1986

The Development of the Shrimp Mariculture Industry in Ecuador and Its Impact on the U.S. Market

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THE DEVELOPMENT OF THE SHRIMP MARICULTURE INDUSTRY IN ECUADOR AND ITS IMPACT ON THE U.S. MARKET

BY

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A major paper submitted in
partial fulfillment of the
requirements for the degree of
Master of Marine Affairs

University of Rhode Island

1986

Major Paper

of

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Master of Marine Affairs

Department of Geography and Marine Affairs

Approved: _____

ACKNOWLEDGEMENTS

I would like to express my appreciation to a few individuals for their assistance in the research and preparation of this report. I wish to thank: the research team at the University of Miami; Dr. Samuel Snedaker, Edward DiPuma, and Sarah Keene Meltzoff, for sharing their analyses of their research trips to Ecuador. Various National Marine Fisheries Service regional offices around the United States, particularly, Dennis Weidner, of NMFS International Division in Washington, D.C., for providing access to their files. The U.S. seafood importers and Ecuadorean shrimp exporters, with whom I had the opportunity for personal communication and correspondence. Dennis Nixon; for his patience. Finally, special appreciation to Tim Kristofek and Gail Rainey for their endless typing and retyping of the draft and final manuscript.

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INTRODUCTION

Shrimp is one of the most widely consumed seafood products in the world, especially in the developed, western nations. The demand for tropical shrimp is increasing at a much higher rate than other fish and seafood commodities. With this increase in demand, there has been enormous interest to expand global shrimp production. Due to a stabilization in catches from the trawling industry (although yearly fluctuations exist)[1], many successful pioneers have been actively developing the aquaculture practice of rearing shrimp in pond environments. Mariculture, the term used to describe the practice of farming animal and/or plant life from the sea, has created new opportunities and problems for the future of the global shrimp industry.

Presently, the majority of shrimp mariculture is taking place in lesser-developed, tropical countries where the conditions and the availability of warm-water shrimp species, both which are not found in colder temperates, have made it possible for these countries to exploit shrimp culture.[2] This farming has also created alternatives for entrepreneurs of these countries to diversify from lower cash, high-bulk agricultural crops, which in the long-term improves national economy.

The practice of farming shrimp has also developed into a "Gold Rush" fever that is having impact world-wide. Many Latin American, Asian, and Pacific Ocean countries have recently altered their agriculture activities to accommodate the expansion of shrimp mariculture enterprises.[3] It can also be fair to mention here that a great deal of the expansion is influenced by western, financial support.[4] Since shrimp is considered a high-value food commodity, the development has drawn interest from many

United States and European investors. One country in particular, Ecuador, which will be the focus of this discussion, has exemplified many of the positive and negative aspects involved with the growing pains of this industry.

In the last decade, the Ecuadorean shrimp industry has risen to such major economic importance that it is presently the leading nation in the production of pond-raised tropical shrimp.[5] (Figure 1, page 4.) From an annual production of 5,800 metric tons (live weight) in 1975, mostly due to the shrimp trawler production, Ecuador had reached an amazing record of 36,000 metric tons in 1983. Approximately 80% of the shrimp production was from the mariculture industry.

Currently, fisheries products rank second only to oil, and a major percentage is from the shrimp industry, mainly mariculture.[6] This is a result of a hasty development into mariculture, from the Colombian border south along most of the Pacific coast to the Peruvian Frontier. (See figure 2, page 5.). Entrepreneurs are converting mangroves, saltflats, farm lands and grazing pastures into shrimp ponds without considering the necessary resource management strategies and proper government approvals. This accelerated growth of shrimp mariculture is totally reshaping the coastal zone, economy, and traditional livelihoods in Ecuador. In addition, Ecuador's shrimp exports to the U.S. have been accused of having an adverse impact on our Gulf Shrimp industry.[7]

Therefore, several biological and economic profiles of the shrimp industry have attempted to analyze the progress and some of the critical issues associated with its development.

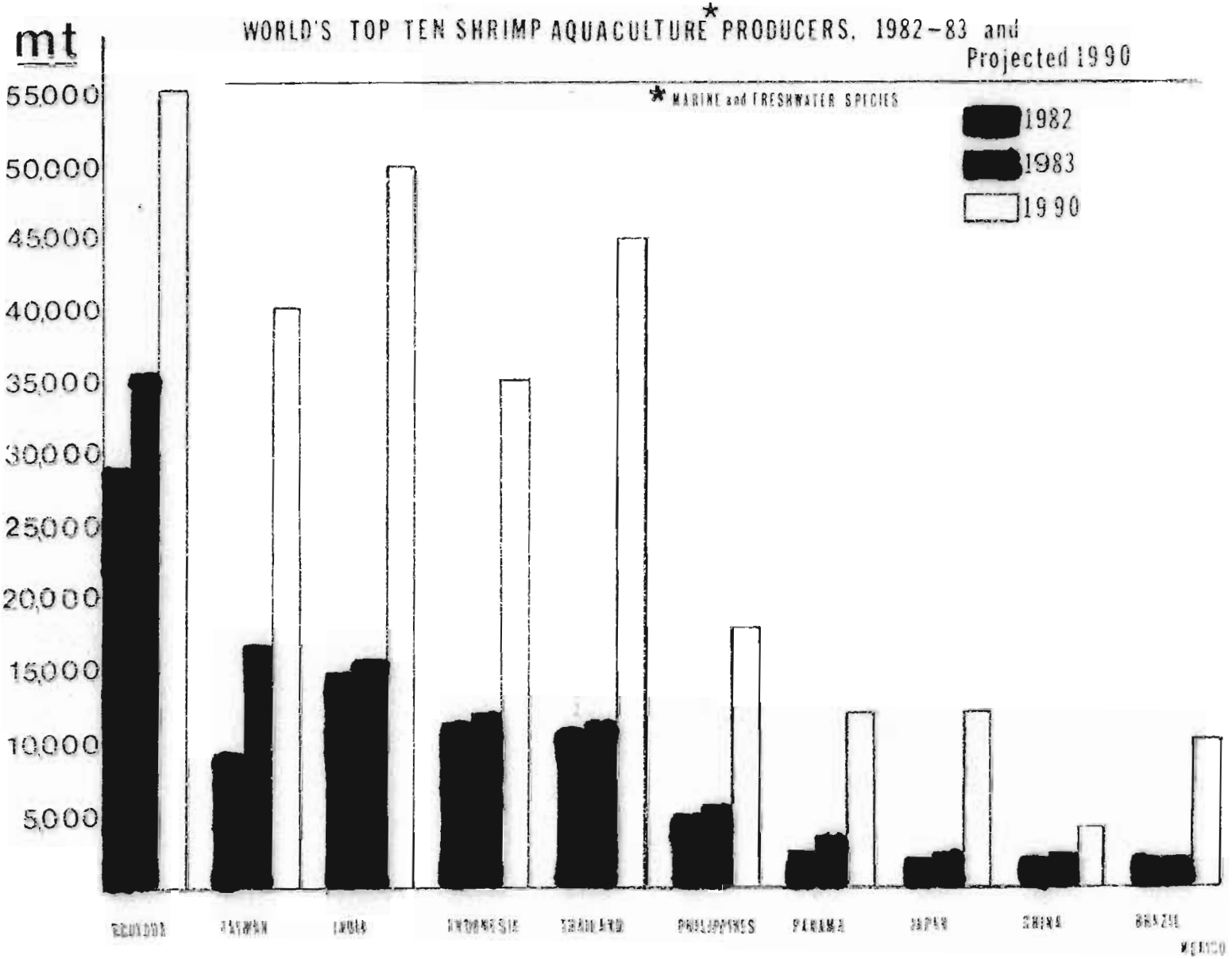

WORLD'S TOP TEN SHRIMP AQUACULTURE* PRODUCERS, 1982-83 and Projected 1990
* MARINE and FRESHWATER SPICIES
mt
55000
50,000
45000
40,000
35000
30,000
25000
20,000
15,000
10,000
5000
1982
1983
1990
ECUADOR
TAIWAN
INDIA
INDONESIA
THAILAND
PHILIPPINES
PANAMA
JAPAN
CHINA
BRAZIL
MEXICO

FIGURE 1

FIGURE 2 - Area under shrimp cultivation(estimated)

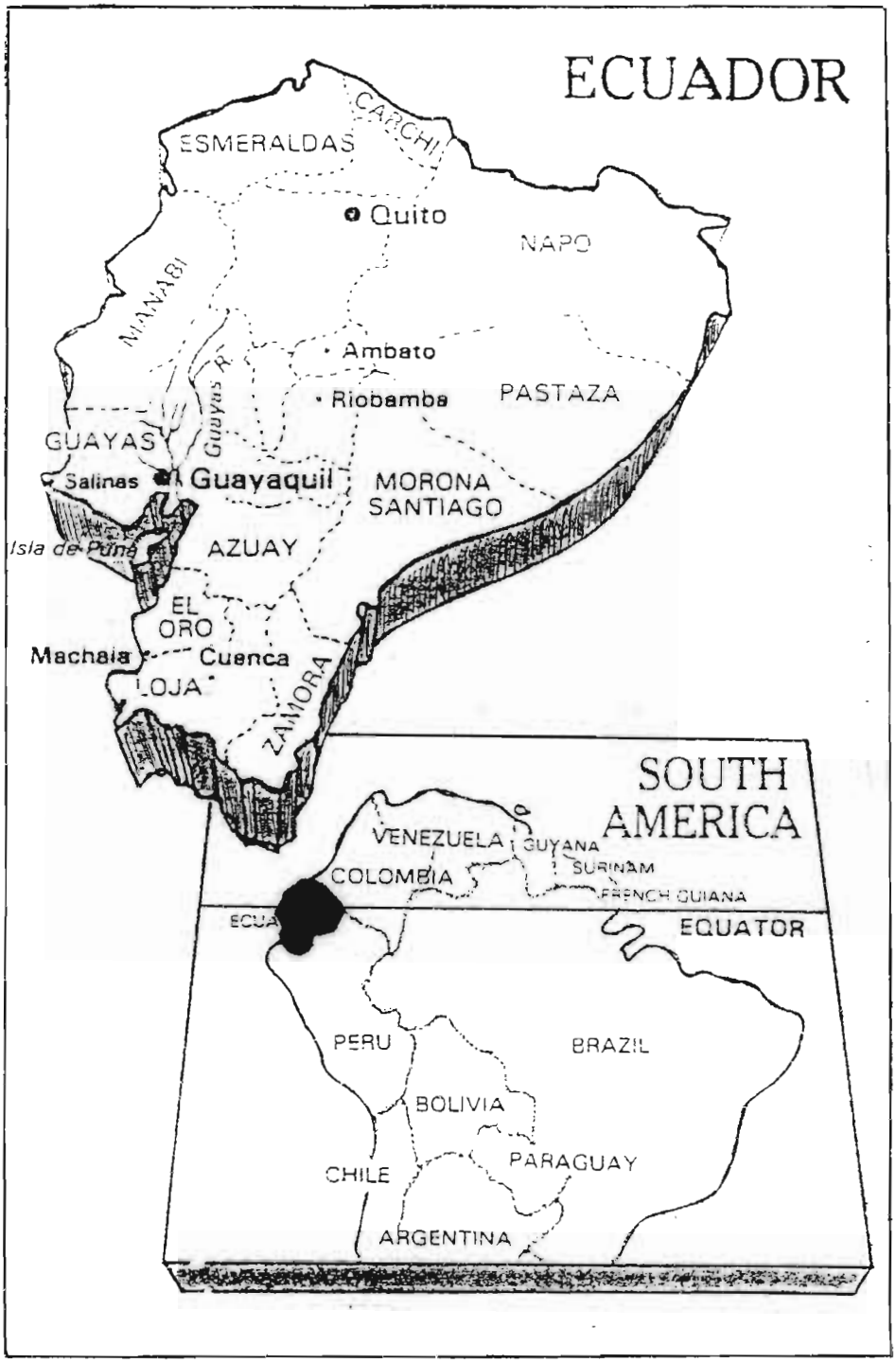
Map reprinted from Background Notes, U.S. Dept. of State, 1982

Various resource management agencies and fisheries experts from the U.S. and other countries are performing investigations in an attempt to assist Ecuador in some of the many problems encountered in this explosive development.[8] But many investigators have found it difficult to produce comprehensive and accurate analyses because of the lack of an organized information system, inconsistent data reporting, and rampant illegal practices throughout the industry.[9] Along with previous investigators, this author has also contended with the problems of deciphering information from statistical reports, government bulletins, and interviews. This paper will attempt to present, given the above-mentioned constraints, a detailed account of the development and management of the shrimp mariculture industry in Ecuador, and its impact on the U.S. shrimp market.

GEOGRAPHY

Ecuador straddles the Equator on South America's northwest Pacific coast, surrounded by Colombia to the north and Peru to the south and east. (Figure 3, page 7.) It is the fourth smallest Republic in South America, but one of the most geographically diversed for its size. The land mass of Ecuador is approximately 283,600 square miles, including the Galapagos Islands which lie 600 miles due west off the coast, which are about the size of the state of Colorado.[10] The country has four distinct topographical regions: the Costa, coastal plain; the Sierra, the Andes mountain region; the Oriente, the eastern jungle; and the Galapagos Islands. The area of concern is the "costa" where the shrimp farming industry is located.[11]

FIGURE 3 - Map of Ecuador



Map - U.S. Dept. of State

The Costa, slightly more than a quarter of the total land area, stretches from the Pacific Ocean to the Andes, and ranges from dense rain forests in the north to a semi-arid scrubland in the south. Although presently, much of this semi-arid land has been temporarily transformed into tropical grasslands due to the effects of the warm-water anomaly "El Nino".[12]

Ecuador's population of approximately nine million is primarily rural, where approximately 40% inhabit the coastal plain.[13] Guayaquil, located on the coast and largest city and port in Ecuador, with a population of 1.5 million, is the economic center of the country. Quito, the high Andes capital, dictates political authority within the country, but Guayaquil is the financial heartbeat of the nation. Guayaquil dominates the Guayas province, presently one of the most densely shrimp-cultivated areas in Ecuador.[14]

The coastline stretches for 590 miles and is fringed by a once thriving tropical mangrove forest. Many coastal areas are now suffering from the effects of the diminishing mangrove forest by means of converting to shrimp farms. Tidal flats, salt pans and dynamic sandy beaches, which also comprise the shoreline, are taking their toll to the rapid shrimp culture development.

CHAPTER TWO: BRIEF SUMMARY OF SHRIMP TRAWLING AND MARICULTURE

TRAWLING INDUSTRY SUMMARY

The present day shrimp fishery in Ecuador did not receive its origins in shrimp farming. Its foundations are rooted as far back as the mid-forties with the birth of trawl fishing. However, the real commercial trawl industry began in 1954 with the introduction of Florida-type trawlers and the opening of the country's first two shrimp processing plants.[15] Double rigged trawlers were first introduced in 1960 and by 1984 the fleet had totaled more than 300 licensed trawlers.[16] Food and Agriculture Organization (FAO) studies suggest that the fishery probably should be limited to a maximum of 160 trawlers.[17] Throughout the years as trawlers have been added to the fleet, yields per vessel have declined. Until the early 1980's, however, rising shrimp prices on the international market and low domestic fuel prices enabled trawler owners to operate profitably, even through individual yields were declining. The existing vessels operate in waters of depths up to 120 meters.

Some shrimp fishermen also are convinced that unexploited stocks of deep-water, royal red shrimp exist, but more sophisticated gear is necessary to harvest these stocks.[18]

The commercial fleet consists of vessels with and without onboard refrigeration. The trawlers average approximately 19 meters in length, with a range from 15 to 30 meters and 20 to 60 tons.[19] About 1/3 of the fleet was built before 1970, and most of these vessels have rudimentary refrigeration systems. Most of the vessels built after 1970, however, do have on-board refrigeration, and operate with fishing trips from 15 to 30 days.[20] The smaller trawlers use ice to conserve the shrimp, and usually return to port daily.

Most of the commercial vessels were built in domestic shipyards, mainly from mangrove wood. The government also has prohibited the importation of any additional shrimp trawlers since the late 1970's due to the over-capitalization in the industry.[21] It should be noted that with the "supposed" moratarium on mangrove conversion and the onslaught of fiberglass hulls, which are not manufactured in Ecuador, import regulations may change in the future. Although competition with shrimp mariculture may seriously influence the survival of the trawler industry altogether.

The smaller, artisanal fleet, built from mangrove and balsa wood, has presently concentrated its efforts in shrimp larvae collections, which are absorbed by the pond culture industry.[22]

GROUNDS AND SEASONS

The shrimp trawling fishery is conducted mainly in the Gulf of Guayaquil, although the fleet is seasonally active in several smaller fisheries to the north of the Gulf. (See Figure 4, page 13.) The principal shrimp port is Guayaquil, the country's major port and economic center. Other important shrimp ports include Esmeraldas, Manta, Playas, and Posorja.

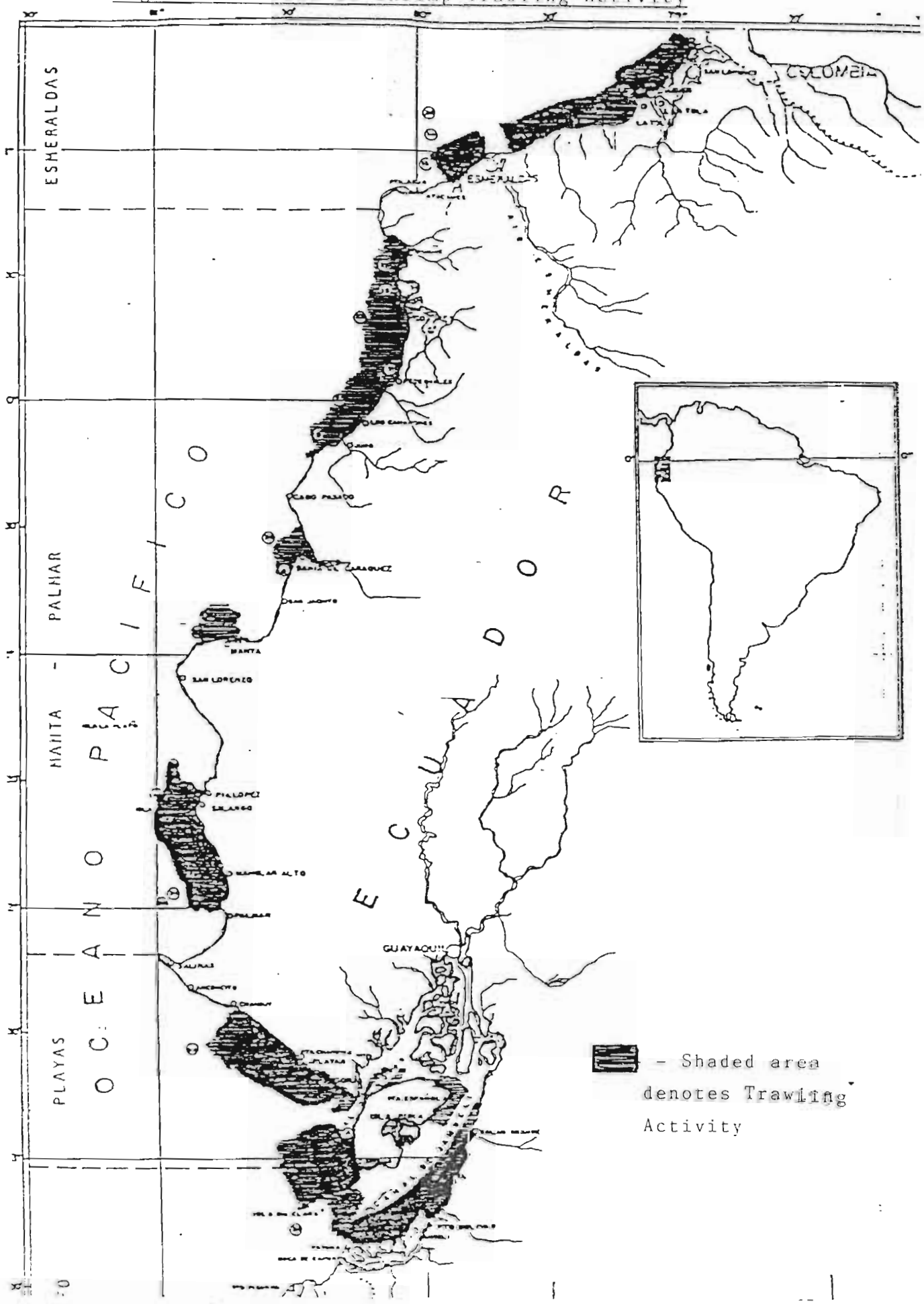
The Gulf of Guayaquil is an excellent natural habitat for shrimp. Mangrove swamp estuaries dominate the coastal interface where juvenile shrimp can develop before returning to the Gulf (or collected for pond stocking) to further mature and spawn. The main tributary to the Gulf of Guayaquil is the Guayas River, which passes through rich agricultural

lands, tropical rain forests and mangrove forest. During the rainy season (December through April) huge quantities of nutrients and silt are transported from the Andes mountains by this river and its tributaries into the Gulf.[23]

Cyclic, climatic phenomenons also seriously influence the annual catches of the trawler fishermen and mariculturists. The warm-equatorial anomaly "El Nino", and the cold Peruvian current, the "Humboldt", have an enormous affect on all the fisheries in that particular region of the Pacific Ocean. (See Figure 5, page 14 .) Sharply reduced rainfalls, resulting in severe droughts, have reduced the quantity of nutrients transported into the Gulf, which adversely affect the spawning cycles and larvae populations. As a result, the catches of shrimp trawlers are also reduced. Although during severe occurances of "El Nino", shrimp populations are unusually high and catches are exceptionally profitable.[24] Details, regarding the affects of these climatic phenomenons in the shrimp industry will be discussed in Chapter 3.

