ecuadorian national laws are more favorable to the shrimp trawl fishery than to the shrimp pond industry.

The optimal structure, size and degree of integration of the shrimp farm industry are different from the optimal structure, size and degree of integration of the exporting canning fisheries and, as such, require a different legal framework. For example, a grant of a "special" category requires a person to own at least one seaworthy vessel, or to have at least two vessels in a joint venture, and to own a land-based cold storage plant with a minimum capacity of at least fifty tons of raw product (A. 13319, 1976). Clearly, these restrictions are inappropriate for mariculture enterprises.

Although the administrative situation has changed somewhat in the last three years, the improvements in shrimp mariculture administration are still governed by the fisheries law enacted more than two decades ago for the sea fisheries industry--an activity quite different from shrimp farming.

Furthermore, the basic tenets of that law--the bigger the enterprise and the more vertically integrated, the better for the country--have never been questioned. In consequence, larger enterprises have

been the more favored. How good has this approach been for the shrimp fisheries industries development? No one knows. It may be better to offer more benefits to smaller enterprises, or a combination of benefits for all the firms because nobody is able to show objectively that the underlying rationale of the existing fisheries law has been or will be better for the fisheries industry development than any other.

Finally, a key fact is that, to date, most shrimp farming businesses in Ecuador do not enjoy any kind of classification or tax benefits.

Mangrove Conservation

Introduction

The growth of shrimp mariculture in Ecuador has contributed significantly to the destruction of mangrove forests and ecosystems. Between 1969 and 1984, CLIRSEN estimates that 11 percent of the country's mangrove forest has been destroyed, with considerable variation among regions. Snedaker (1986) estimates that as much as 30 percent of the Ecuadorian mangrove ecosystem was lost during this same period. This loss continues as new ponds, both authorized and illegal, continue to be constructed.

Shrimp pond operations started in El Oro province in the late 1960s, followed by sudden growth in the 1970s in both El Oro and Guayas provinces. In El Oro province, mangrove and brackish lagoons are far more limited than in Guayas, according to a study conducted in Machala-Puerto Bolivar, the most heavily populated area in El Oro province This area contains between one-sixth and one-eighth of the total mangrove surfaces of the province. The sample shows that between 1966 and 1982 in the pilot area, the mangrove forest decreased by 29.7 percent (CLIRSEN, 1985) with destruction of the mangrove ecosystems (lagoons and wt areas) even greater. Construction of shrimp ponds can be directly blamed for this decline.

Along the rest of the Ecuadorian coastal zone, the ecological consequences of shrimp pond construction in mangroves is not well understood because of the lack of historical data or comparative studies. It is possible, however, that the pressures on mangrove ecosystems in Guayas have not been as strong as they were in El Oro province, perhaps because the salt flats suitable for shrimp pond construction are much larger in Guayas. Guayas province possesses 69 percent of the total salt flat areas in the Ecuadorian coastal zone compared to 14 percent of El Oro. Thus, it is inappropriate to directly extrapolate findings from El Oro to Guayas. Even so, if all the Guayas shrimp ponds were constructed in mangroves, that could account for as much as a 30 percent decline in the total mangrove resource of the Guayas province (Twilley, this volume).

Protective measures have not been successfully implemented. The case of the shrimp pond construction in the area Reserva Ecologica Manglares de Churute is well documented. According to the Direccion Nacional Forestal (DINAFOR), a significant number of shrimp ponds have been legally constructed there, although those lands were declared a "state forestry domain" in order to conserve the mangrove ecosystem there. There is a consensus today among the shrimp farm operators regarding the importance of mangrove conservation. They are aware that widespread mangrove destruction may have negative repercussions on their industry. The essential question is whether prohibitions on mangrove destruction is an effective means of protecting the mangrove ecosystem of Ecuador for the long-term benefit of the coastal economy.

Legal and Administrative Elements of Mangrove Conservation

The Direccion Nacional Forestal (DINAFOR) is a department of the Ministry of Agriculture and Livestock charged with the development of forestry resources in the country, preservation of natural areas and outstanding wild life, flora, landscapes, historical and archeological relics, and aquatic systems (Reglamento Organico Funcional de la Direccion Nacional Forestal, D.E. 1529, 1983).