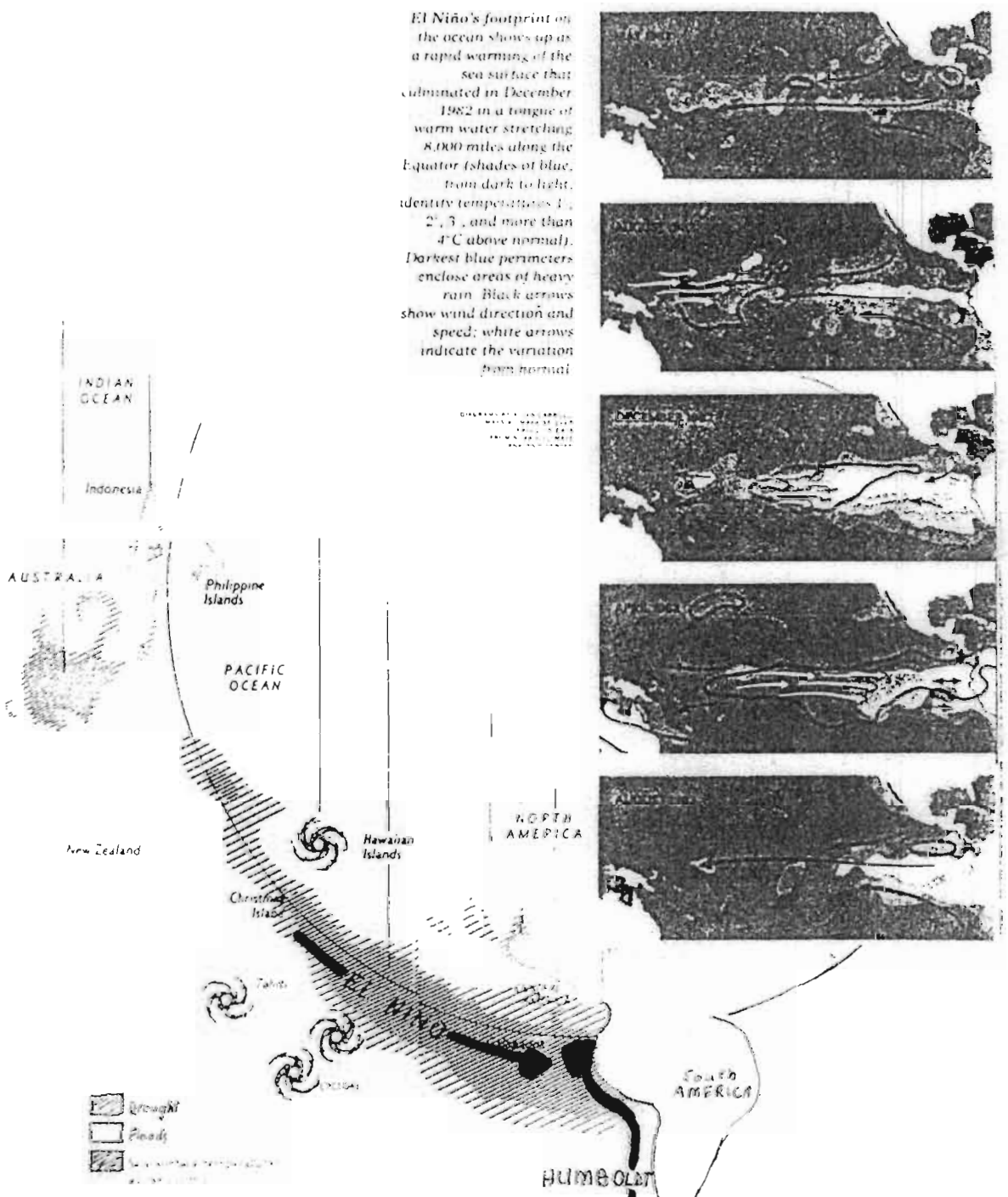
Shrimp trawling is performed throughout the year, but the main thrust is conducted in the Gulf of Guayaquil from December to April (See map, 1 page 15.) The fleet tends to concentrate along the northern coast of the Gulf, but good fishing is also found in the south and around the islands, especially off Puna Island.[25] There are several smaller shrimp fisheries to the north; off Manta and Palmar, the Bahia de Caraquez, Cojimes, and most importantly, off Esmeraldas and San Lorenzo from July to November. It can be seen that the shrimp fleet operates in various fisheries along the entire coast of Ecuador, from Peru to Colombia.

Figure 4 - Areas of Shrimp Trawling Activity



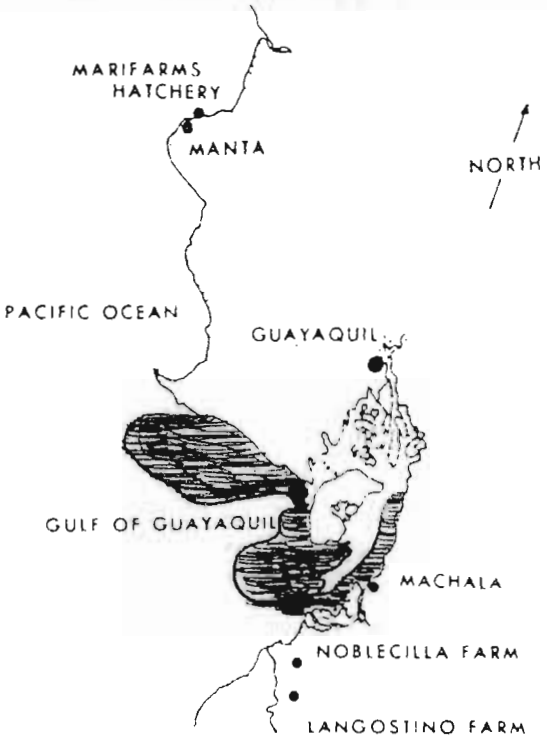
Source: Ministry of Natural Resources, Ecuador

FIGURE 5



Source: National Geographic; Vol165, No.2 2/84

FIGURE 6 - Map of the Shrimp Fishing Grounds in the Gulf of Guayaquil



 - Shaded area denotes fishing grounds

SPECIES

The most important species taken by the shrimp fishermen are various types of white shrimp; Penaeus stylirostris, P. occidentalis, and P. vannamei.[26] Three other species of smaller shrimp; cebra, pomada, and titi, previously were of little interest to fishermen. Now, due to the introduction of mechanical peelers in 1979, these species have greater commercial importance.[27] The royal red shrimp, previously mentioned, has not been exploited due to its slower growth period and would not support such a large fishery as the faster growing cultured penaeid species, where mostly all the new investment is directed.[28]

Presently, the shrimp trawling industry contributes approximately 7,000 metric tons (15,500,000 lbs) annually to the entire national production (See Figure 7, page 18.) This represents approximately 21% of the 1984 production, whereby 79% was achieved through pond culture. It seems that production from the trawling industry has stabilized, although some conflicting reports indicate higher production levels without substantiated evidence.[29] Due to the increased interest and effort in pond cultured shrimp, one should be curious as to the impact on the trawling industry. Unfortunately, there is not sufficient data on this matter that can present a conclusive account. Many insinuations have been documented regarding this issue.

Unconfirmed reports have suggested that some trawler fishermen have sold their vessels in order to either invest at the processing/packing level and/or establish their own pond enterprise.[30] The impact this will have on the mariculture might only be insignificant, but it may at

least relieve the pressures on the already over-capitalized trawler industry. Many artisanal fishermen, who previously fished for shrimp and other species, have now converted to the collections of postlarvae shrimp, which is creating a far-reaching impact on the industry and the nation. Due to the complexity of this issue, a later section will discuss this in more detail.

Overall, the trawler fleet does not appear to be stricken by the present, explosive growth of the pond industry. Apparently, trawler production has been fairly static since the initial appearance of pond culture. Nevertheless, it would be presumptuous at this point to determine the future of the trawler fishermen without more conclusive data. However, hopefully, information will be made available shortly that may shed more light on this controversy. As mentioned earlier, the necessity to initiate a comprehensive investigation should be an upmost priority.

MARICULTURE

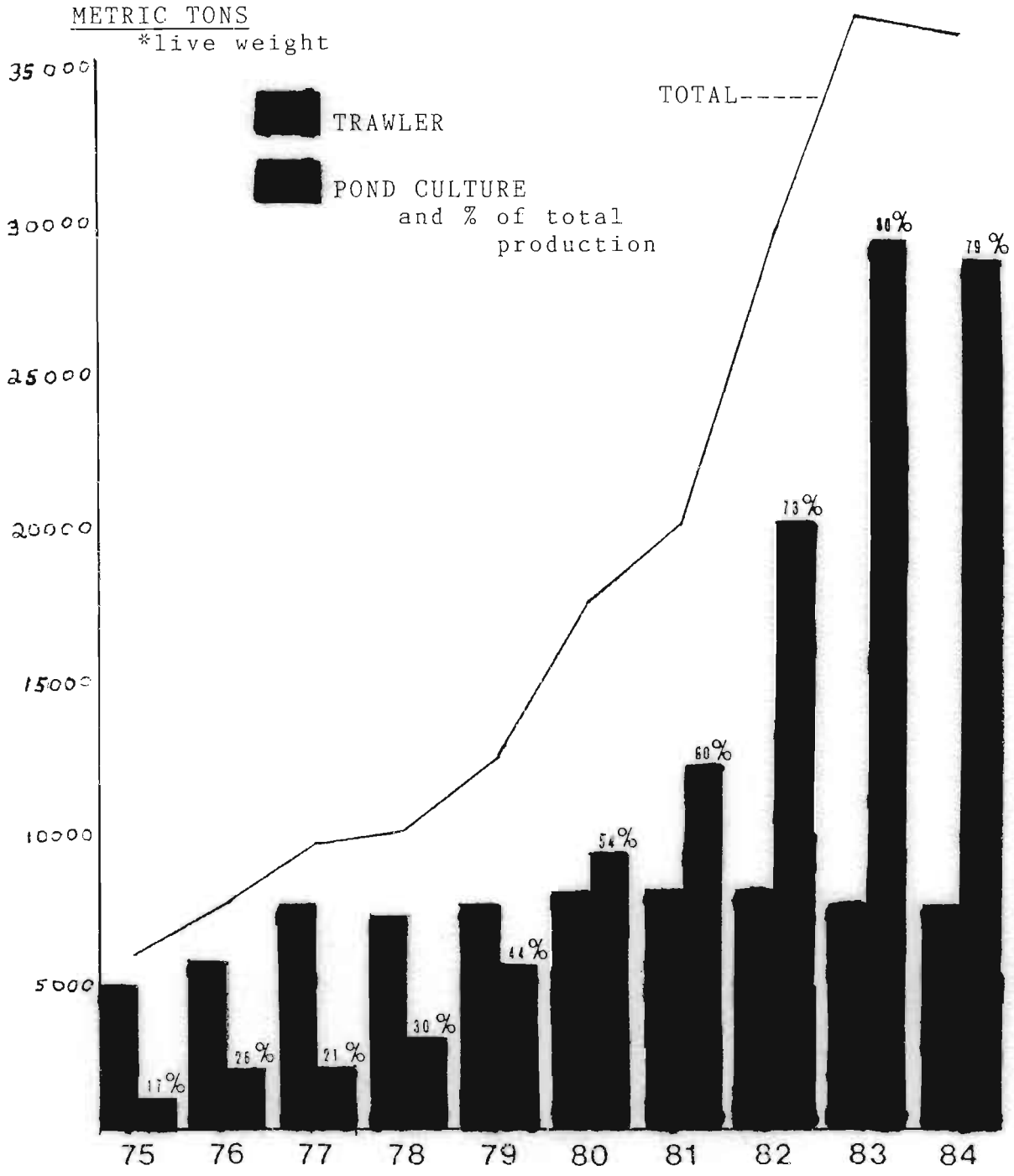
Shrimp farming in Ecuador was initiated by accident in 1962.[31] A farmer from the coastal providence of El Oro, "The Gold Providence", had planted coconut palm trees on his plantation located near the Gulf of Guayaquil. Apparently, the perimeter berm around his plantation was partially destroyed by severe seasonal tides. Upon returning to the plantation after a few months, he observed numerous birds feeding on large shrimp that were contained within the pool of water and the idea of farming shrimp was born. Whether or not shrimp culture in Ecuador received its beginning from this incident, it inspired many other farmers

FIGURE 7

ECUADOR

Trawler and Pond Culture Production

1975-1984



in the area to convert from coconut and banana cultivation to shrimp farming. In reality, the first "commercial" shrimp pond was built in 1969, and although the first harvests were not encouraging, it did not discourage the first Ecuadorean investors.[32]

By 1977, the enthusiasm of shrimp mariculture had reached a "Gold Rush" fever and the number of hectares under cultivation increased nearly ten-fold in less than five years, totalling approximately 3,000 hectares.[33] Each year thereafter, approximately 10,000 hectares of mangrove forest, farmland, and other coastal land areas were converted to shrimp ponds, which presently are estimated at 55-60,000 hectares.[34] Annual shrimp production has increased from 5,800 metric tons in 1975 to a projected 36,000 MT in 1985, and forecasts indicate that 1986 could be a record-breaking year if the postlarvae crisis is resolved.[35] However, this enourmous growth in production is almost exclusively attributed to the expansion of shrimp farming. But this rapid increase has also created a number of problems that could impede the future stability of the industry.

Presently, there are a number of components in the industry that are experiencing their share of growing pains associated with the lack of proper management procedures. This author has outlined the major management problems facing the mariculture industry today in the following categories. (I) Minimal and inconsistent government regulations concerning tide land conversion to shrimp ponds has resulted in inappropriate coastal land transformation (i.e., mangrove destruction, deterioration of regulations governing land acquisition and conversion) (Chapter 5). (II) The absence of a proper exportation system has incited

certain illegal practices to avoid Ecuadorean import duties such as; export diversions to Peru, under-recording of actual export values, and improper financial transaction procedures. This laxity at the export level has created an imbalance in the distribution of profits accrued by this industry. (Chapter 4). (III) The practice of concealing real production levels to the government, competitors, and possible investors has made it extremely difficult to properly monitor the development of the industry. Therefore, the fallacy and inconsistency in statistical reports has made it almost impossible to present a true account of the industry's progress. The mariculture industry has depended heavily upon the stocks of wild, post-larvae shrimp for collection and stocking in shrimp ponds. This practice has been accused of having severe and detrimental affects on the stability of the shrimp populations and the future of the trawling industry. (Chapters 3 and 5). (IV) Technological developments have also dictated the pace and achievements experienced by the industry. Farming methods, ranging from extensively crude to highly-sophisticated, are prevalent throughout the country. Lack of experienced personnel and extensive services has also hampered proper development. Necessity for hatchery development has created a blockade of information transfer among the government and private entrepreneurs. Various import restrictions of foreign species and feed substances has also impeded the progress of the shrimp hatchery development. (Chapter 3). (V) Major economic factors are also seriously influencing the industry's development. In view of the fact that the shrimp market is predominately regulated by international prices, influenced by global supply and demand, Ecuador depends upon price fluctuations to support its industry. Although shrimp prices

have gradually increased, sharply in some years, production costs in Ecuador have disproportionately increased. The instability of the national economy, combined with a weakening of the Ecuadorean sucre in competitive international markets, has increased many costs not previously experienced in the industry. A shortage in postlarvae has also resulted in sky-rocketing seed prices, which in turn can only be absorbed by the industry in Ecuador. (Chapters 3 and 4.)

CHAPTER THREE: PRODUCTION AND MANAGEMENT STRUCTURE

METHODOLOGY

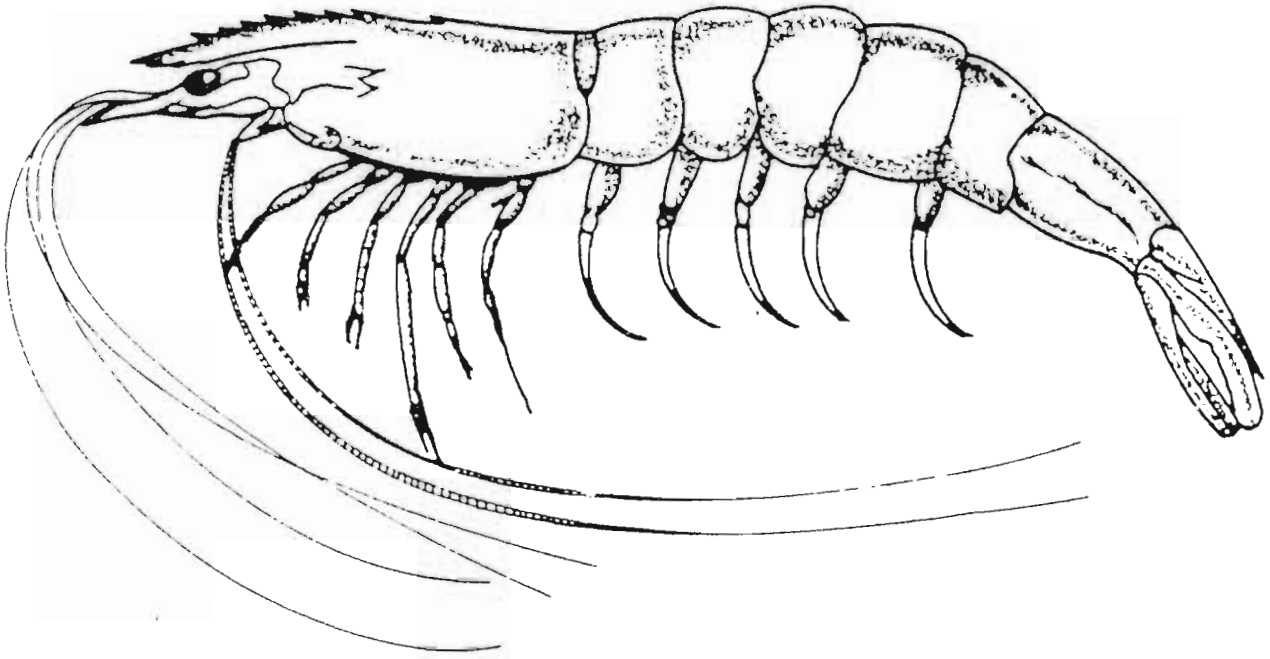
Species

Most of the shrimp presently harvested in Ecuadorean ponds are members of a relatively primitive crustacean family-Panaeid tropical, salt-water shrimp. There are three major species of white panaeid shrimp found in the shrimp ponds in Ecuador, although only one is of greater commercial importance, Penaeus vannamei.[36] Speculative reports state that as low as 60% of the shrimp farmed are Panaeus vannamei, the faster-growing, more adaptable of the species. (Figure 8, page 24.) However, scientific data from the Gulf of Guayaquil, where the shrimp larvae are collected, indicate higher percentages (approximately 80-85%) of P. vannamei found in the Gulf and adjacent mangrove estuaries.[37] Although seasonal immigrations of postlarvae and juveniles affect the percentages of the species present in the Gulf area, P. vannamei occurs in greater abundance throughout most of the year (Figure 9, page 25 .)

Two other species of white shrimp, P. stylirostris and P. occidentalis, are also found in many of the ponds.[38] P. stylirostris is believed to be a desirable species for pond culture, but does not occur in natural abundance. However, research in the artificial hatchery development may create an abundance of stock of this species to compensate for shortages of natural populations. P. occidentalis has been found to be a poor species for pond culture due to its slow growth, therefore, avoided when possible. Further discussion of species selection will be addressed in Chapter 3.

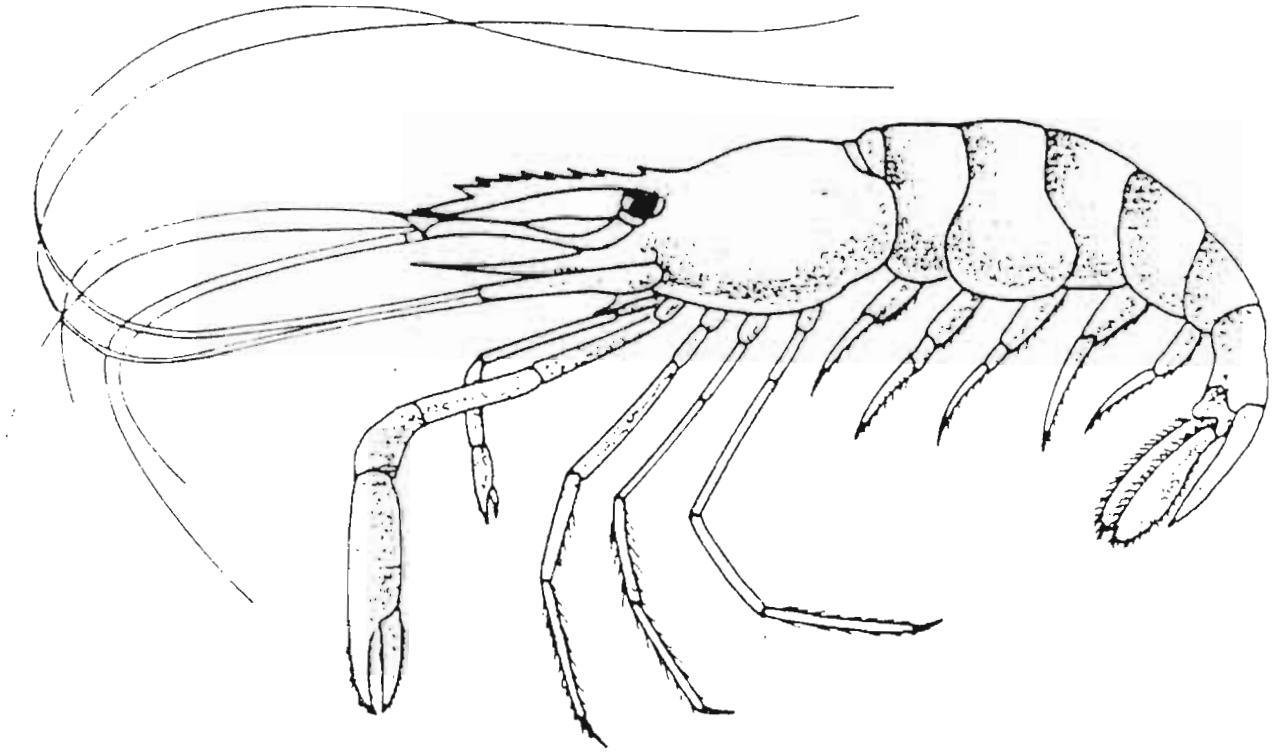
FIGURE 8

Diagram of two species commonly found in shrimp ponds.



Species 1. Penaeus vannamei- Major species of shrimp mariculture.