Part of the forestry law deals with forest exploitation and industry. Title II, "Natural areas and flora and wildlife," refers to conservation of the national forestry domain and its administration through a set of management categories (parks, reserves, etc.; Table 3). Unit chiefs, forestry district directors and the national forestry director are entitled to pass judgment on misdemeanors against the law (Ley Forestal y de Conservacion de Areas Naturales y Vida Silvestre, Ley C.L. 74, 1981).

Concern for mangrove protection has grown steadily in Ecuador. Decreto Supremo 2939-B, 2978 and bylaw A. 0036, 1979, ruled that DINAFOR should zone the mangrove areas in the country. A 1978 law forbade shrimp pond construction in mangrove areas, but allowed for mangrove exploitation in other selected areas. It has been determined that the main mangrove forest concentration of Ecuador is found in the Gulf of Guayaquil, in the Guayas River, and in the estuaries of the Mataje, Najurungo and Santiago (Informe Sobre la Delimitacion del Bosque Protector de los Manglares en Ecuador, no date). The report recommended a halt in permits for shrimp pond construction. Similarly, in 1985, mangrove conservation, protection and restoration was declared to be in the public interest, and mangrove exploitation and clearing forbidden (D.E. 824-A, 1985).

Assessment of Mangrove Conservation in Ecuador

A 1958 DINAFOR report contends that it has been common for the Ecuadorian Institute for Agrarian Reform (IERAC) to grant areas for shrimp pond construction in national forestry domains, namely, Reserva Ecologica Manglares de Churute (DINAFOR, 1985, 16). Apparently, lack of coordination and clear definition of agency responsibilities regarding mangroves has created much confusion so that agencies are often working at cross purposes. There are adequate legal measures for mangrove conservation. However, due to chronically inadequate budgets and a limited number of public servants in charge of controlling and prosecuting misdemeanors in protected areas, enforcement is inadequate.

A first step would be for the lead agencies to coordinate among themselves so no more permits are granted for farms in the state's forestry domain. This would also be a good occasion to inquire into the failure of the so-called "tripatite commission" to carry out joint inspections on shrimp pond sites. The cooperation of those operators already established in the Reserva Ecologica Manglares de Churute operation must be sought to create a management plan, so that they help DINAFOR conserve the remaining area of the reserve.

As the time approaches for the periodic lease renewals of the first shrimp ponds (lease terms are ten years) there will be a good opportunity to initiate long-term mangrove conservation control. The use of coarse tools, such as prohibitions on all mangrove disturbance, that are difficult and costly to enforce, must be replaced by area-specific mangrove management programs that can enlist the support and involvement of all those who depend directly and indirectly upon the productivity of mangroves for their livelihood. Public education and support must also be an ingredient in the strategy, since the funding and enforcement problem will not be resolved in the short term. Lease regulation considers clearing of mangroves as an infraction for which renewal of the leases can be denied. After the CLIRSEN studies, it is possible to make historical comparisons to determine where mangrove destruction has occurred so that DINAFOR will be able to punish violators.