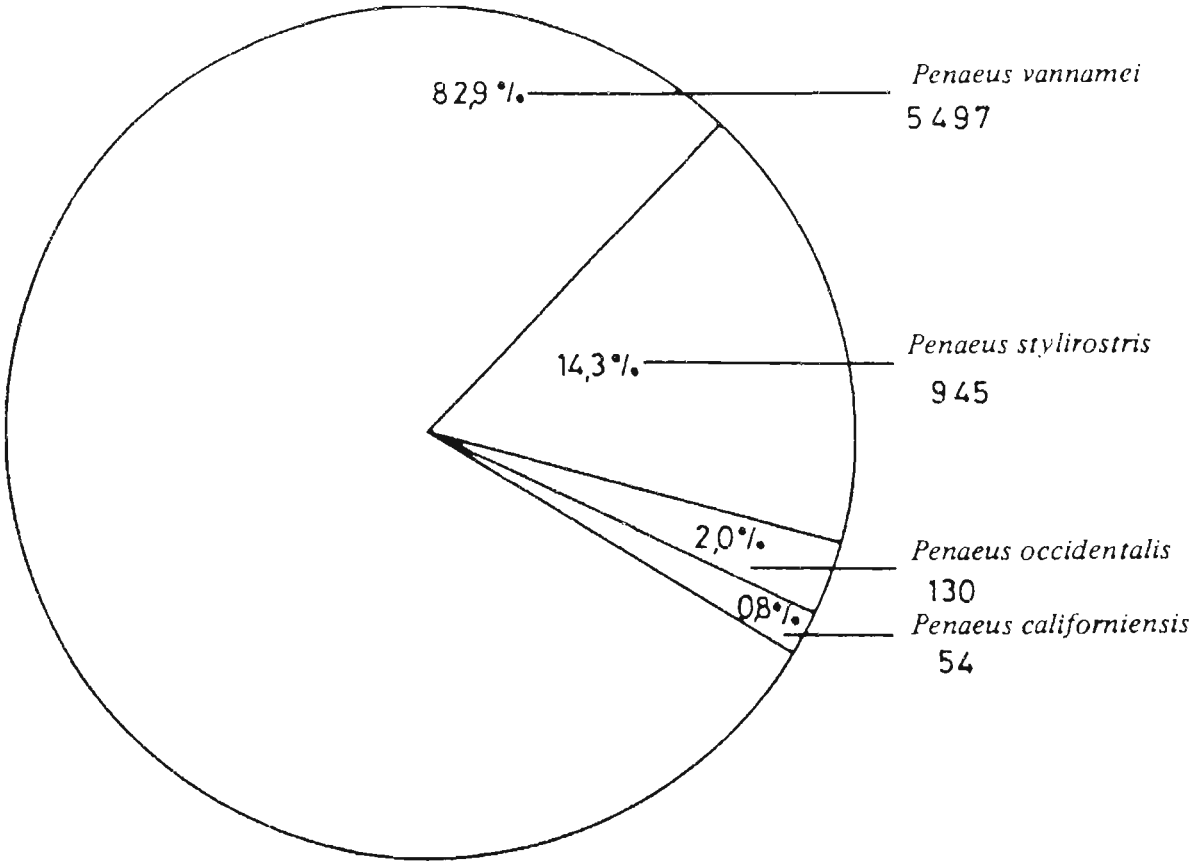
Source: Guia Practica(Camarones), M. Cun; Ecuador, 1982



Species 2. Caridea- An undesirable species often confused with P. vannamei.

FIGURE 9

Percentages of Penaeus shrimp found in the Gulf of Guayaquil.



Source: INP; Boletin Cientifico y Tecnico, M. Cun Vol 5, No. 3 1982

Monthly distributions of the major Penaeus species immigrating into the Gulf of Guayaquil and adjacent estuaries.

Months	*P. occidentalis*	*P. stylirostris*	*P. vannamei*
July	x		
Aug.	x	x	
Sept.	x	x	
Oct.		x	
Nov.			x
Dec.			xx
Jan.			xx
Feb.			xx
Mar.			x
Apr.			x
May			x
June			x

The shrimp shed their eggs into the open sea where they hatch and develop through nauplius, protozoeal, and zoeal stages. Responding to local currents, salinity and temperature, the freeswimming larve become bottom-dwelling postlarvae. The postlarvae infiltrate estuaries and bay areas where they begin to develop into juveniles. It is at this point where most experts agree the postlarvae/juveniles are collected by artisanal fishermen and local inhabitants and then sold for stocking in shrimp ponds.[39] (An indepth discussion of postlarvae collection appears in Chapter 3.)

Land Types

The Ecuadorean shrimp mariculture industry utilizes three types of land: mangroves, saltflats, and agricultural land. It has been mentioned that the distribution of shrimp ponds among these land types is divided into approximately: 70% mangroves, 15% saltflats, and 15% agricultural land.[40] However, this is an extremely dynamic industry and the percentages are prone to shift with increased land conversion, particularly toward agricultural land. Present estimates indicate that approximately 55-60,000 hectares (2.5 acres = 1 hectare) of land area has been converted to shrimp ponds.[41] Unconfirmed reports have speculated higher and lower extremes of total hectares constructed, but as experienced with other data collection, these sources are unreliable. It should also be noted that the majority of construction was initiated after 1980.

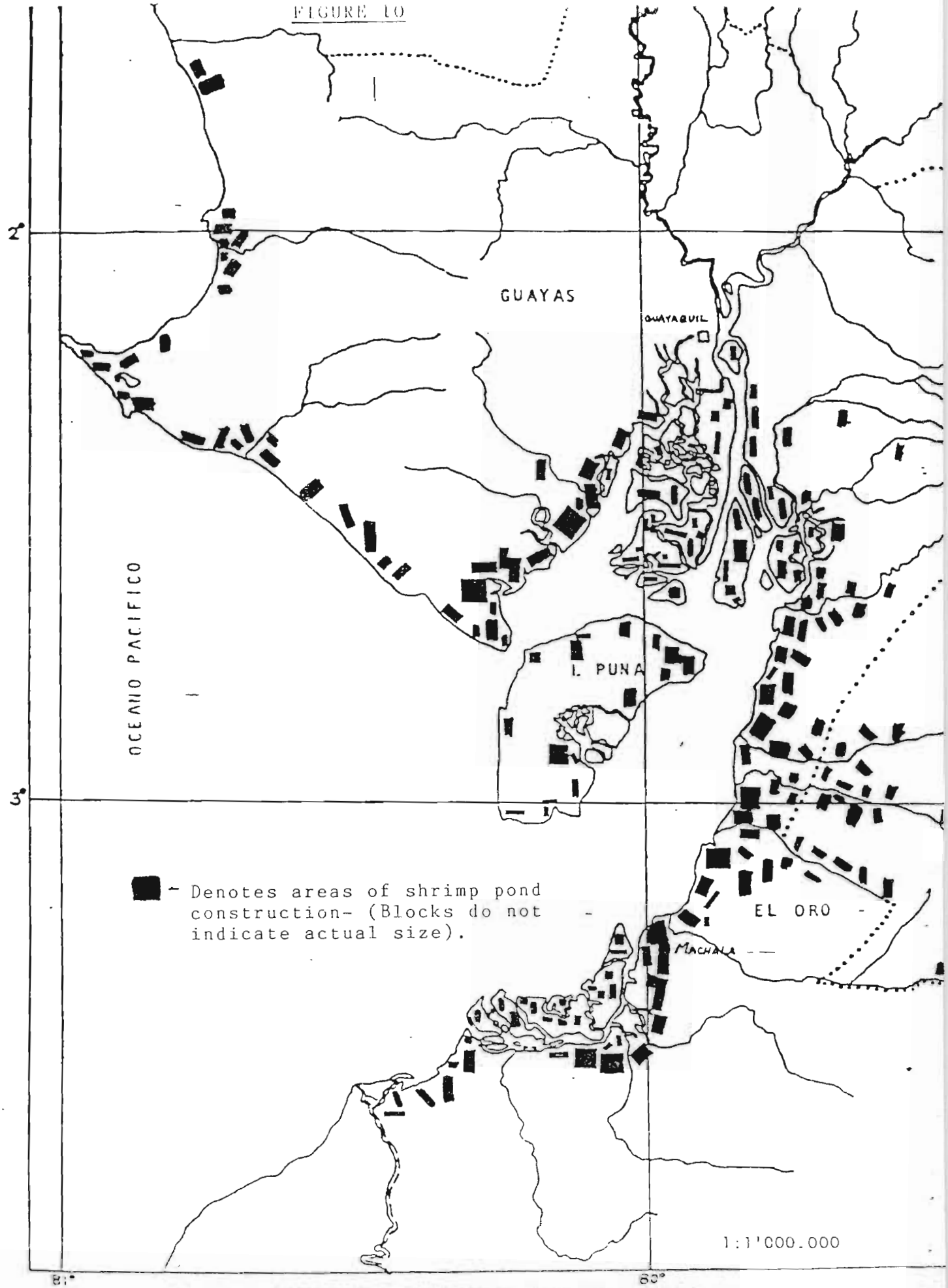
Mangrove areas have the highest incidence of land conversion because of the advantage to utilize the natural exchange flow of the tides,

reducing capital and pumping costs. Many ponds are constructed at the fringe where the mangroves interface with the bays and estuaries (Figure 10, page 28.) Detailed discussion concerning the issues involved with tideland/farmland conversion are found in Chapter 5. Mangrove forests also furnish nutrient support necessary for algae, phyto and zoo plankton growth, vital for shrimp development.

Another factor which has made mangrove conversion desirable is that permits acquired from the Government of Ecuador (GOE) are free.[42] In 1974, the GOE began issuing these permits, rather unsuccessfully, for shrimp cultivation. (Table 1, page 29.) One permit, called a concession, is petitioned through the Directory of Merchant Marine of the Ministry of Defense for a ten year lease of government-owned land. The other permit is called an authorization and allows the owner of private land to convert to shrimp culture through the auspices of the Ministry of Natural Resources.[43] There has been incessant criticism concerning the procedures for acquisition and the lack of resource management policies. (See Chapter 5.)

Saltflats are sometimes preferred by culturists because the land is not swampy like mangrove forests, therefore, less prone to severe flooding.[44] Trees do not have to be felled and pond bottoms consist of a higher clay content which retains water more efficiently. The saltpans are basically acid-free which may be a problem for shrimp in mangrove swamps. Although some producers perceive two major problems with saltflats: (1) water salinity is difficult to control; and (2) the land is not nutrient rich.

FIGURE 10



Source: Ministry of Natural Resources, Ecuador

TABLE 1: GOE Land Concessions and Authorizations for Shrimp Farming 1976-1983 (Hectares)

YEAR	CONCESSIONS	AUTHORIZATIONS	TOTAL
1976	439	?	439
1977	1,906	?	1,906
1978	1,833	?	1,833
1979	864	1,903	2,767
1980	4,694	3,068	7,762
1981	10,414	10,005	20,419
1982	4,822	8,865	13,687
1983	4,380	9,439	13,819
TOTALS	29,352	33,280	62,632
LAND REVOKED (1976-1983)	1,958	232	2,190
NET TOTAL	27,394	33,048	60,442

SOURCE: Sub-Secretaria de Pesca, Guayaquil - May, 1984.

Apparently, there has been increased movement to convert agricultural land to shrimp ponds, although the law technically prohibits this type of conversion. Some lands that had previously been used for cattle and short cycle crop, such as rice, have now been converted to shrimp ponds.[45] Three main reasons for this conversion expressed by culturists are: (1) these agricultural lands lie above flood zones areas, therefore, dikes are reduced from the danger of being washed-out, (2) the areas are readily accessible to direct transportation, and (3) more efficiency in water management control. Farm lands also may furnish richer nutrients, which in turn, would yield higher algae and zooplankton blooms, reducing supplemental feed costs.

Rice fields are also becoming more desirable for conversion because the fields can be periodically rotated to accommodate shrimp culture in off-seasons and alternate years.[46] This has a two-fold advantage in that problems from the leaching of soils are adverted, and (2) income is augmented from the profits of a luxury crop such as shrimp. The major disadvantage to this land utilization is that saltwater, which normally does not reach these elevations, has to be pumped from long distances upland.[47] It should be remembered that the success of these operations, as well as any enterprise, depends upon cost effectiveness, and this method is extremely fuel-intensive and price dependent. Ecuador has also received its share of peridition from its agricultural endeavors, both domestically and internationally, and some experts feel that this will be repeated if too much emphasis is placed on farmland conversion.

It is also important to note that mariculture is more an extension and development of agriculture than shrimp trawling. Therefore, concepts and principles of agribusiness appear in shrimp farming. Many producers defend diverse opinions on which land type is most productive, but each method is relatively experimental at this state, and production has achieved both positive and negative results in all three. However, the present trends have demonstrated a dramatic shift towards farmlands because they reportedly provide the optimum conditions for more intensive, mechanized production.[48]

Due to the infancy of this new process of culturing shrimp under controlled environments, much knowledge can be attained through the errors and successes encountered in the transformation of land for alternate purposes. Hopefully, there has not been any irrevocable damage to the land areas mentioned above during the trial and error transformation.

Production Scheme

Before discussing the different types of pond operations, a brief description of a typical production scheme will preceed in order to better understand the methodology.

The postlarvae, after being either collected from the wild or produced in the hatchery, are placed in the nursery ponds (½-2 hectares) for 3 - 6 weeks until the desired 3 - 5 grams is reached. They are then transferred to the grow-out ponds (5 - 50 hectares) where they feed on algea, photoplankton, and zooplankton. Depending upon the intensity of the operation, fertilizer is added to stimulate algae and plankton

blooms and supplemental feed (a combination of grain, vitamins, animal and fish protein, etc.) is administered on a daily basis.[50]

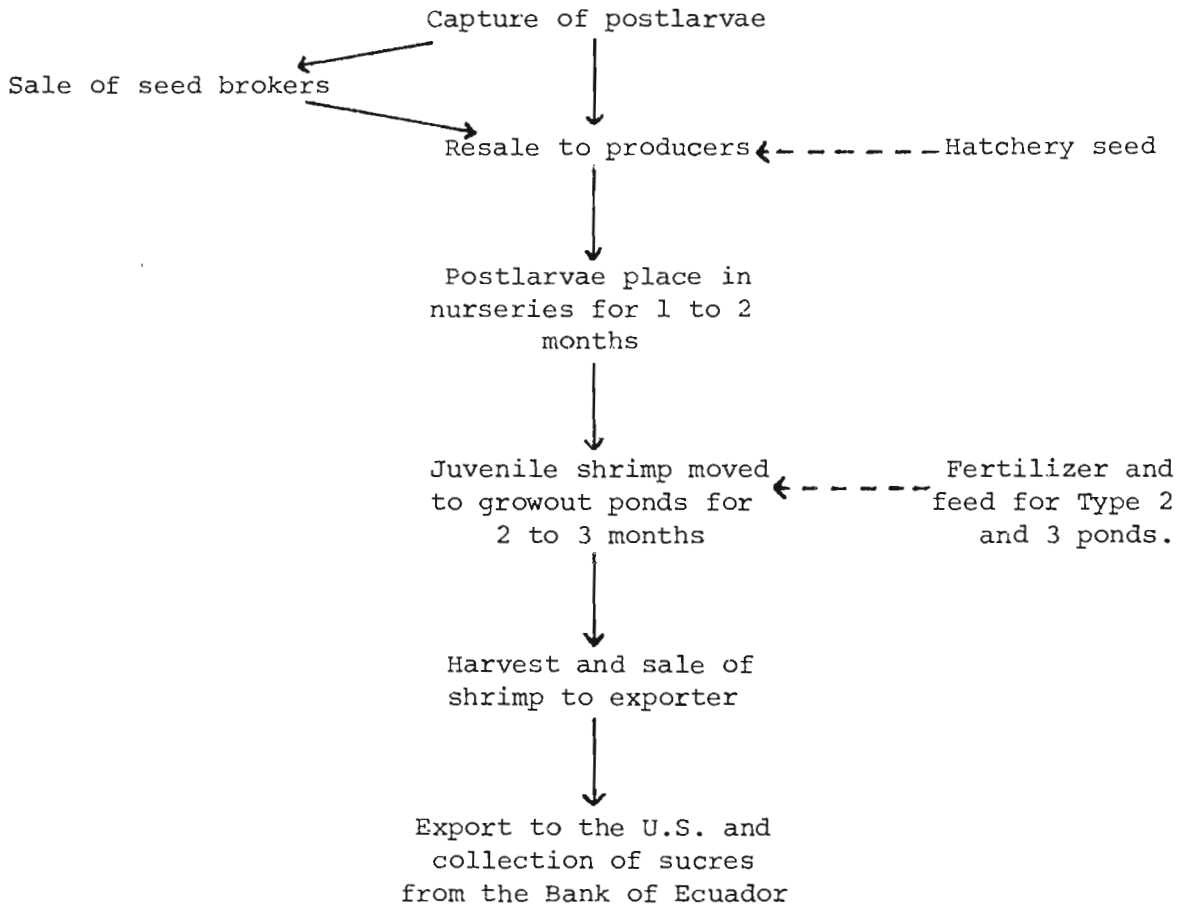
After approximately three months, depending on the desired size, the shrimp are harvested and then transported whole to the processing/packing plant by truck, outboard, or small plane. Although suitable transportation to the processing facility at times may be a concern, Ecuador is fortunate to have sufficient infrastructure to accommodate the transport of iced-shrimp in the tropics.[51]

The shrimp are de-headed (sometimes also deveined), classified into count size, and then boxed into five or ten pound frozen packages. Presently, most processors/packers are exporters, however, there are a number of producers who process/pack at the farm and export directly to the U.S. Japan, and Europe.[52] Figure 11, page 33 illustrates this process.

Pond Operations

There are three basic types of pond operations in Ecuador: (1) extensive: incorporating crude methods of mariculture utilizing the fewest inputs as possible to reduce operating costs. (2) semi-extensive: improving on the extensive method, whereby, operating costs are increased and technology is more sophisticated, and (3) semi-intensive: where artificial and sophisticated methods are employed to achieve relatively high production (in terms of contemporary, global standards).[49] It is presumed that approximately 35% of existing pond operations are extensive, 55% semi-extensive, and 10% semi-intensive. This author believes that there has been a shift to increase input levels in production due to the expanded effort in technology development, therefore, semi-intensive operations must represent a greater portion in the industry at this point.

FIGURE 11: Production Process for Shrimp Mariculture



Extensive: The first method of pond production was the highly extensive system introduced in the early 1960's, in the southern providence of Ecuador, El Oro, by farmers from the local banana industry. These ponds utilize low stocking densities (20,000 semilla (Postlarvae) per hectare - 2 postlarvae per square meter) and natural water exchange by means of tidal fluctuations.[53] Most are situated in cleared mangrove areas, and rely on natural algae and zooplankton growth. In most of these operations, little, if any, artificial feed or fertilizer is used. These producers employ only minimal input management, therefore, operating costs are almost non-existent as compared to more intensive operations.

Land, rather than other inputs such as: feed and sophisticated technology, previously was their avenue for expansion. Now, the GOE has put a halt to any further mangrove depletion, therefore, many of these producers have reached their limits of expansion.[54] In addition to expansion problems, some ponds are now inactive due to the serious dilemma of postlarvae shortages.

In general, these pond systems were not designed for intensification. Hence, the more intensified operations are squeezing these producers out of business.[55] The majority of these pond operations produce from 400 to 600 pounds per hectare per year. Most operations harvest two crops per year, and this method probably contributes approximately 25% of the total pond production in Ecuador. Presently, most are owned by individuals rather than companies.[56]

Semi-extensive: Many newcomers to shrimp farming were first hesitant to employ the improved, higher technological methods used in other countries. Presently, many of the semi-extensive farmers incorporate the moderately sophisticated nursery system (holding wild postlarvae in collection compoundments until maturity is reached for stocking in grow-out ponds). This system reduces the risk of larvae mortality once they are stocked in the grow-out ponds, which is a major problem experienced by low-level management. The juvenile shrimp (5g) are transferred, from the nursery ponds into the production (grow-out) ponds where they stay until harvest. Many farmers utilizing this method strive for three crops or harvests per year.[57]

These ponds tend to be more capital intensive and strive for greater productivity. Water pumps are a strategic component in the salt water exchange process and supplemental feed and fertilizer is administered on scheduled intervals. Stocking densities average between 40,000 and 60,000 per hectare, and sometimes higher due to postlarvae availability and the sophistication of the operation (i.e. greater usage of organic and inorganic fertilizer, higher pumping efficiency).[58] Yields from this type vary from 900 to 1,800 pounds per year with an average of 1,300 pounds per year. Reports indicate that this method may contribute more than 50% of the total annual pond production in Ecuador.[59]

Managing a pond operation of this method requires a more aggressive approach. Therefore, managers or administrators are employed to oversee the purchase of seed larvae (semilla), stocking, harvesting, and

general maintenance activities at the farm. Some possess little biological training, but usually managers of that degree of expertise are employed by the more intensive operators. There is a scarcity of trained shrimp biologists worldwide and many Ecuadorean companies pay handsomely for such personnel. For the most part, a manager is employed in these operations because of his honesty and loyalty to the owner/owners. Theft (stealing shrimp) by employees and outsiders is a common occurrance in the extensive operation. Security personnel and even dogs in some operations, are a strategic measure in these management practices.[60] Nevertheless, due to the extreme hardships encountered in these rural areas, many employees, including the administrators do not receive salaries commensurate with their roles in the pond's operation. Although, it is common for all pond personnel to receive bonuses when the harvest has been unusually successful.

Ownership of this type of operation is commonly by a successful businessman or a group of associates, whose primary occupation is in another trade. Although the manager dwells on the farm and the owners usually live in larger cities such as Guayaquil. Contact between the two is frequent, especially during periods of stocking and harvest.[61]

Semi-Intensive

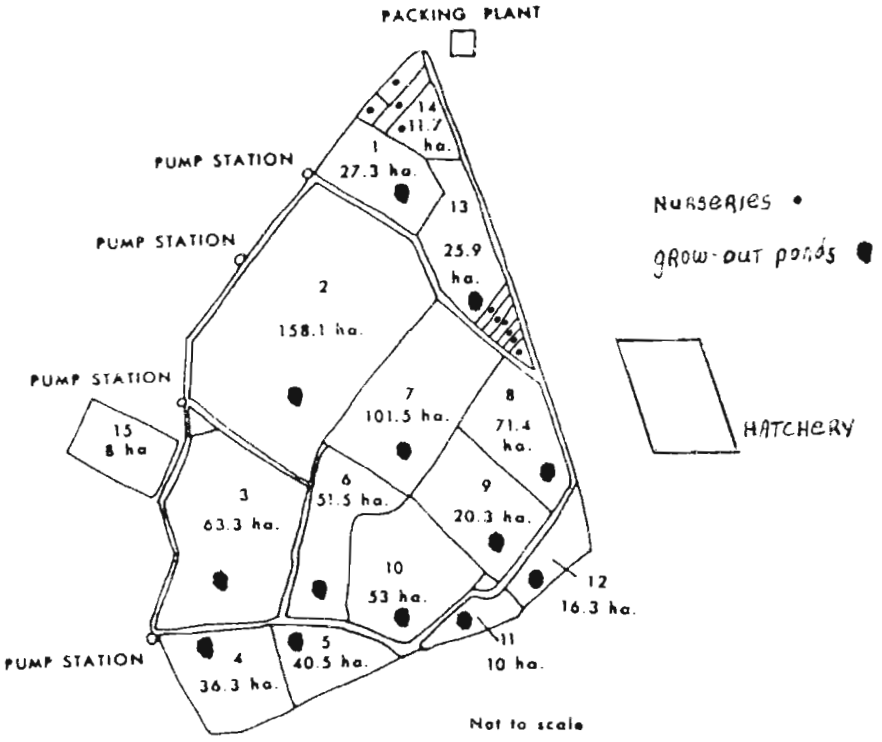
In recent years, there has been a rapid growth in semi-intensive operations under professional management. These pond systems are carefully designed by architects and constructed by engineers to facilitate labor-efficient, capital-intensive water and feed management. In general, the semi-intensive shrimp farm utilizes a continuous water

exchange system and the two-phase nursery and grow-out operation. (See Figure 12, page 38.) Most of these operations are now experimenting with the artificial hatchery system and some are supplying their ponds with hatchery postlarvae. A few hatchery operations have been so successful with this technology that they have been able to supply other producers in Ecuador with laboratory postlarvae shrimp.

The development of the artificial hatchery system is an essential component in the success of the shrimp mariculture industry in Ecuador. It is now common knowledge that the quantities of wild postlarvae shrimp cannot meet the demands of the industry's present and future needs. (See Hatcheries Section 3.)

All of these operations employ professional biologists who supervise the transportation of seed, transfer of juveniles to nursery units and grow-out ponds, daily water quality maintenance, feeding schedules, fertilizations, and harvest procedures. Apparently, it is common on these farms for the biologist to instruct the administrator on his delegation of duties to the farm laborer. The biologist in this scenario is most likely one of the most integral components in the pond operation's success. Some operations also employ the biologist as an administrator. The general opinion is that it is essential to hire a foreign-trained specialist or biologist because they will have advanced training and better business acumen for planning and management. Some owners do send Ecuadorean specialists to the United States, Japan, and other specialized research centers for intensive biological and business training.[63]

FIGURE 12 - Diagram of a typical semi-intensive shrimp culture operation



Source: J. of World Mariculture Society
C.R.Mock; 13:165-184 (1982)

Table 2 Rough Comparison on Economics for Three Methods

	Extensive	Semi-Extensive	Semi-Intensive
Stocking density/ha	12,000	25,000	50,000
Harvest density	10,200	20,000	37,500
Harvest size (g)	25	22	21
Production per crop (whole wt) (kg)	255	440	787.5
Number crops/yr	1.3	1.8	2.4
Total tails (kg/ha/yr)	232.1	554.4	1,323.1
Total sales ($/lb)	$3,064.00	$6,708.00	$14,554.00
Costs:			
Seed at $3/1,000 PL at 70% Nursery survival/yr	$67.00	$193.00	$514.00
Feed at 12¢/lb	-0-	209.00[a]	1,247.00[b]
Total	$67.00	$402.00	$1,761.00
Gross profit over feed and seed	$2,997.00	$6,306.00	$12,793.00

[a]Semi-extensive food conversion 1:1.

[b]Semi-intensive food conversion 2.5:1.

Source: J. Wor. Mari. Soc.
Y. Hirono; 14:451-457 (1983)

These operations stock an average of 70,000 to 100,000 per hectare in the grow-out ponds.[64] A few very successful operations maintain densities of more than 125,000 per hectare. Under these conditions, fertilization and supplemental feeding schedules are strictly enforced. Strategically calculated timing for stocking and harvests are essential in reaching the desired goals in production. These operations average three crops per year with an annual production between 1,800 pounds and 2,500 pounds per hectare.[65] Some farms can produce up to 3,600 pounds per hectare, but presently this is considered extremely rare. This type of operation provides an estimated 25% of the total industry production. The author believes this figure may be low due to the onslaught of more intensive practices in the present industry.

There is no doubt that the future of the Ecuadorean shrimp mariculture industry depends upon the practice of semi-intensive methods. Many of the extensive farmers have already been pushed out of the industry because of the growth in more intensive practices. It should be mentioned that the semi-intensive methods practiced in Ecuador, at the present, are not the most sophisticated worldwide. Highly intensive operations are now under experimentation in Japan, Hawaii, and other areas, and this methodology may very possibly become a threat to countries like Ecuador in the future. Presently, the technology is very expensive and the cost-effectiveness is a number of years away.

POSTLARVAE SITUATION

Wild Postlarvae Shrimp Collection

The rapid development of the shrimp mariculture industry in Ecuador has been mainly dependent upon the capture of postlarvae or juvenile shrimp by artisanal fishermen. Exact numbers are not known, but some sources indicate during the peak year of 1983 between 10-12 billion Penaeus vannamai postlarvae were collected.[66] An even larger number of postlarvae of other species of shrimp were also collected because the collection techniques employed by the fishermen are not very selective.

Nevertheless, the billions collected were not sufficient to meet the demands of the shrimp producers and this problem still exists today. Aside from the increased development in artificial hatcheries, there is a scarcity of postlarvae needed to stock the present 55,000 to 60,000 hectares of ponds. There are experts that suggest the demand may be as high as 20-25 billion postlarvae per year needed by as soon as 1990 if current production trends continue.[67] Therefore, many concerns have been expressed by producers, exporters, government officials, trawl fishermen, and environmentalists on the impact of the postlarvae collection.

Industry sources estimate a total of 90,000 coastal inhabitants may be involved in the collection of wild, postlarvae shrimp.[68] Although these sources do not discriminate between types of inhabitants involved, referring to all as artisanal fishermen, a great majority are family and relatives of the fishermen who aid in all facets of collection and transportation. In some communities, a significant number of artisanal

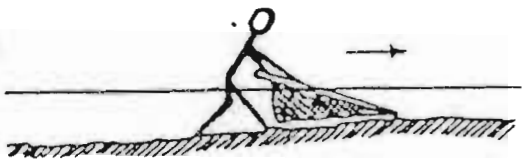
fishermen have stopped fishing (at least during periods of larvae abundance) in order to catch larvae. In some areas along the coast, this has caused shortages of fish in the marketplace. Even in some highland areas, where fish supply is dependent upon coastal sources, a shortage of fish is sometimes experienced. Some government officials have estimated that 60% of the artisanal fishermen have converted to larvae collection, although, some experts report this is grossly overestimated.[69]

Nevertheless, the impact of postlarvae collection has had an enormous effect on the social and economic stability throughout the coastal region, and to some extent, the highland regions (i.e. Many highland inhabitants have migrated to the coast in search of employment in the shrimp industry). While this gold rush in the collection of postlarvae shrimp has caused some disruptions, it has also brought tremendous, perhaps temporary, benefits to thousands of coastal families in the form of increased incomes.

Procedures

There are a few methods employed in the collection process, but the most common and efficient technique engages the simplest technology. The only equipment is a net, two to four large plastic tubs, and a few small strainers to dip in the tubs. The net consists of two crossed bamboo poles about two meters in length, with a very fine mesh nylon webbing spread between them (Figure 13, page 42). The gear is pushed ahead of the fishermen wading in the surf. The net's lead line drags along the bottom, trapping any slower swimming postlarvae into the cone-shaped webbing, and then back into a small bag.

FIGURE 13



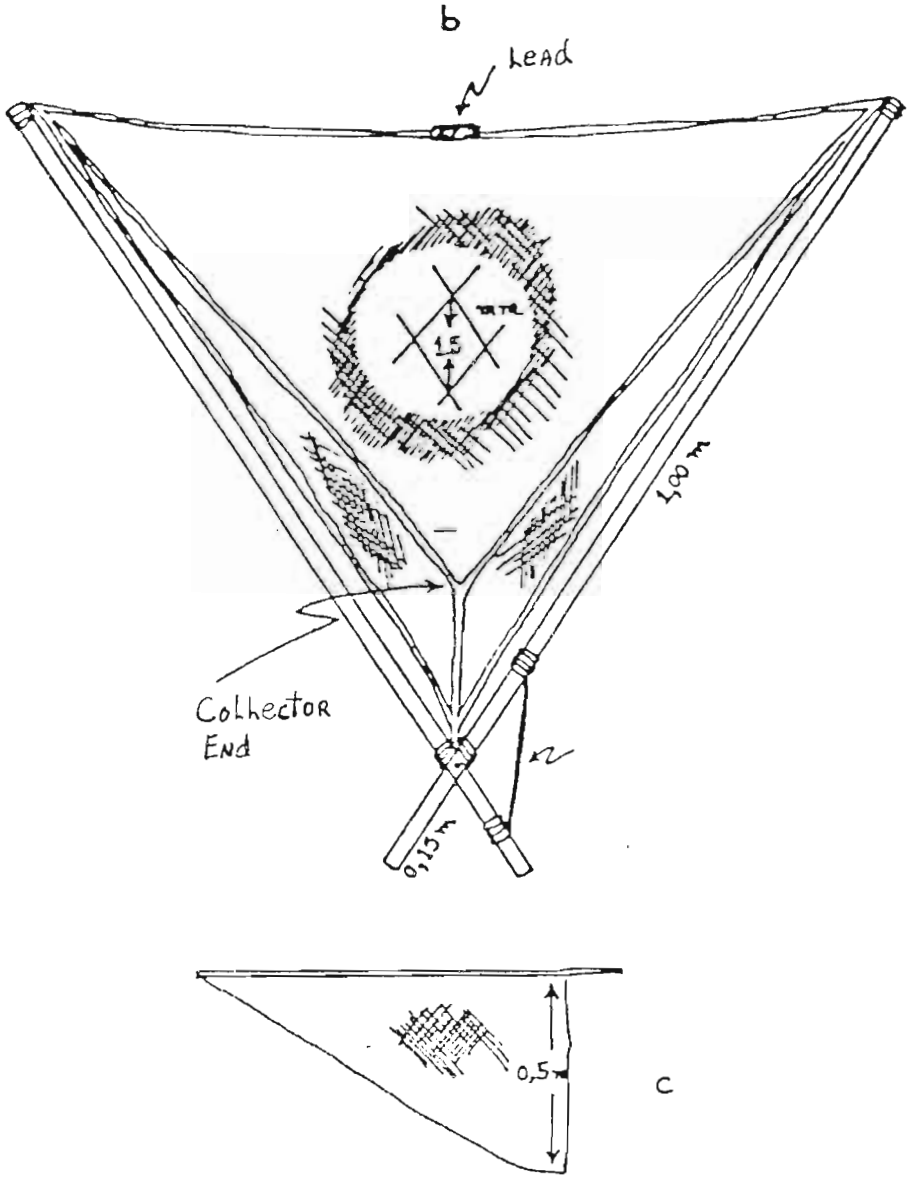


FIGURE 13 - Diagram of postlarvae collection net and technique employed.

Source: Subsecretaria De Recursos Pesqueros; Ecuador Diagnostico y Recomendaciones Sobre El Recurso Camaron, R.B.Zerega 1978

After sweeping a certain distance in waist deep water, the fisherman folds up the net, carries it to the tubs on the beach where the contents are dumped into the tubs, passing through the strainers. The strainers are used to determine the abundance of postlarvae and deter any unwanted material.[70] Different species of shrimp and crustacea appear in these nets and strains, and until recently, most collectors could not distinguish among the desired species. This caused much inefficiency throughout the entire structure of production. Many producers did not know what type of shrimp was in their ponds, let alone the ratios of these species. Postlarvae collection has progressed more efficiently by means of training and experience in the selection of the desired species. The collection technique needs much improvement on selectivity of the correct species.

Seed collection is reportedly most effective in the two to four hours before high tide. Postlarvae are most abundant at the beaches during two six-day cycles per month, according to phases of the moon. Sometimes, a fisherman can earn more during those twelve days than what he would earn in a whole month in his other work. Most collectors gather between 20,000 and 50,000 postlarvae at each tide period during normal population levels.[71]

Seed Brokerage

The quantities of semilla collected by the fishermen are generally too small, and the fishermen too widely distributed, for them to sell directly to the shrimp producers. Therefore, a system has

developed, whereby seed brokers act as agents and transporters.[72] Seed brokers, occasionally fishermen who have raised enough money to invest in motor crafts or trucks, purchase the seed of others and then sell to the producers.

Seed buyers arrive at the beaches in small trucks with tanks and compressed air. They estimate the quantities in the tubs, buy them at 1,000 postlarvae per lot at current prices, and transport directly to a prearranged pond location.[73] Depending upon the size of the juvenile shrimp, stocking is either in a nursery or grow-out pond. Some producers also have large nursery units for holding great quantities of seed which are later sold to other producers in the area.[74]

This system is fairly crude, but the only one that the present technology allows. A major drawback to this method is the repetitive handling encountered before final stocking in the grow-out ponds. Mortality rates are higher at times when employing this method. Some pond owners prefer to buy and transport directly from the fishermen to guarantee lower mortality through their own proper handling.

Seed prices fluctuate considerably from season to season (at times week to week) and are determined by a number of factors. The two most critical being (1) percentage of species composition, and (2) availability at any given period.

1. Although only P. vannamei is the desired specie, many fishermen still harvest seed indiscriminately. Therefore, brokers and producers examine the tubs carefully and pay accordingly. The higher the percentage of P. vannamei, the greater the value.[75] This practice of examining the catch has only recently developed as a result of the earlier,

indiscriminate stocking of ponds. Most brokers and/or administrators use magnifying glasses and screens to calculate percentages. Some buyers even go to such lengths employing microscopes and statistical procedures to check percentages.[76] Some fishermen are now improving their straining methods to ensure a greater return for their effort due to the increased pressure by the brokers.

Another factor of equal significance is the size of the juvenile shrimp. Usually, the greater the stage of maturity, the sooner the juvenile may be stocked in the grow-out pond. Therefore, the risk of mortality and feed costs are reduced. On the average, fishermen may command up to four times more for these larger juveniles.[77] This appears to be an exception rather than a rule because of longer maturation time and the intensity of effort throughout the coast.

It is rather difficult to illustrate the fluctuation in actual selling prices of postlarvae in terms of dollars because of the instability of the Ecuador sucre and the complexity of the international market. In 1980, the average price for seed was U.S. $.50, approximately 50 sucres per 1,000 postlarvae.[78] Since then, prices have obviously risen, but most reports conflict concerning the relative seed prices. Some reports indicate that during the latter part of 1984, seed prices were U.S. $16.00 per 1,000 postlarvae (1,680 sucres) and then in March, 1985, prices reported were U.S. $.83 (100 sucres) per 1,000 larvae.[79] Another report indicated that prices increased to as high as U.S. $25.00 (3,125 sucres) in October, 1985.[80] (This author can attest to prices of 25 to 50 sucres per lot in 1982, when postlarvae sources were abundant.[81])

Although it is evident these reports are widely varied and sometimes grossly inaccurate, there may be a number of reasons for these price discrepancies.

a.) The Ecuadorean currency has continued to lose strength in the exchange with U.S. dollars, therefore, conversion is extremely timely and may result inaccurately in these reports.

b.) Brokers mark-up beachhead prices anywhere from 100 to 150%.[82]

c.) Seed prices also vary geographically. Densities of post-larvae populations along the coast affect prices. Accessibility to pond sites (i.e. transportation costs) also affect prices.[83]

d.) Seasonal abundancy affects prices tremendously. Generally, prices are lower when supply is greater, (i.e. Seasonal postlarvae migration into the bays and estuaries increases supply and lowers prices.)

2. Perhaps the most important factor determining seed prices is the availability of postlarvae shrimp. Prices can rise considerably when shortages of postlarvae exist. Since the early 1980's, owing to the explosive growth in shrimp pond construction, supplies of postlarvae shrimp have had difficulty meeting the demands of the shrimp producers, with only the exception of the 1982-1983 season. Reports indicate that presently there are more hectares than the natural postlarvae population can supply.[84]

Climatic conditions off the west coast of South America create wide fluctuations in the seed population. The "El Nino", a warm-water anomoly, can create periods of abnormally high populations of post-larvae when its affects are heightened.[85] Torrential rains along the coast and in the highlands swell the estuaries with higher nutrient

fresh water, causing a reduction of predators and an abnormally favorable environment for larvae production. The "El Nino effect" occurred during the 1982-1983 season creating enormously high populations, which in turn caused seed prices to drop. Incidentally, the higher populations also incited an insurgence of new pond construction throughout Ecuador, of which many went inactive after the populations returned to normal levels.[86]

Contrary to the El Nino effect, the cold-water Peruvian Current, the Humboldt, creates its share of devastating cyclic occurrances.[87] During these severe occurrances, water temperatures remain well below normal levels and droughts spread throughout the Pacific coastal regions. This prohibits normal larvae production and maturation, reducing populations, and consequently, creating seed shortages. This occurrance was experienced throughout most of 1985, and a seed crisis was directly responsible for many inactive ponds. Prices increased exorbitantly due to the reduced supplies and elevated demand.[88]

Current Situation

Presently, there is no question that Ecuador is experiencing difficulties associated with the management of its collection of wild postlarvae. Periodic shortages have been encountered throughout the past six years, and one of greater severity exists currently. Measures have been taken to counter this crisis. Artificial hatcheries are rapidly developing which will alleviate, and hopefully, resolve the postlarvae dilemma (see Chapter 3).

Other alternatives have also been explored and not necessarily to the compliance of Ecuadorean law. Reports indicate that smuggling postlarvae from northern Peruvian waters into southern Ecuador has become a common practice in recent years.[89] The exact quantities and prices are not known, but some reports indicate that many ponds in the El Oro, Machala, and Guayas regions have benefitted from these illegal procedures. Although these practices do alleviate the shortage crisis, they are counter-productive to any success in the development of organizing policy and management strategies within the industry. Ecuadorean law also strictly regulates the importation of any foreign species for the prevention against unfair competition and disease control (See Chapter 5 on Government Policy).

Unconfirmed reports have also alleged that the shortages can incite such drastic disturbances as armed confrontations between buyers and the hijacking of postlarvae.[90] In many pond areas along the coast, postlarvae is considered an extremely valued commodity.

The trawling industry has repetitively expressed its concern with the collection of postlarvae and its possible threat to ocean catches. Many trawler fishermen believe that too much effort is being conducted by postlarvae collectors, creating an insufficiency in the open-sea populations. They state that only a very small percentage of all the shrimp species escape the collection practices, therefore, allowing insufficient recruits to return to mature and spawn in the deeper waters.[91] Some scientists have supported this theory, but there are no conclusive reports as of yet to substantiate these accusations. A few investigations are underway, and it has been mentioned that some preliminary results are forthcoming.[92]

As demonstrated in Figure 7, page 18, the trawling industry has not suffered any setbacks in production due to the onslaught of shrimp mariculture. Contrary to their speculations, the trawling industry had an excellent season in 1985. Projections suggest that total annual catch may well exceed 9,000 MT (20 million tons), registering about 25% more than the trawler production of 1984. Nevertheless, these are short-term effects and it is extremely important to analyze the possible long-term effects before any conclusions can be ascertained.

Current Postlarvae Situation

As of September, 1985, reports indicated that berried (gravid) females were beginning to appear after many months of disappearance.[93] (Postlarvae populations in Esmeraldas, near the Colombian border, have maintained normal levels throughout the shortage and have been exploited for pond stocking in the central and southern regions of Ecuador).[94] In October, 1985, these populations were increasing, and by November and December, postlarvae collectors were experiencing excellent results. Reports of good availability continued throughout January and February, 1986. These reports also mentioned that seed prices dropped from $8.00 - $10.00 per 1,000 postlarvae in early January to $6.00 - $10.00 per 1,000 postlarvae in early February (note that prices were reported as high as $25.00 per 1,000 in October, 1985).[95] Overlooking the accuracy of these figures for the moment, it is astounding that such price fluctuations can occur in a short time span. The impact must surely affect the stability of the entire industry.

Producers have also reported that the concentrations of postlarvae collected contain unusually high amounts of the preferred P. vannamei species. One report indicated that many collectors are delivering catches that contain up to 90 percent P. vannamei.[96] Government officials believe the abundance of postlarvae is due to the warming-water temperatures and newly implemented shrimp fishing closure which allows more females to survive and spawn. Due to the severe postlarvae shortage the Government of Ecuador, via the Under Secretary of Fisheries, announced on November 27, 1985, that a shrimp fishery closure would be in effect from December 15, 1985 to January 31, 1986.[97] Only companies with hatcheries that required wild-caught gravid females to produce postlarvae received a limited exemption to operate one or two trawlers. Apparently, the measure was successful in attaining its objective.

A postlarvae collection closure, prohibiting juvenile and adult broadstock collection, will commence on June 1, 1986 and extend until July 31, 1986.[98] The Under-Secretary also indicated the right to extend the closure for an additional thirty days if necessary. Additionally, due to incessant requests by the mariculture industry, the GOE adopted new import regulations in May, 1985 allowing hatcheries and farmers to import nauplii and postlarvae.[99]

These regulations are the first of a few measures finally being implemented by the GOE Secretary of Fisheries. The development of a shrimp mariculture management scheme, designed to protect the shrimp resources, is long overdue, but finally underway. Some observers,

however, are not convinced that the new closures will solve the problem. Scientists still believe that a more long-term factor may be the gradual destruction of coastal mangrove estuaries which provide the shrimp nursery habitat (See Chapter 5 for further discussion.).