Conclusions

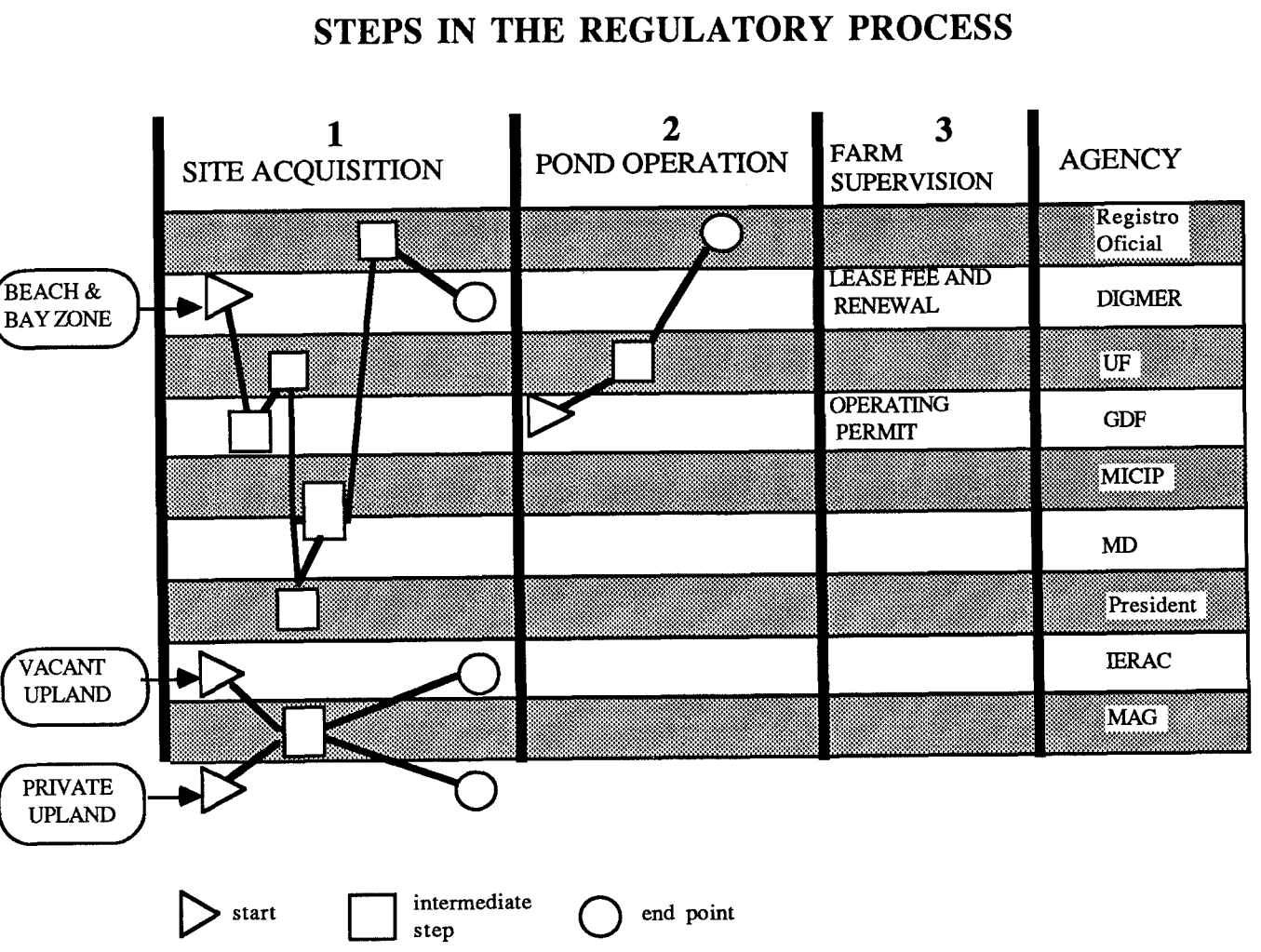
Ecuador does not lack basic mechanisms for regulating the environmentally disruptive aspects of shrimp mariculture and significant improvements to the policies have been made in the last two years. However, it has been largely unsuccessful in utilizing available legal and institutional tools to create an effective program for maintaining a sustained natural resource base for shrimp mariculture. One major deficiency is traceable to Ecuador's failure to adopt policies specific to shrimp mariculture, or to establish relevant decision making rules and criteria early in the expansion phase of the industry. Both the lack of clear purpose and complex administration have worked against successful coastal management in the case of shrimp mariculture, which is particularly significant in light of the fact that expansion of shrimp exports has been desperately needed.

Given its experience, Ecuador could simply rewrite its laws and regulations on shrimp mariculture to address these problems. However, a more useful approach would be for Ecuadorians to learn from their experience with shrimp mariculture and become the first developing nation to design and implement wise controls on mariculture. Gaining support and cooperation for any development restrictions is difficult under the best circumstances because each rule must be able to stand up to careful, often skeptical, scrutiny. First, restrictions aimed at protecting the "environment" must be interpreted in terms of keeping resource-based industries sustainable or preventing one economic or public use from causing damage to another.

Second, the mechanism for making decisions must be simple, both to encourage compliance and to allow flexibility within government agencies which are chronically understaffed, underfunded, or not necessarily organized to effectively regulate every activity under their jurisdiction.