HATCHERY DEVELOPMENT

While postlarvae captured in the wild continues to be the primary source of postlarvae for most producers, some operators and investment groups (particularly foreigners) have been developing a viable hatchery system that will produce steady supplies of postlarvae throughout the year. As previously mentioned, the key to success in the shrimp mariculture industry is a guaranteed procurement of postlarvae. This is the objective sought by those who have pioneered for the past several years in the experimentation of artifically hatched postlarvae. This concept of the hatchery system is to control environments so that maturation of the species is achieved at a predetermined time period.[100] It is an expensive and highly-sophisticated operation.

For many reasons, it has been slow to develop in Ecuador. There are still many technical problems that must be resolved before any substantial production can be achieved. Controlling maturation, algae growth, and disease infestation seem to be the most critical.[101] In addition to technical problems, managerial difficulties complicate the situation. These include labor laws, security, utilities, import restrictions, and communications.[102]

Nevertheless, many producers and exporters have invested in the technology. Most of the interest surfaced in 1985 when many operators were unable to obtain postlarvae at any price.[103] Postlarvae prices rose to such levels that hatchery production appeared favorable. The GOE has been encouraging producers and processors/exporters to invest in hatchery construction. Incentives for hatchery construction include low interest loans and a five percent increase in export rebates (Acuerdo Interministral, July 1, 1985).[104] Various government agencies have also initiated hatchery projects for investigation purposes, although some observers believe that a number of officials are receiving personal benefits from these operations.[105] The Politecnica (ESPOL) has constructed a hatchery for research purposes, and is presently providing postlarvae to commercial producers.[106]

Sources indicate that an estimated 70-80 hatchery projects are currently planned, or in various stages of construction (See Appendix A for partial listing). It should be noted that many interest groups have had plans to construct hatcheries that never surfaced, therefore, it is unlikely that all of the 70-80 projects will ever succeed in actually building hatcheries. Presently, it is uncertain exactly how many hatcheries are operating and producing postlarvae due to earlier mentioned reasons and secrecy of activities. Table 3, page 53 can shed some light to the approximations.

Locations

Due to the necessity of providing high salinities and unpolluted water for proper hatchery production, most hatcheries are and will be

TABLE THREE

Ecuador Penaeid Shrimp Hatcheries

1980 - 1986

YEAR	HATCHERIES NUMBER
1980	1
1981	1
1982	2
1983	3
1984	4
1985	7P*
1986	10P*

P - Projected

* - About 80 financial groups are planning new hatcheries. It is unlikely, however, that all will succeed in actually building hatcheries.

Source: Personal communication with various industry sources.

Reprinted from NMFS IFR-85/3-B and adjusted by the author.

located in areas of close proximity to the sea.[107] Although the most densely populated pond sites are around the coastal areas of Guayas and El Oro, salinities are below normal seawater levels because of the Guayas river system. The largest metropolitan city in Ecuador, Guayaquil, situated upriver, makes it difficult to maintain proper water quality standards for hatchery production.[108] Thus, it is necessary to construct hatcheries away from urban areas and areas of high freshwater influxes.

A popular site is near Salinas on the Santa Elena Peninsula where good quality seawater is available year round.[109] Although it is obvious not every installation can be constructed there, the Ecuadorean coast offers numerous locations with similiar conditions, without disrupting more ecological habitats.

Methods and Production

Obtaining details on the hatcheries' construction and operations is rather difficult due to their understandably secretive practices, necessary to protect their commercial interests. The exchange of hatchery information is not common practice in Ecuador among owners, although, the GOE and interested business groups have made numerous pleas to the Shrimper's Association to reverse their attitudes. There does not appear to be any shift toward the latter in the near future. However, there is some general information published that explains the processes and results of their effort.

Two of the methods encountered in Ecuador incorporate varying degrees of sophistication. The first, being a less-sophisticated practice whereby sources of wild, gravid females are spawned under controlled situations.[110] Companies invest in trawlers that exclusively target on ocean concentrations of fertilized females which are then transported to the hatcheries to produce larvae. This method has been very successful, however, there is a major drawback to this practice. Hatcheries must rely on the collection of wild, fertilized females for continuing the hatching operation. Wild females have a low-survival rate under these conditions and egg production declines at each spawning. Also, one must consider the impact this collection effort for gravid females must have on the ocean stocks. Although this is a major concern, many experts believe this method will become obsolete with the onslaught of the following procedure and others similiar to it.

The second method utilizes some very sophisticated maturation techniques. Brood stock, ensuring high-survival rates and multiple offspring, are almost exclusively used. Eye ablation, pinching or removing one eye from the male and female stimulates sexual reproduction which then allows spawning and fertilization to occur.[111] Diet, optimum living conditions, and other sophisticated mechanisms guarantee successful hatching operations, sometimes producing up to 200,000 eggs. The napalli are then fed through a series of successive stages under intense conditions, whereby they mature into postlarvae or juveniles and are ready for transport to nursery ponds.[112]

The entire process, from ablation to nursery unit, may take three to six weeks depending upon the skill and sophistication of the operation. An extremely important process that has been mentioned throughout these reports, but not readily practiced in the field, is the acclimation of napalii and postlarvae through each successive stage, up until stocking in the grow-out ponds. Ensuring the proper measures for acclimation, without stressing the shrimp, greatly reduces the risk of mortality and slow growth development. Although this technology has received a fair amount of success, there are still a number of techniques that must be refined. Diseases, encountered throughout the different maturation stages, have hampered the development to a certain degree. Technology is being offered by U.S., Japanese, and French personnel to investigate new species to find disease-resistant strains, raise larger, shrimp sizes, and break dependences on monoculture (one-specie culture).[113]

Food sources necessary for larvae development are not found in readily accessible quantities to meet the present demand. Artemia, a brine-shrimp crucial for larve development, was only recently permitted for importation by the GOE.[114] However, quantities are still not sufficient to supply the hatcheries needs. There is mention that investigations to produce Artemia are underway in the private sector and the universities. One university in particular, the Escuela Superior Politecnica Del Litoral (ESPOL) - the Superior Liltoral Polytechnical School, is presently conducting investigations on Artemia in cooperation with the Food Science Department of the University of Rhode Island.[115]

At this point, it is uncertain exactly what the total production capacity will be, although projections have been made from analyzing data from previous years and the estimated potential that exists today (Table 4, page 58). Presently, most of the operative hatcheries estimate output to be between 10-15 million postlarvae per month, although some reports indicate that monthly production has varied from 0 to 20 million.[116] One hatchery, El Rosario, had targeted annual output for 1985 to be 200 million postlarvae. By the end of 1987, this hatchery has projected an output of 600 million postlarvae, with an eventual output of approximately one billion.[117] One report indicates that in 1986, more than 70 percent of the projected postlarvae production may come from only six hatcheries because of the start-up difficulties experienced by the new installations.[118]

If hatchery production achieves its projected goal of 2.4 billion postlarvae during 1986, that would only amount to 20 percent of the estimated 14 billion postlarvae needed to meet this year's demand.[119] However, these are only projections and it should be remembered that the industry has developed by means of many unexpected circumstances.

Hatchery Costs

Many industry observers believe that the industry in Ecuador is heavily invested by foreign business firms.[120] It is quite possible that the recent spur in hatchery development has been influenced by foreign financial support. Outsiders have been increasingly looking at the Ecuadorean shrimp industry for possible avenues to invest

TABLE 4

ECUADOR. HATCHERY

PRODUCTION OF MARINE SHRIMP

POSTLARVAE, 1980 - 1986

YEAR	PRODUCTION
	Billion Postlarvae
1980	Negl.
1981	0.1
1982	0.1
1983	0.3
1984	0.4
1985	0.7
1986	2.4P

P - Optimistic projections by hatchery managers. Actual production will probably be lower.

SOURCE: NMFS. Office of International Fisheries

capital. In view of the fact that the Ecuadorean economy relies considerably upon the influx of U.S. dollars, there is no doubt that the opportunity exists for foreign interests. For a detailed account of Foreign investment, see Chapter 5.

Presently, construction costs for building a small hatchery with the capacity of producing 10-20 million postlarvae is believed to be approximately $1 million.[121] Raw materials are readily available, but most of the equipment, feeds, antibiotics and chemicals must be imported. Ecuadorean import regulations are quite strict, although the government has eased many of the regulations concerning imports necessary for the mariculture industry. However, many owners indicate that procedures for obtaining permits and approving arrived materials are sometimes very lengthy and costly. Many growers partly blame the customs department for the slow development in the hatchery research.

Considering all the inputs for production such as feed, chemicals, utilities, etc., it costs approximately $4 - 5 to produce 1,000 postlarvae.[122] Presently, this might be rather expensive, but considering the price of wild-collected postlarvae, these hatchery larvae are still quite attractive to buyers and producers.

Aside from the initial investment capital and production costs, a substantial amount is expended for the salaries of advanced biologists. Ecuadorean companies must be willing to pay competitive salaries (between $40-80,000 depending on experience) and provide good facilities for those professionals.[123] Due to the relative infancy of the mariculture industry, there is a high demand for trained and experienced biologist worldwide. Therefore, Ecuador is now providing competitive incentives to attract these advanced biologists.

PRODUCTION

The following table represents the Ecuadorean shrimp harvests, both ocean caught and mariculture during 1980-1985: (in metric tons, live weight)

TABLE 5

	1980	1981	1982	1983	1984	1985
Ocean caught	7,800	8,000	8,000	7,500	6,700	9,000E
Mariculture	9,180	12,100	21,100	29,100	25,220	27,000E
TOTAL	16,980	20,180	29,500	36,600	31,920	36,000E
Percent mariculture	54%	60%	73%	80%	79%	75%

The total harvest of shrimp increased by 86% overall during 1980-1985, from 16,980 MT in 1980 to a peak of 36,600 MT in 1983, before declining to 31,900 in 1984. The increase is almost completely attributable to the expansion of the mariculture industry, which increased by 194% overall during 1980-1984, from 9,180 MT in 1980 to 29,100 MT in 1983, before declining to 25,220 in 1984. Poor trawler catches and the ill-effects of "El Nino" and the Humboldt ocean current reportedly are responsible for the 1984 production declines. (An estimated $10 million in damage to ponds, caused by flooding and heavy rains, offset the 1984 production.)[124]

Estimates for the 1985 production are still lower than average and industry specialists attribute the decline to the postlarvae crisis. Although a recent report indicates that 1985 estimates may need to be revised due to an improvement in culturing methods and a previously inaccurate account of inactive ponds.[125] However, industry observers

believe production levels should begin to increase in early 1986, and overall, 1986 may be a record year. The following table presents history of the industry's production levels (trawler and cultured) and projections from 1975-1990:

TABLE 6: Shrimp Trawler Catch and Cultured Harvests 1975-1990

	Harvests		
YEAR	TRAWLER	CULTURED	TOTAL*
1975	4.8	1.0E	5.8
1976	5.6	2.0E	7.6
1977	7.5	2.0E	9.5
1978	7.0	3.0E	10.0
1979	7.5	5.5E	12.5
1980	7.8	9.2	17.0
1981	8.0	12.1	20.1
1982	8.0	21.5	29.5
1983	8.9	35.6	44.6**
1984	6.7	33.3	39.9++
1985	9.9P+	27.9P	36.0P
1986	N/A	N/A	40.7P
1987	N/A	N/A	45.4P
1988	N/A	N/A	50.2P
1989	N/A	N/A	55.1P
1990	N/A	N/A	60.P

1,000 METRIC TONS

N/A - Not Available
E - Estimated
P - Projected by the Direccion General de Pesca, June 12, 1985
* Totals may not agree due to rounding
** The 1983 figure is sharply higher than that reported by FAO (36,600 tons).
+ Most Ecuadorean observers believe that future trawler catches will vary from about 6,000 to 9,000 tons.
++ Ecuadorean officials believe that actual harvests in 1984 may have been about 20 percent higher than the actual quantities reported.

SOURCES: FAO. Yearbook of Fishery Statistics, various years (1975-79 data) and the Ecuadorean Direccion General de Pesca (1980-90 data).
#Reprinted from NMFS, OIF - IFR - 86/07 and adjusted by this author.

In addition, the graph on page 63 depicts a dramatic representation of the accelerated mariculture growth compared to the stabilized trawler industry.

QUALITY OF MARICULTURE SHRIMP

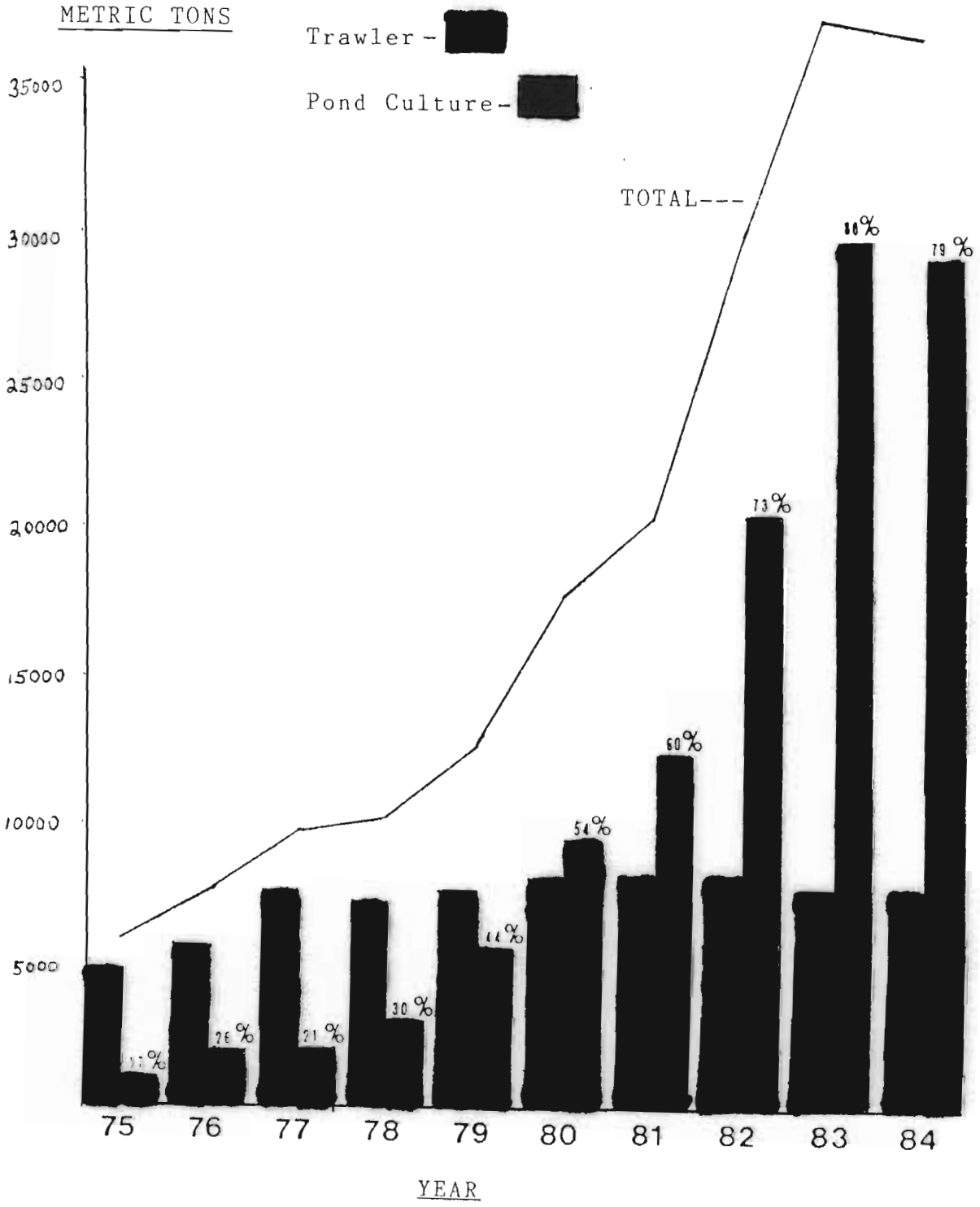
Ecuadorean cultured-shrimp has been well accepted in its penetration of the U.S. market. Several U.S. processors and fishery inspectors have been impressed with its quality. The product often has good size uniformity, very few broken pieces, firm flesh, bright color, and intact shells.[126]

Cultured-shrimp are easy to process because of a thin shell and consistently firm texture due to little or no holding in ice on trawlers. The shrimp are moved quickly and directly from the farms through processing to freezing. Most growers in Ecuador are able to deliver shrimp to the packers within one to two hours of harvest, and others quicker with air transport.

Sizes most commonly produced by Ecuadorean farmers range from 21-25 to 41-50 count per pound (21-25 indicates the approximate tails per pound). However, heavy concentrations of 31-35 count shrimp were previously farmed and exported. This resulted in higher than normal concentrations in the U.S. market, creating much competition with the U.S. catch, hence, stabilizing prices that normally increased during the interims of U.S. seasonal shrimp landings. Therefore, many Gulf and South Atlantic shrimp fishermen protested the imports (see Chapter 6 on the Impact of Imports). Operations in Ecuador are now improving

FIGURE 14

ECUADOR -Trawler and Pond Culture



their production methods in order to diversify into larger and smaller sizes which will hopefully reduce the stabilization of middle-sized shrimp prices in the U.S. market. Although, in the case of the larger sizes, growth periods may be longer, but price differentials for the larger sizes will make the transformation extremely profitable.[127]

Imports of cultured-shrimp generally possess good sensory characteristics and are free from iodine flavors and odors to the shrimp. This was experienced on certain occasions during the 1982-1983 "El Nino" as a result of unusually heavy rainfall. Sources also indicate that the quality of cultured-shrimp can be superior to shrimp caught by trawler fishermen.[128] Foreign cultured-shrimp are sometimes affected by an uneven enforcement of strict quality control standards. However, Ecuador does enforce these standards, more so than most of the other cultured-shrimp producing countries.

In addition to the reputation of excellent quality, Ecuadorean farmed-shrimp has also gained wide acceptance from U.S. importers due to the continuity of supply. (U.S. shrimpers do not hold the same opinion.) The production of farmed-shrimp allows the prediction of desired sizes and timed harvests with a fair degree of accuracy. This is very difficult to achieve in the trawling industry. Although, the "thrill of the catch" is basically non-existent in the practice of mariculture; nevertheless, farmed-shrimp has created an even supply of shrimp into the U.S. market, particularly, the more desired product from Ecuador.

OPERATIONAL COSTS

Investment in a 200 hectare shrimp farm requires $1-1.5 million in capital. This 200 hectare farm can be expected to produce approximately 500,000 - 600,000 pounds of shrimp during each of its first two years in operation.[129] Production costs for a farm of this size can be seen in the following example:

TABLE 7: Production Costs per Pound of Shrimp

Labor	
Administrator	$0.10
Direct Labor	.04
Indirect Labor	.01
Depreciation/Amortization	.72
Transport to Processing Plant	.02
Fuel/Lubricants	.18
Maintenance	.04
Electricity	.08
Seedstock	.04
Feed	1.16
Contingency Costs	.20
Production Costs:	2.75
Processing/Packing:	0.25
Total Costs:	$3.00

The single largest operating expense is feed, which amounts to $1.16 per pound of output, or 54% of total costs. (Postlarvae seed

may be the major expense during periods of scarcity.)

Labor is a relatively minor expense, totaling $0.15 per pound, or 5% of total costs. (This compenent is what has made the industry so attractive to foreign investment.) Fuel, which increased from $0.14 per U.S. gallon in 1980 to $0.45 per gallon in 1984, amounts to $0.18 per pound. (Fuel is subsidized by the GOE because it is an oil-producing nation, but due to the glut in global supplies and reduced oil prices, the GOE has gradually raised domestic fuel prices.)[130]

The total cost of $3.00 per pound (excluding hatchery costs) is a reflection of the more intense operations, rather than the typical less-sophisticated operations. Industry sources indicate that the moderate operations may produce shrimp for as little as $2.00 per pound. Although, the industry is subjected to dramatic price increases and fluctuations regarding raw materials, imported equipment and machinery, and seedstock which can considerably alter the above operating costs. Nevertheless, these mariculture operations can produce shrimp for much less than Ecuador's trawler industry, and considerably less than the U.S. Gulf trawling industry.

CHAPTER FOUR: EXPORTS AND EXCHANGE RATES

EXPORTS

In the past ten years, the shrimp industry in Ecuador has risen to such significance that it is now one of the chief export industries. In 1983, shrimp earnings surpassed bananas and coffee to become the second most important export commodity in foreign exchange. It is clearly important to see how valuable the shrimp is to Ecuador as a source of foreign exchange. The following table presents the major commodities in export earnings.

TABLE 8

Ecuador - Foreign Exchange Earnings - 1978-1984

(Million U.S. Dollars, FOB)

YEAR	CRUDE OIL	BANANAS	COFFEE	SHRIMP
1978	558.0	171.8	281.2	42.3
1979	1,032.0	200.1	263.1	63.1
1980	1,390.0	237.1	130.4	65.9
1981	1,560.0	207.9	105.9	77.5
1982	1,388.3	213.3	138.8	122.3
1983	1,636.8	152.9	148.6	175.1
1984	1,622.7	132.8	174.2	159.9

SOURCE: Central Bank of Ecuador
(Parodi, St. 7)

It is reported that only 2-4% of frozen shrimp is consumed in the domestic market.[131] Shipments are made to the U.S., Japan, European countries, Canada, and Colombia. The following table represents the major importers of Ecuadorean shrimp:

TABLE 9: Major Importers - Ecuadorean Shrimp

1980-1985 (1,000 Metric Tons)

	IMPORTER		
YEAR	EEC	JAPAN	U.S.
1980	-	Negl	9.2
1981	0.3	0.2	11.2
1982	Negl	0.4	16.4
1983	-	1.0	23.3
1984	-	0.7	21.1
1985	Negl	0.2*	18.7*

EEC European Economic Community
N/A Not available
* Partial data through October (Japan) and November (United States)

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However, it is reported that approximately 98% of the total export volume is directed to the U.S. Market.[132] Ecuador's exports to the U.S. increased rapidly up to 1983, when they accounted for 15% of total U.S. imports by quantity and 17.9% by value. The strength of the U.S. dollar worldwide and the heightened U.S. demand has allowed Ecuador the margin in the U.S. market. (Recently, increased strength of the Japanese Yen has created more competition for Ecuadorean shrimp in both the Japanese and U.S. markets.)[133]

The following table represents U.S. imports of Ecuadorean shrimp by quantity and value from 1980-1985:

TABLE 10

U.S.A. - Imports of Shrimp from Ecuador - 1980-1985

Heads-Off Weight 1,000 MT - Millions $ U.S.