Finally, the continuing attempts in Ecuador to establish mechanisms for governing the use of coastal resources should be viewed as a key ingredient of the overall national effort to develop the country's economy and its political institutions. In this respect, the problems of establishing and implementing effective management of shrimp mariculture provide Ecuador with a valuable experience to draw on as it considers how best to develop its vast coastal zone in the remainder of the 1980s and beyond.

Figure 1. An outline of the regulation of shrimp farming.



DIGMER: Merchant Marine and Coastal Directorate
UF: Undersecretary for Fisheries
GDF: General Directorate of Fisheries
MICIP: Ministry of Industry,Integration and Fisheries
MD: Ministry of Defense
IERAC: Ecuadorian Institution for Agrarian Reform and Colonization
MAG: Ministry of Agriculture and Livestock

Figure 2. Acquisition of leases in the beach and bay zone.

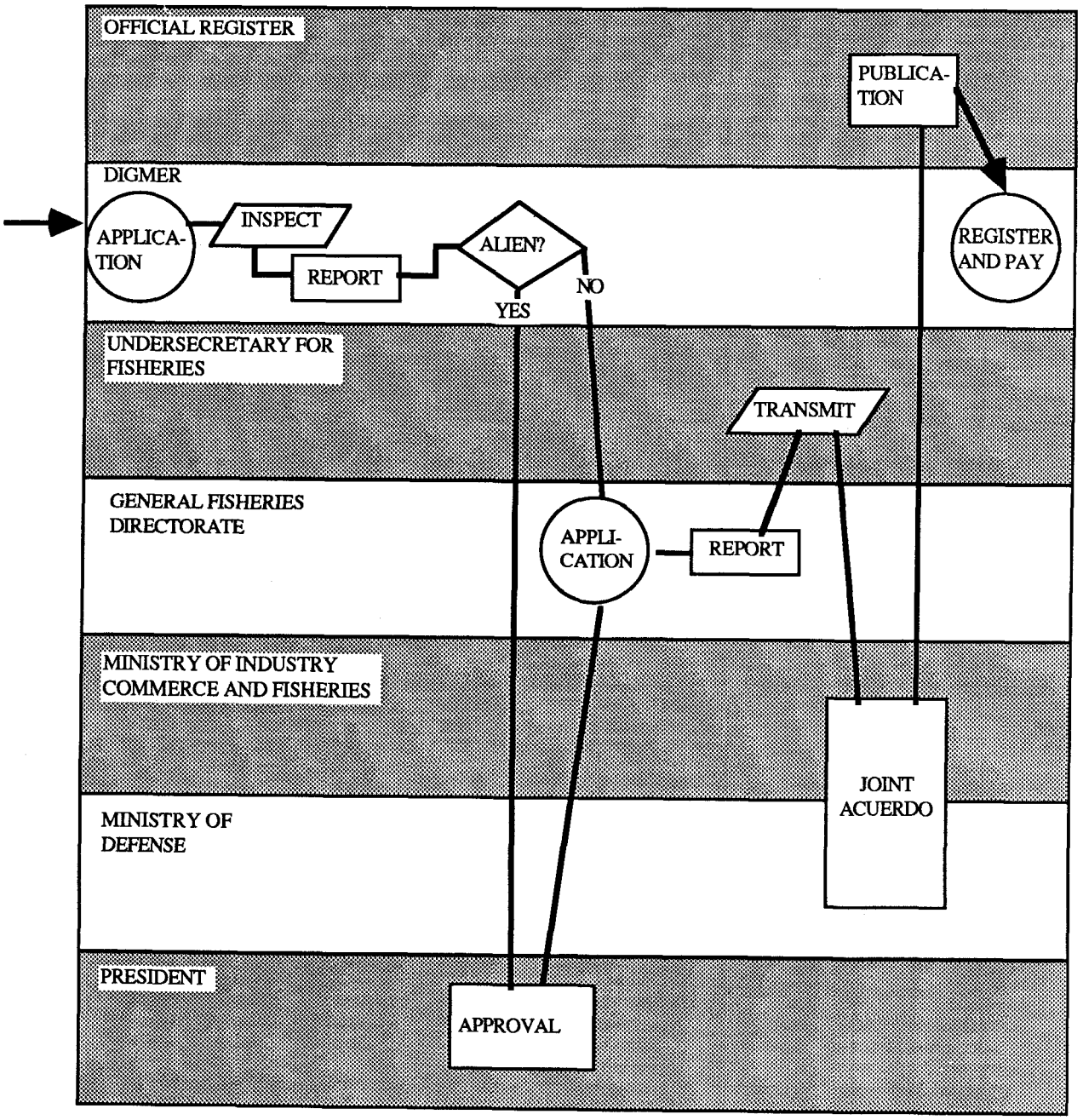


Figure 3. Procedures for acquiring a shrimp pond operating permit in Ecuador.

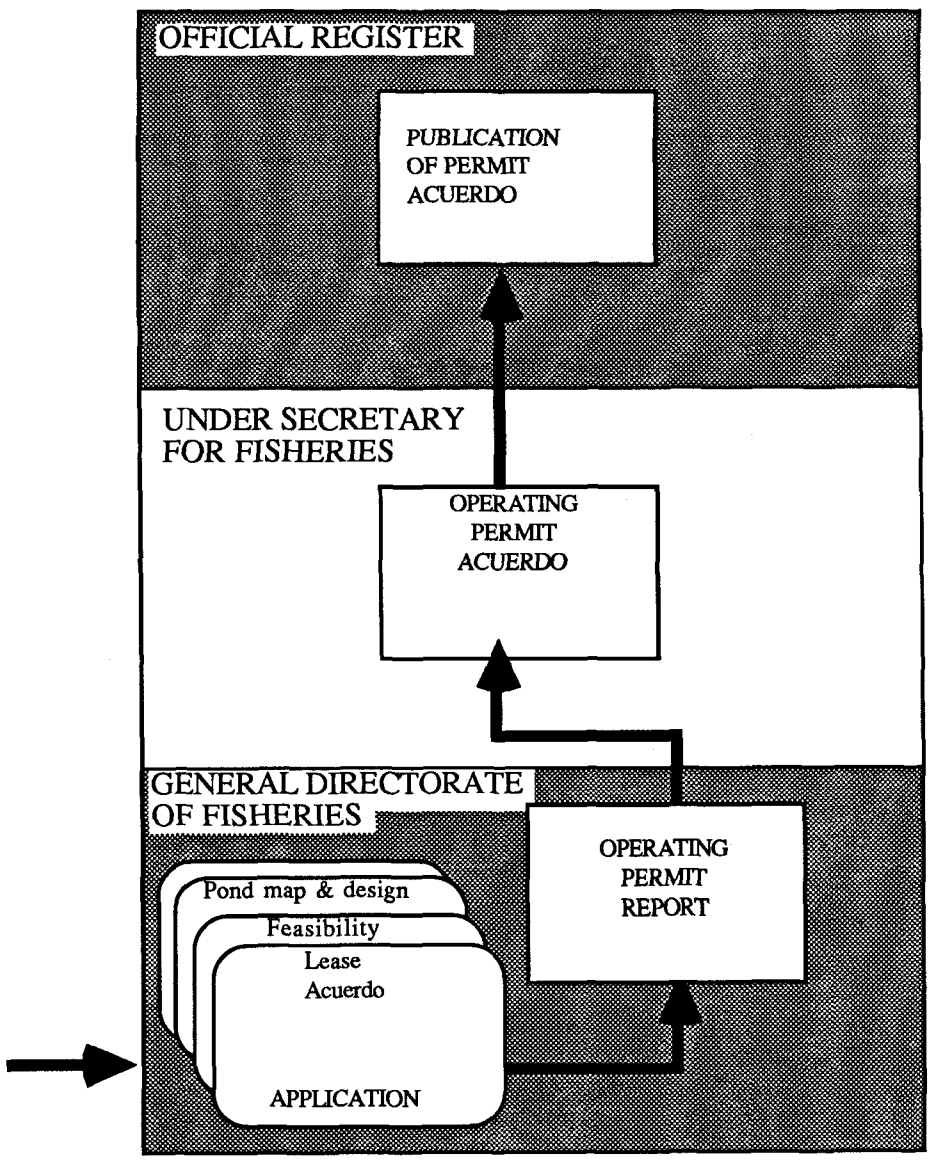