YEAR	QUANTITY MT		VALUE $	
	Ecuador	Total U.S. Imports	Ecuador	Total U.S. Imports
1980	9.2	99.6	68.1	719.3
1981	11.2	101.0	80.3	723.9
1982	16.4	125.5	136.5	980.2
1983	23.4	155.2	218.7	1,223.5
1984	21.1	155.7	185.5	1,216.3
1985	19.9	163.4	166.1	1,152.9

SOURCE: National Marine Fisheries Service/Adjusted by this author.

The graph on the following page gives a more dramatic illustration of the shrimp exports to the U.S. (See Figure 15, page 71.)

Exporters in Ecuador generally sell outright on the basis FOB Guayaquil or other ports, with the result that importers pay the freight to the U.S.

The GOE publishes each week minimum FOB reference prices by sizes and colors. It is understood that these prices are based on market information (Fishery Markets News Report - (Green Sheet) - NMFS) obtained by the GOE from U.S. market sources. Exporters are not

permitted to make shipments at prices which have been negotiated below the Green Sheet levels.

The procedures normally followed by U.S. importers is to telex bid prices each week, valid for that week and quanities of each size. Many U.S. importers are now contracting in-country agents and sending U.S. buyers to negotiate purchases in order to guarantee continuous supplies.[134] Presently, due to a higher demand than current supplies can meet, most industry observers believe it is an exporters market at the moment. Exporters decide to whom they will sell on the basis of bid prices received, but often engage in bidding sessions with groups of buyers. One U.S. importer stated that at times, the Ecuadorean export offices look like a U.S. buyers convention during their bidding sessions.[135]

An example of prices, bid by a U.S. importer on March 1, 1985, follows: (Source: Ecuadorean Exporter)

TABLE 11

Ecuador Headless White Shrimp Bid Prices (March 1)
and Government Minimum Reference Prices
for the Week of February 25 to March 3

COUNT PER POUND		U.S. DOLLARS	PRICE PER POUND (FOB Guayaquil)
	Supply % of each size	Bid Prices	Minimum Reference Prices
U-12	2	8.25	8.10
U-15	2	7.15	7.10
16-20	4	5.90	5.85
21-25	5	4.80	4.70
26-30	15	4.05	4.15
31-35	36	2.95	2.70
36-40	18	2.85	2.65
41-50	8	2.75	2.55
51-60	5	2.60	2.40
61-70	3	2.40	2.25
71-90	2	2.00	2.00
	100%		

PRODUCERS/EXPORTERS

The number of exporters has greatly increased in the past five years. Reports indicate that there are presently 64 firms registered as shrimp exporters in Ecuador, up from 21 in 1980. (See Appendix B for a partial listing.) Because expansion has been rapid among these firms, many observers believe that the number of firms will decline in the future when the industry begins to stabilize. Many industry observers also indicate that future worldwide supply and demand will reduce the amount of exporters that exist, not only in Ecuador, but other countries that have increased their shrimp-cultured exports. Increased competition among exporters will eventually reduce the numbers in their community.

Each of the three major producing provinces, El Oro, Guayas, and Manobi have at least one producers association. These organizations are primarily lobbying groups who fight against taxes, fuel hikes, and more restrictive legislation. They join forces to pressure the GOE to increase government financing of hatchery development and other loan programs. Usually, they meet when there is a common problem. Otherwise, they meet once a year at a symposium in Guayaquil to discuss developments in the industry and seldom draw the majority of owners.[136]

Some of the major operations, especially those who own the more sophisticated operations, are hesitant to become involved with this association. Apparently, they see the association's internal factionalism and they believe the association is not instrumental in GOE decision making.[137]

In recent years, producers associations have split into different factions. It is reported that the division is between those who have established ponds and those who are interested in expanding their operations. It appears that the division may be slightly exaggerated. Even though the exchange of technical information is not transferred among Ecuadorean producers and exporters, they do seem to display some amount of concern over the development of the industry.

EXCHANGE RATES

Since 1979, there has existed in Ecuador a subsidy Law of Tax Credit (Ley de Abonos Tributario), designed to encourage exports to all countries. Rates have varied between 0% and 20% of the export value. Although this is an export subsidy, the legislation was basically enacted to ensure GOE control of the export flow and to guarantee a continuous supply of U.S. dollars in Ecuador. The current rate is 20% of the FOB value, payable at 15 months, without interest, at the current official exchange rate.[138] However, many exporters indicate that the tax credit is extremely lengthy in terms of reimbursement. Therefore, many exporters are using their proposed tax credits to pay-off annual export tax duties. The GOE is not particularly in favor of this practice, but has succumbed to these export conditions because of their new dependency upon the shrimp exchange earnings.

The GOE does impart strict export restrictions on exporters regarding currency exchanges. Exporters must convert 50% (some reports mention 70%) of total export earnings of U.S. dollars into sucres at the official exchange rate.[139] As previously mentioned, the Ecuadorean currency is presently unstable, and devaluation takes place on a daily basis. However, there is a floating rate, acknowledged by the GOE, that exceeds the official rate, presently by 25%.

Therefore, exporters convert U.S. dollars earned at the present intervention (official) rate of 95 sucres per U.S. dollars, while the free floating rate fluctuates around 125 sucres. From the exporter's perspective, exchanging 50% of a firm's earnings in dollars to sucres

at the official rate instead of the entire sum at the free market rate, amounts to a tax of approximately 22% on gross revenues. Many exporters interpret this measure as a hidden tax by the GOE.[140] This policy more than completely offsets the somewhat favorable effects of the 15% export subsidy. Cushioning the effect of the foreign exchange policy has developed a few widespread illegal practices among producers and exporters.

Smuggling shrimp out of Ecuador into Peru and under-declaring true export weights at customs are two forms of illicit exportation that have become institutionalized as a result of avoiding Ecuadorean export taxes.[141]

1. Capitalizing on the favorable differential between the floating and official rates of exchange and Peruvian export incentives, smugglers can offer the strongest shrimp prices, selling in Peru for re-export to the U.S.. The spread between the floating and official exchange rates, creating an avenue for higher profit margin, has made it possible for smuggling to occur. Peruvian export incentives also stimulate the flow of contraband shrimp. Peru offers a 35% export rebate for all exports, over and above their own floating rate.

In March, 1985, the Ecuadorean rate was 95 sucres per dollar and the Peruvian rate was 167 sucres per dollar. Therefore, a sale of 1,000 pounds of shrimp that would yield 95,000 sucres through the Ecuadorean Central Bank, earned 167,000 sucres through the Peruvian system. There is no doubt that the temptation existed. Most of the smuggling was performed by means of motorcraft, or simply, trucked over the Peruvian frontier. It is well known in the shrimp industry that

the areas under production in Peru cannot produce the quantities that have been exported. Unconfirmed reports indicate that both Ecuadorean and Peruvian customs agents received unofficial payments to ignore the stream of illegal trade.

Realizing the extent of this illegal practice, the Peruvian government (via pressure from the GOE) cancelled the 35% rebates paid to shrimp exporters.[142] The GOE has also stated that it will strengthen its procedures for reimbursement of the 20% export subsidies.[143] As a result of these new regulations, the quantity of Ecuadorean shrimp being smuggled through Peru has declined. Table 12 illustrates this decline.

TABLE 12

PERU - U.S. SHRIMP IMPORTS

1980 - November, 1985

YEAR	EXPORTS	
	QUANTITY	VALUE
	1,000 Metric tons	U.S. Million
1980	0.7	4.0
1981	0.9	5.7
1982	1.3	9.6
1983	4.2	35.9
1984	3.0	23.9
1985*	2.0	16.8

*Through November

SOURCE: U.S. Department of Commerce, Bureau of the Census

2. In addition to Peruvian sales, there are the unreported sales direct to the U.S.. These exports occur in the form of undeclared and under-declared sales. Exporters falsify the size category (reporting a more inexpensive count size) and/or understate the true product weight. Therefore, the declared price for the shrimp is lower and, consequently, the export tax is reduced. It is stated that Ecuadorean statistics for exports are usually U.S. $1.00 per pound lower than those registered by U.S. Customs.[144]

It has also been mentioned that some Ecuadorean custom officials assess exporters one-half of their expected gain from these unreported exports. Officials may charge exporters about 13% of the unrecorded value, being one-half of the 25% surcharge tax from the differential exchange rates. If this is true, then there is a substantial loss of potential export earnings that could be channeled back into the development of the industry.

It is not exactly known how saturated the shrimp export industry is with these illicit practices, but in one case, the Undersecretary of Fisheries attempted to halt several illegal shipments, only to be defeated by Port and Customs authorities. In reprisal, the GOE has hired SGS, a Swiss investigation company, to investigate the situation and ensure that exports are properly documented. The only problem is that the team consists of four observer units, which hardly seem sufficient to check the entire export flow.

One other problem of great significance that is employed to avoid surcharges is the channeling of export sales out of Ecuador. Some

exporters arrange all their financial transactions in U.S. banks, therefore, the payment in U.S. dollars is deposited in a U.S. account and not taxed in Ecuador.[145] It is unclear how these transactions are made, especially since Ecuadorean export and investment laws prohibit this practice. Nevertheless, it is common practice, even though it is counter-productive to the objectives of strengthening the foreign exchange programs of Ecuador.

CHAPTER FIVE: GOVERNMENT INTERVENTION AND U.S. INVOLVEMENT

MINISTRIES AND FISHERIES AGENCIES

There are a number of Ministries, government agencies, and academic institutions in Ecuador which participate in the legislation and research activities of the fishing industries. It would be lengthly to name them all, but the major institutions which have impacted the mariculture industry are as follows: Commission of the Naval Oceanographic Institute (INOCAR), the Directorate of the Merchant Marine and the Coast (DIMERC), the Ministry of Natural Resources, Directorate of Fisheries (DP), Subsecretariat of Fisheries, National Fisheries Institute (INP), and the Politecnia (ESPOL).[146]

There has always been much concern for the fishing industry from these departments (i.e. the Tuna Wars). Not until the appearance of the shrimp mariculture industry has there been such excelerated interest to extend governmental authority over a particular national fisheries. Each one of the above departments and agencies has a certain control, some say "interest", in the industry. Many observers mention that the authority is too widely distributed among these departments, creating a "national institution" of the shrimp mariculture industry in Ecuador.

For instance, depending upon the type of permit one would petition for tideland and/or farmland conversion, three government agencies; (INOCAR), (DIMERC), and (DP), and one fisheries institute; (INP), must be consulted before authorization is given.[147] In addition, if the land in question is privately owned, not government leased, then approval is also required by the Ministry of Natural Resources. Due

to this lengthy application process, many owners have circumvented the procedures by employing the illicit use of nepotism, political patronage, and monetary compensation.[148] Although there are no official reported accusations, it is common knowledge among Ecuadoreans that these practices are prevalent throughout every facet of the industry.

Many industry observers are also inclined to believe that a particular branch of the Ecuadorean Navy has one of the largest single percentages in shrimp pond hectares. Apparently, this is not a secret to many within the industry. However, information concerning their operations is not public nor industry domain.[149]

Granted, the industry is relatively new and some errors are undoubtedly expected, but others, such as previously described, can certainly be avoided. Although the processes employed by the Ecuadorean bureaucracy are distinctly cultural and different from North American practices, it is evident that the system harbors a number of faults that have facilitated a number of undesirable practices.

MANGROVES

The rapid growth in the shrimp mariculture industry has raised an important issue concerning the conversion of salt pans and mangrove forest to shrimp ponds. Controversy over this matter first surfaced in the early 1970's when many environmentalists took notice to these diminishing resources. As previously mentioned, shrimp pond construction originated in areas where mangrove forests fringed the shoreline. Relatively low conversion costs, compounded with the practice of

minimal input management, created an irresistable haven for profit seekers that eventually destroyed tens of thousands of mangrove swamps.[150] Ecologists and biologists firmly believe that the mangrove swamps are a critical habitat for shrimp larvae, among other fish and shellfish larvae. The shrimp trawling industry has repeatedly expressed their concern about the destruction of mangroves. They believe there may be a discernible connection between the postlarvae shortage and the reduction of larvae habitat in the mangrove swamps and estuaries. One report indicates the species, P. vannamei, accounts for only ten percent or less of the total, traditional catch of the trawler fishermen.[151] Mangroves also play an integral role in certain coastal livelihoods such as: wood production and artisanal fisheries. Some experts also believe mangrove forests may act as a natural buffer, protecting the inland coastal areas.

It is unknown exactly how many square miles of mangrove forest existed in Ecuador before mangrove destruction started, but presently, of the 55-60,000 hectares of constructed ponds, 30-40,000 hectares were once mangrove forests.[152] In 1974, after finally realizing there was a threat to the survival of the mangrove forests, the GOE began issuing permits for shrimp cultivation. The objective was to reduce the rate of mangrove destruction and control the number of operations that were establishing throughout the coast. This did not have much impact because many farmers were still destroying mangroves and constructing ponds without any government notification, aside from authorization..[153]

In 1979, the GOE issued further legislation in an attempt to implement stricter regulations in the mangrove situation. "Technically permissable areas" were designated in the mangrove forests for cultivation and hatchery construction.[154] This measure was primarily aimed at the hatchery sector, requiring registration and government authorization. Regulations place restrictions on sites, distance from neighboring hatcheries, discharges, etc.. It was at this point the GOE complicated matters by distributing the application process among numerous agencies. Even though the GOE was concerned about the possible long-term effects of mangrove destruction, they were not strictly enforcing their regulations.

It was not until early 1985 when shrimp pond construction in the mangroves began to subside considerably due to the postlarvae scarcity (although some construction continued in the Esmeraldas Providence). Some government officials and industry experts reccommended that further construction of ponds be restricted, especially in the mangrove areas where the destruction may have partly caused the postlarvae scarcity.[155]

Some reports indicate there is a moratorium on further mangrove conversion.[156] During personal interviews with a few industry specialists in early 1985, there was mention that shrimp pond construction in the mangrove areas had come to a halt, and newly constructed ponds in other areas were on a sharp decline.[157] Whether or not this actually occurred, the probable cessation of pond construction was not a direct result of government interaction, but largely from the critical postlarvae shortage. Sharp increases in land values and

the reduced availability of coastal land may also be responsible for the decline.

There is some uncertainty concerning the extent of mangrove destruction. Some observers believe the damage may be severe, while other industry experts believe the damage has been exaggerated. A National Marine Fisheries Service (NMFS) shrimp culture expert, who has made numerous trips to Ecuador, reports that he has not observed the large-scale destruction reported by some observers. He has stated that ponds built in the mangroves would not be conducive to shrimp culture because of the acidic soils and many ponds are built on land behind the mangroves.[158] This may very well be the method practiced in Ecuador, but there are still many conflicting reports that indicate large areas of mangroves have been cleared for shrimp construction.

The GOE has initiated a number of contractual agreements with several U.S. academic institutions in attempts to investigate some of the problems that have occurred within the industry. Consultants from the Universities of Miami, Rhode Island, Texas A & M, NMFS, and various other agencies and institutions have become actively involved in coordinating assessment programs with Ecuadorean agencies. It is the objective of the coordination to achieve an understanding of the problems and then explore avenues that may facilitate comprehensive investigations.

GOE ASSISTANCE

Although the shrimp industry is basically conducted by private companies, which had previously received little, direct government assistance, the GOE has been taking a gradual, active role, providing a number of programs and legislation which have benefitted the industry. Shrimp fisherman and culturists are permitted to import duty-free, manufactured equipment and fishing gear not domestically available. (Although this does not apply to the importation of shrimp trawlers.)[159] Only companies which can afford direct importation are allowed the privilege, and the law requires that the equipment not be resold. Unconfirmed reports indicate that some equipment has been resold at considerable profit to the importers. There are rumors indicating that a blackmarket of various machinery and laboratory equipment is rapidly growing in Ecuador.[160]

The GOE also adopted new import regulations regarding the importation of foreign species. Persistant requests from the shrimp producers finally led the GOE to revoke a previous import regulation that prohibited the importation of any type of foreign shrimp and larvae species. The new regulation adopted May 30, 1985, allows producers to import nauplii, postlarvae and Artemia sp. until Ecuadorean hatcheries are able to meet industry demand.[161] However, some observers believe this may incite the illegal importation of the more, undesirable species that are known to be less disease-resistant.

The GOE has also made available a few "soft" loan programs for those interested in the shrimp mariculture industry. The financing

appears in two structure types: (1.) Bonos de Fomento (Development Bonds); and (2.) Fondos Financieros (Financial Funds). These development programs are sponsored by the GOE and funded through private and commercial banks in Ecuador.[162] Almost all the shrimp investment endeavors in Ecuador apply to these GOE laws.

Under the Development Bond program, the Central Bank of Ecuador buys "Development Bonds" from private lending institutions, extends financing up to 80% of the project cost, and guarantees lower interest rates.[163]

Similiar to the Development Bond program, the Financial Fund also offers low interest rates, but there is a limit on the maximum sucre amount to be borrowed. Unlike the 80% which is allowed under the Development program, the fund program may borrow up to 60 million sucres (approximately $500,000.00). Therefore, borrowing from the fund, one must have a particularly large amount of equity in order to qualify (Remember: initial investment is approximately $1.3 million).[164]

Although these programs are relatively new and need some finetuning, many investors complain that the red-tape process is too lengthy and some have acquired funding through other alternative sources. (There has been mention that the GOE has discontinued both programs because of a lack of government funds, but there are plans to administer another program incorporating new lending concepts.) Other financing vehicles available are found in a number of private and commercial banks in Ecuador and the United States, however, interest rates are higher and loan terms can be more inflexible than GOE loans. The GOE has also

implemented a number of export regulations that have had a far-reaching impact on the industry. Due to the magnitude of these issues, a lengthy discussion can be found under Exports (Chapter 4, page 68).

U.S. INTEREST

Because of the phenomenal growth and potential of the shrimp mariculture industry in Ecuador, many U.S. investors have taken an active role investing in all levels of the industry.

Many Ecuadorean pond operations are considered to be heavily invested by U.S. interest groups. Reports indicate that U.S. investment is found in the farms, hatcheries, and export levels. The U.S. is also a major source of technical assistance, skilled personnel, and equipment. Imported equipment used by the industry such as: diesel engines , pumps, graders, refrigeration machinery, earth moving and hatchery equipment, is largely supplied by U.S. manufacturers.[165]

It is impossible to give a true account of the exact amount of U.S. capital invested in the Ecuadorean industry, but reports estimate that between 40-60% of the industry is U.S. invested.[166] (One report in 1984 gave an estimate of $20-30 millión in 1984, however, it is this author's opinion that the present figure may be well above that account.) There are many obvious reasons for the secrecy, but one that may be of vital importance is the Ecuadorean law itself. The Ecuadorean National Fisheries Law states that foreign control of a fisheries related venture (including mariculture) cannot exceed 49% of the total equity of the venture.[167] Therefore, it is quite possible

arrangements may have been made between U.S. and Ecuadorean entrepreneurs to conceal the actual percentage of ownership or controlling interest. It should be remembered that avenues for acquiring capital are indeed more accessible to U.S. entrepreneurs, and they will undoubtedly make every effort to protect their investments.[168] Table 13 gives some examples of U.S. activity in Ecuador, although the list is far from being conclusive.

TABLE 13

ECUADOR - U.S. INVESTMENT IN THE SHRIMP INDUSTRY

Ecuadorean Company	Areas of Activity	U.S. Investor
Empacadora Nacional	Shrimp boats Packing plant Hatchery Farm production	International Protein Corp., Fairfield, NJ
Acuespecies S.A.	Farm production	Amorient Aquaculture, Int'l. Laguan Niguel, CA
Langostinos S.A.	Farm production	Castle and Cooke, San Francisco, CA
Frescamar S.A.	Packing plant Hatchery Farm production Feed mill	Morrison Grain Company Salina, KS
Molinos Champion	Farm production Feed mill	Continental Milling Corp. New York, NY

Apparently, the ten years' experience of U.S. investors in Ecuador's shrimp sector has been generally favorable. There is, at times, concern over labor conflicts, increased labor costs, and a slowdown in the

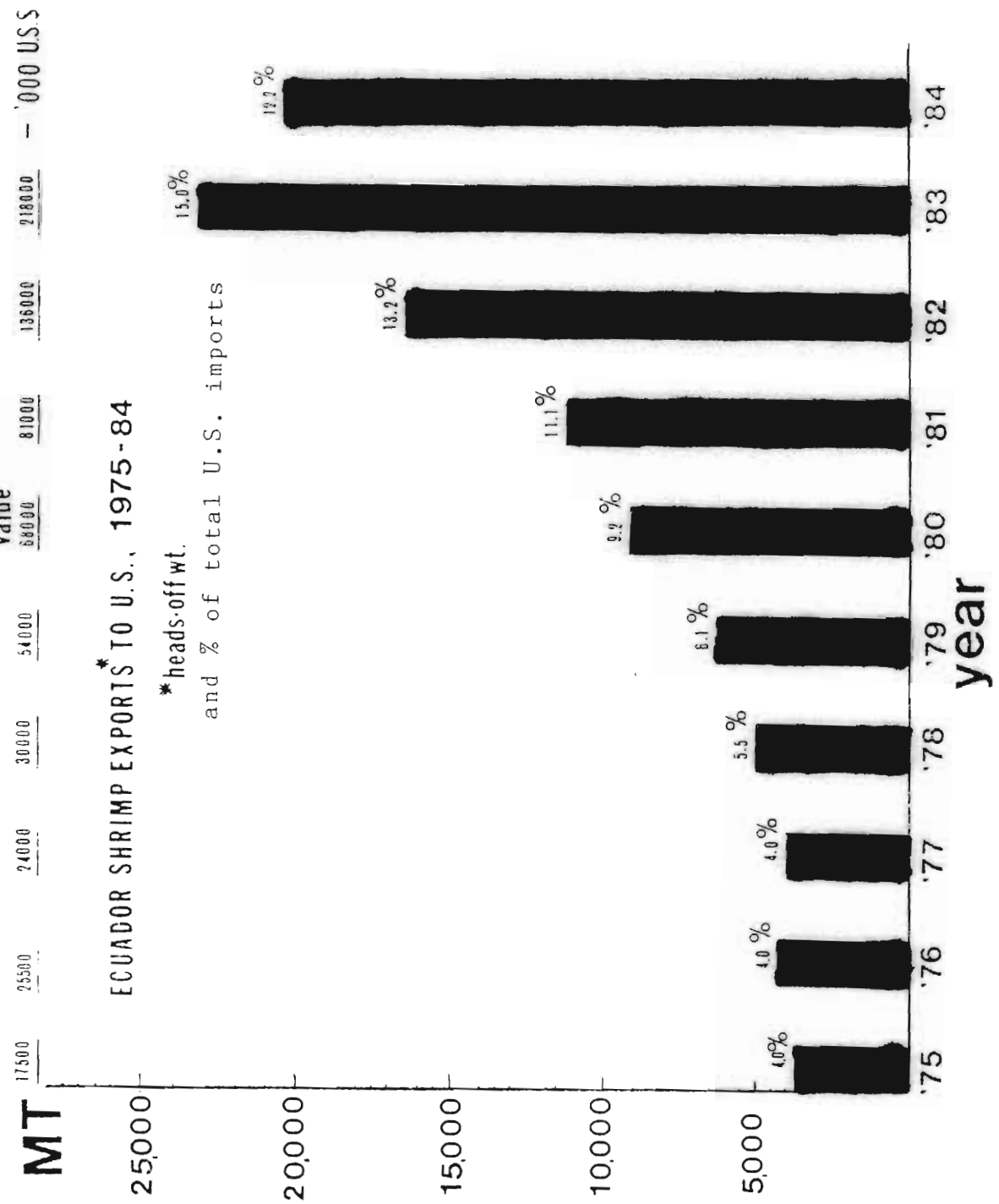
decision-making process within the bureaucracy. These concerns are far from universal among the business community.

There is an interesting aspect of the investment process that one might have considered a major concern of the U.S. investors. It is virtually impossible to purchase political risk insurance for Ecuador, and very difficult to purchase commercial risk within or outside of Ecuador. The U.S. Overseas Private Investment Corporation (OPIC) will not issue insurance policies for projects in member countries of the Andean Pact (a South American treaty organization).[169] Therefore, it is extremely difficult to insure oneself against bankruptcy or illiquidity involving internal and external economic - political forces. It is interesting to note the amount of U.S. financial involvement in Ecuador considering the enormous investment risk. One must remember Ecuador is a fairly stable country compared to her neighboring South and Central American countries, but internal political and economic problems have become more critical and there are indications that civil unrest is evident.[170] Nevertheless, there is a great deal of profit potential in Ecuador and U.S. investors are continuing their endeavors to acquire a portion of that profit.

It should also be mentioned that it should not appear as the U.S. investors are solely responsible for the heavy U.S. investment in Ecuador. The GOE and Ecuadorean entrepreneurs encouraged foreign investment by means of favorable investment incentives, invitations to interested U.S. business groups, and the contractual agreements with U.S. private consultants. Whether or not there presently exists a happy median among the U.S. and Ecuadorean business community, they

apparently have demonstrated a satisfying relationship. Ecuador has strengthened its industry via U.S. technology and capital, and the U.S. investors and supply groups have increased their profit potential. (See Chapters on Exports and Ecuadorean Shrimp Impact for further information.)

FIGURE 15


ECUADOR SHRIMP EXPORTS* TO U.S., 1975-84
*heads-off wt.
and % of total U.S. imports
MT
value
- '000 US$
17500
25500
24000
30000
54000
68000
81000
136000
218000
25,000
20,000
15,000
10,000
5,000
4.0%
4.0%
4.0%
5.5%
6.1%
9.2%
11.1%
13.2%
15.0%
12.2%
'75
'76
'77
'78
'79
'80
'81
'82
'83
'84
year

CHAPTER SIX: THE IMPACT OF ECUADOREAN SHRIMP ON THE U.S. MARKET

U.S. MARKET

Shrimp producers in developing countries, such as Ecuador, are highly reliant on the United States as a market for their products. These imported shrimp products complement the domestic supply while generating sources of foreign exchange for the exporting nations. Imports also sustain the availability of shrimp to the consumer, and subsequently, help build demand in the market. Although, these increases in foreign imports, particularly from Ecuador, have created a shift in the current status of the U.S. market.

This understanding of the current market status in the United States requires an analysis of long-term and worldwide conditions and trends in the industry. As with any world commodity, shrimp prices are subject to cyclic fluctuations. However, analysis reveals a generally upward swing of prices and increasing demand over the years. Presently, the market is on an upswing after the 1979 dip.[171]

Prices are naturally affected by the demand of competitors of the United States on the world market, especially Japan, which is one of the world's largest importers of shrimp. Prices are also affected by supply fluctuations and general economic conditions. Therefore, cyclic fluctuations in prices must be understood in order to project the economic stability of the industry. As with shrimp, the cycle is between 3 and 4 years.[172] Despite price fluctuations, the high demand in the world market produces a general push toward higher prices. This generally upward trend has been analyzed extensively and attested to by many experts in the industry.

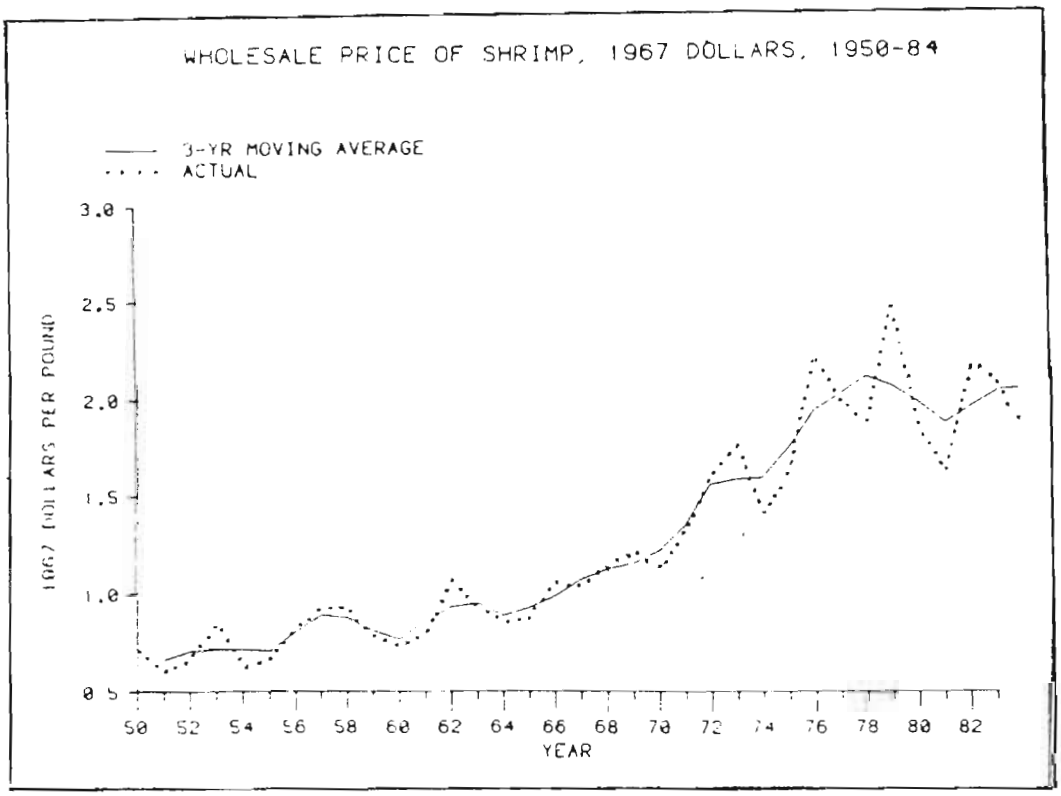
The general long-term price trend for shrimp has been upward for many years due to the increased consumer demand and the availability of supply. There are periods when prices move sharply upward for several months in succession to new highs and then recede for a series of months. The figure reproduced on page 95 demonstrates that prices have generally swept upward throughout the years, with each successive crest in a cycle being higher than the preceding one.

Shrimp prices have also increased in comparison with many other foods. Ex-vessel prices for Gulf and Atlantic shrimp have far exceeded the product price index for other foods such as beef, veal, and poultry. In addition, shrimp prices at the retail level have soared at an even faster pace than many Consumer Price Index (CPI) food items consumed outside the home, including many other fish products.[173]

The value of the United States shrimp production has also increased considerably, although landings have decreased. In 1983, the industry produced $487 million as compared with $143 million in 1950. In 1967 dollars the 1983 value of domestic production was $171 million, three times the 1950 value of $51 million. Ex-vessel prices in 1983 measured in 1967 dollars were $1.21 per pound, or three times the 1950 value of $0.43 per pound. Although imports increased considerably between 1982 and 1984 period, prices in current dollars did not decrease and continued their upward trend.[174]

The United States is the world's greatest market for shrimp. No other country in the world consumes more shrimp than the United States.

FIGURE 16



Reprinted from Trends in U.S. Markets For Processed Shrimp, John Vondrusks, NMFS, Feb. 1985.

Total U.S. consumption of shrimp reached a record 528 million pounds (heads-off weight) in 1983. This amount is 3.5 times the 1950 level. Data from 1980 shows that the United States consumed 19 percent of the total world supply of shrimp.[175] Japan was second with 16.9 per cent.

Not only is the total quantity of shrimp being consumed in the U.S. increasing, but U.S. consumption of shrimp per capita is also increasing. In 1985, U.S. per capita consumption reached a record 2.29 pounds per person (Table 14, page 97). This trend is particularly significant. It clearly shows an increase in the demand for shrimp in the U.S., not just an increase in quantity demanded. Demand has been increasing despite rising prices.

U.S. consumption of fresh and frozen warm-water (Panaeid) shrimp was a record 465 million pounds in 1983. This quantity is nearly four times what it was in 1950. The supply of the Panaeid shrimp came from two sources: U.S. commercial landings from the Gulf and South Atlantic, and foreign imports, mainly Mexico and Ecuador.

U.S. domestic landings of shrimp have been relatively stable since 1950, with the exception of the decline during 1982 and 1983. Many marine and industry specialists believe this is attributed to the overcapitalization of the industry which in turn has been fishing below the maximum sustainable yields (MSY) of both the tropical and cold-water species. Cyclic environmental occurances such as "El Nino" may have indirectly influenced the climatic conditions in these areas, which may have inversely disrupted natural spawning behavior, but most experts agree that overfishing is the major reason.[176] Once annual commercial

TABLE 14

UNITED STATES PER CAPITA SHRIMP CONSUMPTION
1964 - 1985

YEAR	PER CAPITA CONSUMPTION
1964	1.16
1965	1.24
1966	1.21
1967	1.24
1968	1.37
1969	1.33
1970	1.46
1971	1.41
1972	1.44
1973	1.38
1974	1.50
1975	1.41
1976	1.48
1977	1.56
1978	1.52
1979	1.80
1980	1.42
1981	1.47
1982	1.52
1983	1.71
1984	2.13
1985	*2.29

*Record
Figures for "PER CAPITA CONSUMPTION" are in U.S. pounds and include all preparations of shrimp. Data - NMFS

catches equal or exceed the populations annual production, commercial landings will remain constant or decline. This is the current situation in the U.S. shrimp industry today.

An increase in the U.S. demand for shrimp, combined with declining domestic catches, has caused a sharp growth in U.S. imports of shrimp. In 1983, the United States imported 421 million pounds of shrimp, valued at over $576 million dollars. The 1984 imports hit a record of 423 million pounds valued at $1,216 million (Table 15, page 99). The U.S. Imports more shrimp than any other country in the world, purchasing supplies from over 80 countries. Mexico and Ecuador are its leading suppliers. (Table 16, page 100.)

IMPORTS

Shrimp imports comprised 73 percent of the U.S. supply in 1983, and 68% in 1985. (Table 15, page 99). This is in contrast to 1978, when imports provided only 48 percent of the shrimp supply (Table 15, page 99). With natural populations nearing their MSY levels, shrimp mariculture is becoming the solution to future supply requirements. World shrimp farm production in 1983 amounted to 117.5 million pounds, and some experts estimate by 1990 shrimp mariculture can potentially produce up to 875 million pounds. Should harvests from capture fisheries remain constant, as is anticipated, this will represent approximately 18 percent of the total world harvest of shrimp. This is a significant change in the source of shrimp being supplied to the consumer (Table 17, page 101).

TABLE 15

UNITED STATES SHRIMP SUPPLY 1974 - 1985

1,000 pounds (Heads-off Equivalent)

	U.S. COMMERCIAL LANDINGS		IMPORTS		TOTAL SUPPLY
YEAR	THOUSAND POUNDS	PERCENT OF TOTAL	THOUSAND POUNDS	PERCENT OF TOTAL	THOUSAND POUNDS
1974	225,529	45.5%	270,516	54.5%	496,045
1975	209,151	45.5%	231,522	52.5%	440,673
1976	245,597	45.5%	271,894	52.5%	517,491
1977	288,295*	51.5%	271,811	48.5%	560,106
1978	256,882	51.7%	240,414	43.3%	497,296
1979	205,587	43.3	269,263	56.7%	474,850
1980	207,869	44.6%	258,112	55.4%	465,981
1981	218,900	45.8%	259,112	54.2%	470,012
1982	175,613	35.5%	319,596	64.5%	495,209
1983	155,591	27.0%	421,179	73.0%	576,770
1984	188,132	31.0%	422,340	69.0%	610,472
1985*	210,000E	31.8%	452,232*E	68.2%	662,488E

*Record Imports
+Excluding Beginning Year inventories
E Estimate
Data - NMFS

TABLE 16

MAJOR SUPPLIERS OF SHRIMP

TO THE UNITED STATES

1981 - 1983

COUNTRY	1981		1983	
	QUANTITY (t)	VALUE ($000)	QUANTITY (t)	VALUE ($000)
Mexico	51,023	290,309	60,884	388,027
Ecuador	17,809	80,303	36,984	218,729
Panama	11,464	55,406	11,704	58,694
India	13,678	32,731	21,702	53,278
Thailand	4,658	14,278	13,920	48,331
Taiwan	3,974	10,940	14,329	48,110
Brazil	7,872	23,459	10,544	44,992
Norway	881	4,080	7,823	36,259
Peru	1,382	5,716	6,737	15,789

Reprinted from Draft: The Outlook for Salmon and Shrimp Aquaculture Products in World Markets, NMFS, November, 1984.

TABLE 17

WORLD SHRIMP FARMING ESTIMATED PRODUCTION (1,000 POUNDS)

NORTH/CENTRAL AMERICA:	1983	1984	1985	1990
United States	210	1,024	2,829	56,400
Mexico	-	80	400	4,000
Belize	-	33	220	2,200
Guatemala	96	160	1,000	2,000
El Salvador	-	-	-	?
Honduras	94	94	94	4,464
Nicaragua	-	-	-	?
Costa Rica	-	-	-	?
Panama	968	1,320	2,200	8,800
TOTAL:	1,368	2,711	6,743	77,864
SOUTH AMERICA:				
Colombia	9	176	440	4,400
Ecuador	65,600	71,300	76,000	83,200
Peru	1,235	1,600	2,000	8,000
Venezuela	-	176	880	8,800
Guyana	-	-	4	40
Surinam	-	-	4	40
French Guiana	-	-	4	40
Brazil	46	200	1,000	4,000
Uruguay	-	-	-	1
Argentina	-	-	-	2
TOTAL:	66,890	73,452	80,332	103,523
CARIBBEAN ISLANDS:				
Cuba	0.4	1	1	40
Jamaica	-	-	1	20
Haiti	-	-	44	440
Dominican Republic	-	4	220	440
Puerto Rico	-	-	4	88
St. Croix	-	1	13	132
Bahamas/Andros	-	22	88	220
Long Island Key	-	88	88	440
Great Inagua	4.0	10	22	440
TOTAL:	4.4	126	481	2,260
ASIA:				
Japan	7,800	7,800	7,800	7,800
Taiwan	38,500	38,500	38,500	77,000
Philippines	1,000	2,000	60,000	600,000
China	2,028	2,000	2,000	2,000
TOTAL:	49,328	50,300	108,300	686,800
GRAND TOTAL:	117,590.4	126,589	195,856	870,447

Currently, about 88 percent of the shrimp consumed in the U.S. is of the Peneaus, or warmwater specie.[177] The most popular specie in the U.S. is the P. vannamei. The American seafood consumer prefers this specie because of its white color and firm tail meat. Although the U.S. Gulf industry does catch a significant percentage of white shrimp, at seasonal intervals, a large percentage of white P. vannamei is imported, particularly from Ecuador. Therefore, Ecuadorean shrimp has established a reputation for high quality among U.S. consumers.[178]

The demand for shrimp in the U.S., especially white shrimp, traditionally far exceeds domestic landings. Ever since 1961 (with the exception of 1978) domestic landings have not been able to meet even half the demand in the U.S. This shortfall of domestic landings reflects not only a very large demand, but also that the South Atlantic and Gulf shrimp resources are being harvested to their full capacity.[179]

In light of the extreme shortfall of domestic landings, the U.S., out of necessity, mostly relies on imports to satisfy the growing level of demand. Over the past decades, imports have represented the main source of supply growth for processors and distributors. The pattern has characterized the U.S. shrimp industry for many years, and hence, appears unlikely to change. Imports are essential to the processor, importer, wholesaler, retail markets, restaurants, and most importantly, the consumer.

Plainly, imports have benefitted the shrimp industry. Ecuadorean imports have helped fulfill the consumer demand, without that supply, shrimp prices might have risen to such levels as to decrease consumer interest in shrimp commodities. Shrimp is one of the most favored

seafood items, and there were periods when seasonal prices influxes stagnated consumer interest. It is the onslaught of cultured-shrimp that has aided in leveling prices to where consumers can afford to purchase shrimp more frequently. The steady flow of Ecuadorean shrimp, and other foreign shrimp products, has stabilized speculation in the market with respect to the middle-size counts. It is this category which has created the most dissatisfaction among the Gulf shrimp fishermen.

As previously mentioned, middle-count shrimp sizes (31-40 count), at the present, are the most profitable means of producing Ecuadorean cultured-shrimp. They are also the sizes most profitable in the catches of U.S. shrimp trawlers. (Although larger sizes are traditionally sought after in the Gulf industry, 21-30 counts).[180] Hence, the Gulf and South Atlantic Shrimp Associations petitioned the International Trade Commission (ITC), in the fall of 1984, to investigate the competition of foreign imports and their affect on the U.S. shrimp industry. It appears that the main objective of the Shrimpers' Association was to investigate the possibilities of imposing tariffs on imported shrimp. Some industry observers believe that this might have been an attempt for the U.S. shrimpers to remove the burden of their own over-capitalized industry.[181] Apparently, the Gulf and South Atlantic industries have been avoiding their own internal problems for a number of years and chose to blame foreign imports as the culprit. The further the ITC probed into the matter, the more the Gulf industry realized that the problem was rooted in the domestic infrastructure rather than imports. Some fishermen did not and still do not accept the findings from the ITC.

INVESTIGATION OF ECUADOREAN SHRIMP IMPORTS

Shrimp, in all forms enters the U.S. free of import duty (Appendix C), except Cuba, North Korea, Kampuchea, and Vietnam. Although there are no non-tariff barriers on shrimp imports, there are some U.S. regulations and laws which can restrict imports under certain conditions. The ITC was designated to investigate the possibility of implying these regulations toward foreign imports, particularly Ecuador. Under present U.S. law, three avenues were investigated by the ITC: Section 201 of the 1974 Trade Act or the "Escape Clause", a countervailing duty, and the Antidumping Action.[183]

Ecuadorean shrimp was accused of undercutting the prices of domestic caught shrimp. Under the Antidumping provisions, as amended by Section 101 of the Trade Agreements Act of 1978, imports that are being sold in the U.S. below the cost of production or the home market price of the foreign producer may be subject to U.S. duties. However, it is evident that prices for Ecuadorean shrimp are generally higher than U.S. domestic shrimp because of the quality difference. Indeed, if anything, it tends to sell at or above comparable domestic shrimp prices (See Appendix D for price comparisons). Prices of the small quantities of frozen shrimp sold in the domestic market in Ecuador normally maintain a close relationship with export prices.[184] The Ecuadorean product was not "dumped" in the U.S., therefore, not subject to the above provisions.

Under the provisions for countervailing duties, Section 101 of the Trade Agreements Act, a duty may be imposed on imports from a

foreign nation that receives subsidies to produce those products which are at competition with a similiar U.S. product. A material injury test was added to the U.S. law with regard to countries under the Subsidy/Countervailing Duty Code negotiated in 1979 during the Tokyo Round of the Multilateral Trade Negotiations. Ecuador is not a signatory to the Code, therefore, the test could not be used against its imports. Due to the weak performance of subsidy programs in Ecuador, the countervailing provisions would be difficult to justify in the case of their exports.[185]

Lastly, "Escape Clause" provisions from the 1974 Trade Act, allow the U.S. to impose tariffs, duties, and quotas on foreign imports that demonstrated such an increase in quantity as to be a substantial cause of serious injury to the domestic industry. It is evident that the middle-size counts have not proportionately increased in price with the other counts because of the even annual flow of imports from Ecuador, Mexico, and other shrimp producing nations. However, referring to the provisions, this does not substantiate serious injury to the U.S. industry.

There has been pressure on the Ecuadorean industry to diversify more evenly in other shrimp counts. The U.S. shrimpers are allowing a longer growth period for ocean-shrimp in order to catch larger-sized shrimp.[186] They also have the potential to diversify their efforts in the harvest of smaller sizes. Both industries could improve their management strategies so that a more efficient use of the shrimp resource is achieved. These changes will obviously create more speculation in the market, which is one of the primary objectives of all producers.

These trade restrictions would have seriously disrupted the established pattern of the world market for shrimp commodities. The U.S. imports shrimp from 80 countries, but none of those economies depend upon shrimp exports as highly as does Ecuador. It would also be unfair and equally difficult to administer quotas and tariffs on one or two nations. Trade restrictions would not produce any more domestic shrimp, but would most likely impede the exports of U.S. equipment, supplies, and other products traded worldwide.

The ITC submitted its findings to President Reagan's commission in August of 1985. The results of the commission's review concluded that it would not be in the United States best interests to impose trade restrictions on foreign shrimp imports. However, the commission did reveal that there is a definite need to reform some of the management practices employed by the U.S. trawling industry.