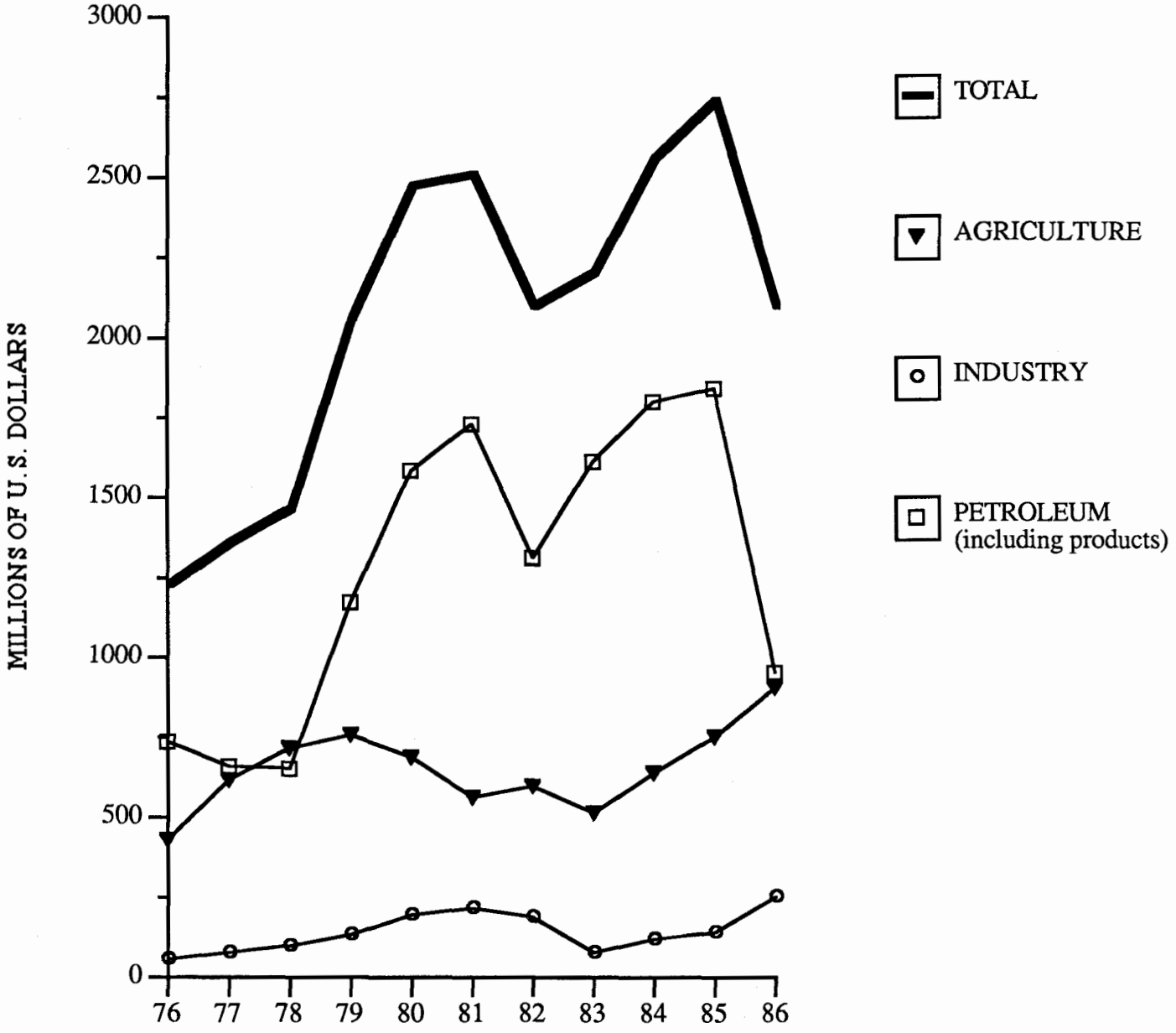
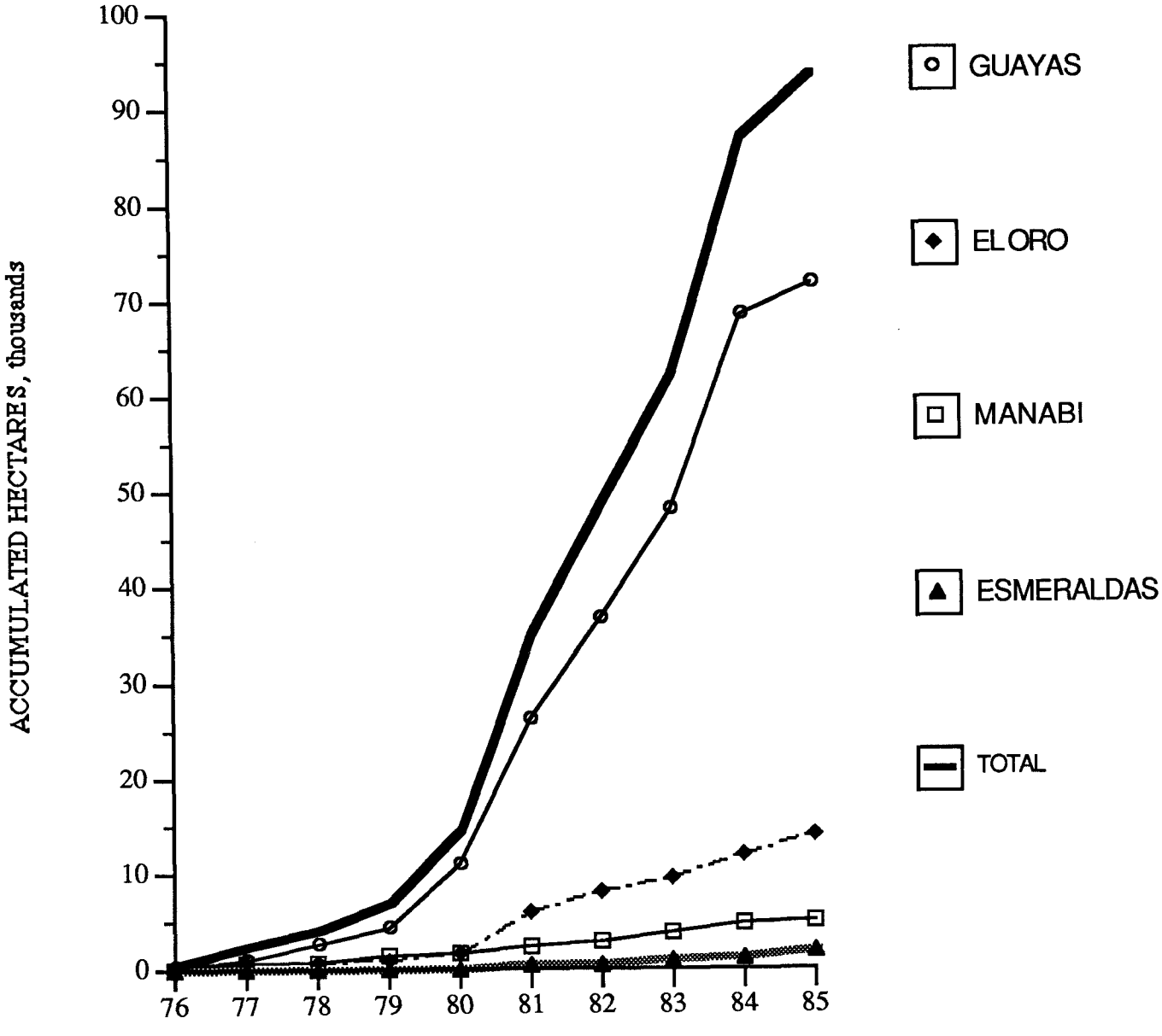


Figure 4. Ecuadorian exports by sector, 1976-1986.



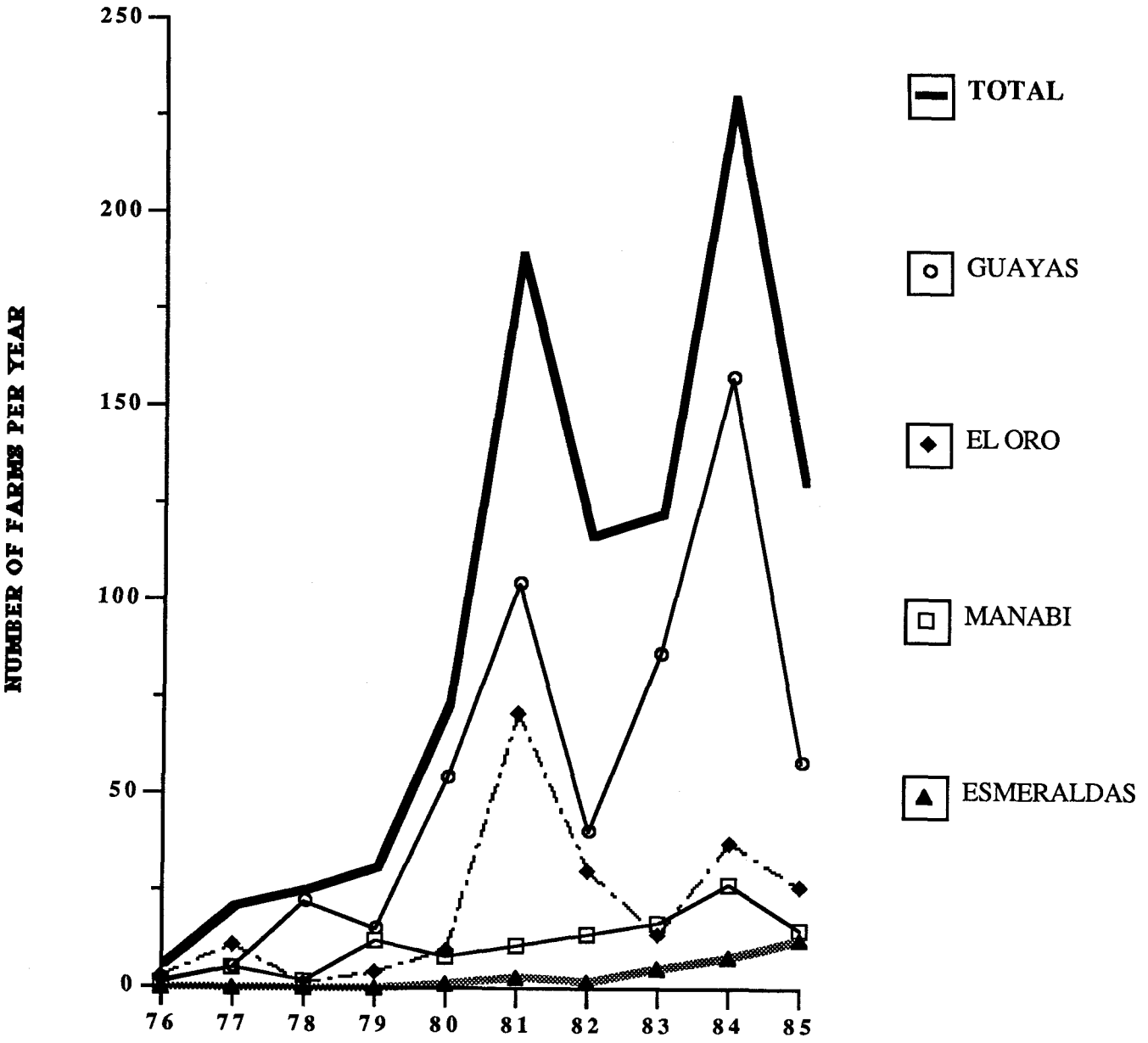
SOURCE: Ecuador:An Agenda for Recovery and Sustained Growth, World Bank, 1984. (1976-1979) Banco Central del Ecuador Boletin 1.587, Febrero ,1986. (1980-1985)

Figure 5. Cumulative area authorized for shrimp farming in Ecuador, 1976-1985.



Source: General Directorate of Fisheries

Figure 6. Number of authorized shrimp farms per year in Ecuador, 1976-1985.



Source: General Directorate of Fisheries

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