CHAPTER SEVEN: CONCLUSION

CONCLUSION

In the absence of major changes, Ecuador is in its final phase of explosive growth. There have been serious problems faced by the industry up to this point, and there does not appear to be sufficient remedies in the near future. Although the industry has achieved a fair amount of success and triumphs. The shrimp mariculture industry has risen to become the world's leading producer of cultured-shrimp in only ten years from inception. It might be rather difficult to locate another country with the same caliber that could presently demonstrate such a success story. However, it is not only the success of an industry that drives most investigators to analyze the development of a new industry. Most often, it is the critical issues and their subsequent dilemmas and/or remedies that incite these investigations.

No doubt, both expansion and the shift toward more intensive production will slow until the availability of hatchery seed resolves the postlarvae dilemma. The short term horizon of most producers prevents them from following modest conservation practices. Their reasoning is that profits must be taken as quickly as possible because economic and political circumstances are always apt to change in countries that are developing their socio-political environment. Hence, these producers, in general, tend to treat their environment as a disposable commodity, rather than a renewable resource. In many lesser-developed countries there is a poorly-defined infrastructure for conservation. This is a result of rapid modernization and the inexperience associated with the practices of resource management. The GOE is gradually accepting the necessity to develop such programs.

On a more positive side, two areas which will grow most rapidly in the years to come are the production of feed and hatchery seed. These areas offer excellent opportunities for the Ecuadorean entrepreneur. A major step would be the development of high-quality shrimp feed that would lessen the dependence upon foreign products. Investigations are underway to analyze the possibilities of utilizing locally available products, and Ecuador does have potential technology, via foreign assistance, to produce commercial quantities.

Obviously, hatcheries are the solution to the postlarvae problem, and partly, the intensification of production processes. Hatchery development will generate major structural changes. The dependence on wild, postlarvae will be greatly reduced. The employment level, as in any partly "automated" industry will decline. (It should be remembered that the postlarvae collection "industry" was a temporary component, and most of those involved have the ability to return to their previous professions. There will be employment opportunities in the more improved sectors of the industry.) Laboratory research and development will also improve the development of disease-resistant species. Finally, it is most probable that hatchery development is likely to be more seriously influenced by foreign companies, since they have the technology and capital. Though some observers believe foreign investment may maintain control in many components of the industry, eventually the distribution of control will become dominated by the Ecuadorean business community. U.S. involvement in mariculture is gradually appearing in other Latin American and Asian countries.

The shortage of postlarvae is changing the industry's view of how the government should be involved in the industry, and how the industry should evolve. On one hand, producers are reluctant to encourage government involvement, but on the other hand, they understand the difficulties of developing hatchery construction on their own and/or through foreign intervention, which results in foreign technological and financial dependency. In this curcumstance, it appears to be a reliance on capital other than what can be self-produced, therefore, outside interests can influence their profit structure dramatically.

No matter who develops the hatcheries, it is clear that progress will occur more rapidly if the government decides to improve its import procedures and loan programs. There is a healthy export continuum with the U.S., but there should be stronger government involvement in the production components.

There are two other pragmatic ways the GOE could help assure a stable, long-term growth of the shrimp industry. First, the GOE could reform its concession and authorization processes. Stricter enforcement of land acquisition, and the procedures necessary for acquiring these lands for shrimp cultivation is absolutely necessary. This may be one of the most difficult measures to enforce because of the historical means of receiving land for shrimp cultivation. Other reports have mentioned the levy of government taxes to regulate land conversion. These measures could possibly affect the present conversion, but an indoctrination of sound coastal management plans would be the most efficient solution. Conservation programs, formed by private

organizations, are beginning to achieve public and GOE awareness. Presently, the U.S. AID, contracting natural resource specialists from around the U.S., is coordinating investigations with the GOE to aid in the future implementation of coastal resource management programs.

Secondly, the advent of government and foreign aid training programs would provide and encourage open access to technical information. It is obvious that scientific institutes, industry associates, and government agencies do not exchange necessary information. In this matter, the GOE should take the initiative to relay pertinent technological information. The Ecuadorean industry may self-defeat itself if there is not reliable communication among producers, via government assistance. Therefore, it would be in the best interests of the Ecuadorean Navy to relinquish its commercial interest (if that may be the case) and concentrate on research strategies that will assist the commercial industry.

As the industry begins to resolve its problems and reshape itself, a few points should be considered: (1.) streamline the bureaucratic process and seek to minimize the conflicts of interests; (2.) create a viable data base to better monitor the developments in the industry; (3.) tailor coastal resource policies to the structure and limitation of the social economy; (4.) enact only those coastal resource management laws which are enforceable; (5.) create a proper mix of economic incentives to motivate compliance.

In conclusion, the Ecuadorean shrimp mariculture industry has tremendous potential to generate employment, foreign exchange, and

technological development. It has, however, matured to the point where future growth and stability depends upon the creation of a coastal resource management policy, concurrent with a coherent economic development program.

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and

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7. Ibid.
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9. Personal Communication with Dr. Samuel Snedaker, University of Miami, Florida. Dr. Snedaker, along with a Miami team, undertook a study of the Ecuadorean Shrimp industry in 1984-1985 under contract with U.S. AID. The project was titled the "National Economics of the Shrimp Industry and the Contribution to the National Economy." The project concentrated on the many faceted problems associated with conversion of mangroves to shrimp ponds.
10. Ecuador, Background Notes, U.S. Dept. of State Bureau of Public Affair, Washington, D.C., March, 1982.
11. Ibid.
12. This author spent two years in Ecuador, 1981-1983 under the auspices of the U.S. Peace Corps Fisheries Program. This occurrance was observed throughout much of southern Ecuadorean coast.
13. Ecuador, Background Notes.
14. Site visit observations.
15. Ecuadorean Shrimp Fishery, 80-81, NMFS Publ. Division of Foreign Fisheries, NOAA IRF-81/91F Washington, D.C., May 1981, pp. 16. Hereby cited as NMFS IFR-81/91F.
16. Ibid. page 3
17. Ibid.
18. Ibid.
19. Ibid.
20. Ibid.
21. Ing. Miguel Fierro Samaniego, April 1985.
22. Ibid.
23. "El Nino's Ill Wind," Thomas Y. Canby, National Geographic, Vol. 165, No. 2, February, 1984, pp 144-183.
24. Ecuador's Shrimp Farms Go High-Tech, Bill Durkee, Seafood Leador, Winter, 1984, pp 26-32.
25. NMFS IRF-81/91F, P. 2.
26. Ibid.
27. Ibid, p. 3.

28. Ibid.
29. Various GOE Ministry of Fisheries Publications. Many GOE statistics do not coincide with U.S. reports.
30. Some industry observers are inclined to believe the explosive growth in mariculture has drawn interest from some shrimp trawler fishermen to change to mariculture.
31. Preliminary Report on Shrimp Culture Activities in Ecuador, Yosuke Hirono, J. of the World Mariculture Society, Vol. 14, 1983, pp. 451-457.
32. Ibid., p. 451.
33. Ibid., p. 452.
34. Snedaker, April, 1985.
35. Many industry reports are fairly optimistic about production for 1986 since hatchery production has progressed rapidly in late 1985 and early 1986.
36. NMFS IFR-81/91F, p.s.
37. Boletin Cientifico y Tecnico, Especies de Camarones Marinos (Peneaus) Que Sa Han Adaptadi a Las Condiciones de Cultivo in Ecuador, Medardo Cien, Vol. 5., No. 3, Ecuador INP 1982, pp. 33-38.
38. Ibid., p. 35.
39. Ibid., p. 36.
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41. Snedaker, April, 1985.
42. LiPuma and Meltzoff, p. 10.
43. Ecuador Shrimp Industry, Pros and Cons of U.S. Private Investment, Dept. of State Airgram Amconsul, Guayaquil, Ecuador 6/7/84, p. 19, hereby cited as Airgram Amconsul.
44. LiPuma and Meltzoff, p. 10.
45. Ibid.
46. Site visit observation.
47. Ibid.
48. LiPuma and Meltzoff, p. 11.
49. Hirono, p. 454.
50. LiPuma and Meltzoff, p. 7.
51. Ibid.
52. Ecuadorean Exporter who was extremely helpful in providing information, but prefers to remain anonymous.
53. Hirono, p. 454.
54. Fierro, April, 1985.
55. Snedaker, April, 1985.
56. LiPuma and Meltzoff, p. 12.
57. Shrimp Farming: A Business Today; Profits and Problems, Peter Shayne, Proceedings of the 34th Annual Gulf and Caribbean Fisheries Institute, November, 1981, Vol. 34, pp. 90-94.
58. LiPuma and Meltzoff, p. 12.
59. Hirono, p. 455.
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62. Ecuadorean Shrimp (1985-1986 Update), NMFS, F/M321: DW IFR-86/07 P. 12.
63. Fierro and Miranda, April, 1985.
64. Shayne, p. 93.
65. LiPuma and Meltzoff, p. 13.
66. Statement Before the U.S. ITC, Emilio Parodi, President Chamber of Shrimp Producers of Ecuador, New Orleans, March 21, 1985, p. 35.
67. Almost every report analyzing the Ecuadorean Shrimp industry and the postlarvae seed problem projects demands for 1990. It is rather difficult to approximate number due to the uncertainty of hectares constructed. Most indicate demands between 20-30 billion postlarvae will be needed.
68. Parodi, p.7.
69. Report of U.R.I. Consultancy on Potential Role of ESPOL in Artisanal Fishery Development in Ecuador, Richard Pollnac and Steven Drew, ICMRD, U.R.I., March, 1985, p. 15.
70. Ibid. pp. 13-14.
71. LiPuma and Meltzoff, p. 5.
72. Ibid., p. 5.
73. Pollnac and Drew, p. 14.
74. Fierro, April, 1985.
75. LiPuma and Meltzoff, p. 6.
76. Ibid.
77. Ibid.
78. Personal communication with various shrimp farmers during site visits in 1981-1983.
79. NMFS
80. NMFS IFR-86/07, p. 2.
81. Personal observation during shrimp farm visits.
82. LiPuma and Meltzoff, p.6.
83. Ibid.
84. Snedaker, April, 1985. Almost every recent report on the Ecuadorean shrimp industry acknowledges the postlarvae crisis.
85. Durkee, p. 28.
86. Snedaker, April, 1985.
87. Canby, pp. 160-170.
88. See above number 79-81.
89. Personal communication with Sarah Meltzoff - Rosenstiel School of Marine and Atmospheric Science, U. of Miami, March, 1985. Meltzoff had just returned from Ecuador where she investigated, with Edward LiPuma, the socio-economic development of the shrimp industry.
90. Ibid.
91. Fierro, April, 1985.
92. Espol has a few investigations underway, of which one was to be completed in early 1986. FAO and British and French investigation teams have completed some preliminary studies, although the author has not obtained that information for this report.
93. NMFS IFR-86/07, pp. 5-6.
94. LiPuma and Meltzoff.
95. NMFS IFR-86/07 p. 2.

96. Ibid.
97. Ibid., p.6.
98. Ibid.
99. Ibid.
100. Report on Penaeud Shrimp Culture Consultation and Visit, Guayaquil, Ecuador, S.A., C.R. Mock, J. Of World Mariculture Society 13:165-184, 1982.
101. Ibid., p. 170.
102. Ecuadorean Shrimp Hatcheries, NOAA, NMFS, F/M321:DW IFT-85/3-B p. 15.
103. NMFS IFR-86/07, p.1.
104. Ibid. p.7.
105. The Ecuadorean Navy has one of the largest shrimp operations in Ecuador, Snedaker, 1985 - See Section on Government Intervention.
106. Anonymous Ecuadorean Exporter
107. NMFS IFR-85/3-B, p.6.
108. Ibid.
109. Ibid.
110. Informe Sobre La Investigacion Del Cultivo de Eamarones en El Ecuador, Richard A. Neal, U.S. AID Publ. September, 1976,pp 19.
111. Shayne, p. 92.
112. Ibid.
113. Fierro and Miranda, April, 1985.
114. NMFS IFR - 86/07, p.8.
115. Miranda, April, 1985.
116. NMFS IFR-86/07, p. 7.
117. Durkee, p. 29.
118. NMFS IFR-86/07, p. 7.
119. Ibid.
120. It is common knowledge that foreign investment is deeply rooted in the industry, particularly U.S. interests. Most reports confirm this situation.
121. Airgram Amconsul, p. 12.
122. NMFS 86/07, p. 7.
123. LiPuma and Meltzoff, p. 17.
124. Fierro, April, 1985.
125. NMFS-86/07, p. 9.
126. ITC Proceedings, Statement by Charles Peckham, Consultant, pp 245-252.
127. Fierro, April, 1985.
128. Personal Communication with various U.S. importers in New York, Miami, and California, Spring, 1986.
129. Airgram Amconsul, p. 11.
130. Personal observation from 1981-1983.
131. State by Parodi, ITC Proceedings, p. 17.
132. Every industry report indicates this export volume.
133. Personal Communication with John Vondruaka, March, 1986.
134. Personal communication with various U.S. importers.
135. Personal communication with a Californian importer of Latin American shrimp.
136. Personal attendance of the 1982 Annual Shrimp Conference of the Ecuadorean Shrimp Association, February, 1982.

137. Personal observation.
138. NMFS IFR 86/07, p.4.
139. Airgram Amonsul, p. 7a.
140. Ecuadorean Exporter.
141. Communication with Meltzoff, March, 1985.
142. NMFS IFR-86/07, p. 5.
143. Ibid.
144. Meltzoff, March, 1985.
145. Snedaker, May, 1985.
146. Amendments to Ecuador's Fishing Laws, U.S. Dept. of State, Amconsul, Ecuador, August, 1979, hereby cited as Ecua Fishing Amendments.
147. Ibid.
148. Conversations with Snedaker, Meltzoff, and other industry specialist, including various U.S. importers.
149. Snedaker, April, 1985. Dr. Snedaker was allowed to visit the Navy operations, but was prohibited from taking photographs.
150. Snedaker, June, 1985.
151. Conditions of Competition Affecting the U.S. Gulf and South Atlantic Shrimp Industry, U.S. ITC Publ. 1738, Washington D.C., August, 1985, p. 277, cited p. 84.
152. Snedaker, June, 1985.
153. Meltzoff, March, 1985.
154. Ecua Fishing Amendments.
155. Fierro, April, 1985.
156. Snedaker, June, 1985.
157. Ibid.
158. NMFS IFR-86/07, cited from Cornelius Mock, a well reknowned shrimp industry specialist.
159. Fierro and Miranda, April, 1985.
160. Ecuadorean exporter, various U.S. Importers confirmed these statements.
161. NMFS IFR-86/07, p. 2.
162. Airgram Amconsul, p. 15-16.
163. Ibid.
164. Ibid.
165. Official Transcript of ITC Proceedings, Statement of Emilio Parodi, p. 2.
166. Ibid.
167. Airgram Amconsul, pp. 15-16.
168. Conversations with various U.S. importers.
169. Airgram Amconsul, p. 18.
170. Personal observation and communication with various Ecuadorean nationals. There is an obvious dissatisfaction with the present administration. U.S. newspapers have also reported a rising number of civil and military disturbances in the last two years.
171. Economic Assessment of Trends in Shrimp Fisheries, Markets, Mariculture and Analog Products, John Vondruska, NMFS, Comments on the Proceedings of the Workshop on Shrimp and Prawn Markets, 1985, pp 77-98, hereby cited as Vondruska, comments, 1985.
172. Vondruska, Trends, p. 2.
173. Vondruska, Comments, 1985, p. 80.
174. Proceedings, ITC, Statement by Parodi, p. 26.
175. Vondruska, Trends, p. 84.

176. Many U.S. industry reports indicate this situation of overfishing. At this point, it can be considered common knowledge among industry specialists.
177. Belizean Mariculture Limited, Thesis by Bennett, King, Kirsch, Nielson, and Webb from the Monterey Institute of International Business, May, 1985, pp 179, cited p. 50.
178. Statement by Parodi, p. 34.
179. See supra number 176.
180. Conditions of Competition, ITC Publ. pp. 17-21.
181. Communication with various U.S. Importers and NMFS specialists.
182. Ibid.
183. Draft: The Outlook for Salmon and Shrimp Aquaculture Products In World Markets, NMFS, November, 1984, pp 23-25.
184. Statement by Parodi, p. 4.
185. Fierro, April, 1985. Ing. Fierro was convinced this measure was the least likely to succeed because of the poor performance of their programs.
186. Communication with John Vondruska, June, 1985.

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4. Ecuadorean Fishery Events, NMFS IFR-81/150 1981
5. Ecuadorean Aquaculture Developments, NMFS IFR-80/102 1980
6. Statistical Appendix to Annual Fisheries Report, 1980 U.S. Department of State, Amconsul Guayaquil, October 1980
7. Conversations with Dennis Weidner, Office of International Fisheries, NMFS, Washington, D.C.
8. Various NMFS offices around the United States

II. Industry Sources:

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2. Coastal Aquaculture, Texas Agricultural Extension Service, Texas A & M University, 1984-1985.
3. National Fisherman, Journal Publication, Inc., Camden, Maine, Volumes 1980-1986.
4. Seafood Leader, Waterfront Press Company, Seattle, Washington, 1983-1986.
5. Correspondence with Ecuadorean Exporters, 1985-1986.
6. Correspondence with U.S. Ecuadorean officials, 1984-1986.
7. Numerous conversations with various importers of Latin American shrimp, particularly importers of Ecuadorean products, 1985-86.

III. Ecuadorean Sources:

1. Diagnostico Y Recomendaciones Sobre El Recurso Camaron Subsecretaria De Recursos Pesqueros, by Rodolfo Barnoil Zerega, Ecuador, 1980.
2. Various Ecuadorean exporters and industry observers.

APPENDIX A: ECUADOR, SHRIMP HATCHERIES

Appendix A --Ecuador. Shrimp hatcheries, 1985

AQUABIOS, S.A.
Av. C.J. Arosemena, Km. 4
Guayaquil, Ecuador
Telephone: 386600

Aquacultura de Tonchigue
Address unavailable
Esmeraldas, Ecuador

AQUACOP
Address unavailable

Acuapoli, S.A.
Edif. Banco Internacio, Of. 902
Av. Patria 640 y Amazonas
Guayaquil, Ecuador

AQUALAB
(Delfini/Filanbanco)
Casilla 5738
Guayaquil, Ecuador
Telephone: 373813, 373415

AQUASEMILLAS
Casilla 5608
Guayaquil, Ecuador
Telephone: 399-313

AQUASPECIES, S.A.
Casilla 191-P
Guayaquil, Ecuador

Jorge Cabal and Cabral Brazil
Briseno, Bahia, Manabi

Piproisa
8° Piso
Av. Quito 806 y 9 de Octubre

Esteban Quirola
Address unavailable
Avenque, Guayas
Ecuador

SEMACUA
(FRESCAMAR)
Apartado 9796
Letamenti 113
Guayaquil, Ecuador

Somicosa S.A.
Of. 8184
Boyaca y 10 de Agosto
Guayaquil, Ecuador

Note: Some projects are not listed at the request of the owners.

Source: NMFS Branch of Foreign Fisheries Analysis

Camaronera Deli
Casilla 9282
Guayaquil, Ecuador

CAMLAB
Address unavailable
Telephone: 351-403, 353-157

Casapesca S.A.
Casilla 4256
Guayaquil, Ecuador

CRIDEC
(Empacadora Nacional)
Apartado 4344
Guayaquil, Ecuador
Telephone: 515845

Criolla
Address unavailable
Ayangue, Ecuador

Javier Duenas
Address unavailable
Bahia, Manabi
Telephone: 399-256

Emagro C. Ltda.
Casilla 2822
Manta, Ecuador
Telephone: 373-415, 610-326,
241-889

Escamarlan, S.A.
Address unavailable
Campanal, Esmeraldas

Escuela Politecnica de Guayaquil
(ESPOL)
Casilla 5863
Guayaquil, Ecuador
Telephone: 303040-Ext 120
Telex: 43509 Espol- ED

Gallardo
Address unavailable
Manglaralto, Guayas
Ecuador

Gomez-Jimenez
Address unavailable
Ayengue, Guayas
Ecuador

Granpac
(El Rosario)
Casilla 659
Guayaquil, Ecuador
Telephone: 431327

INACA
Address unavailable

Inbiosa S.A.
(FINANSUR/MARDELSA)
Casilla 6020
Guayaquil, Ecuador
Telephone: 370-087, 391-117

INDULARVA
(COSEMAR)
Casilla 1230
Guayaquil, Ecuador
Telephone: 398-710

Instituto Nacional de Pesca (INP)
Casilla 5918
Guayaquil, Ecuador
Telephone: 405-859

Langolit S.A.
(Baltec)
Casilla 333
Guayaquil, Ecuador
Telephone: 307-042, 399-528

LARVAMAR
Address unavailable

MACRO BIO
(Caterpillar)
Address unavailable
Ayengue, Guayas
Ecuador

Noramac
(Langostinos/Wind)
Casilla 329
Guayaquil, Ecuador
Telephone: 383620

Eduardo Perez
Casilla 6271
Guayaquil, Ecuador
Telephone: 350-833

APPENDIX B: ECUADOREAN SHRIMP EXPORTERS

Appendix B

EMPRESAS EXPORTADORAS DE CONSERVAS DE PESCADO Y OTROS PRODUCTOS.-

1º. ALIMENTOS DEL MAR S.A. (ALMAR).-

Sr. Eduardo Paredes Romero, Gerente
Los Ríos Nº. 811 y 9 de Octubre
Telef. : 390499
Casilla : 6096
Cable : ALMAR-GUAYAQUIL
Ciudad : Guayaquil.-

2º. ANDINA DE ALIMENTOS CIA. LTDA.-

Sr. Juan Sotomayor, Gerente
Km. 2 1/2 Panamericana sur, El Arenal
Telef. : 822919 - 830632
Casilla : 175 - 5011
Cable : ABA-CUENCA
Telex : 877045 - ABA
Ciudad : CUENCA.

3º. CONSERVAS ISABEL ECUATORIANA S.A.-

Sr. Pedro Corrales B., Gerente
Telef. : 610399 - 610928
Casilla : 4863
Cable : ECUSABEL - MANTA
Telex : 6184 - ECUBEL - ED
Ciudad : Manta .-

4º. COMPAÑIA PESQUERA INTEGRAL DEL ECUADOR C.A. (INPESCA).-

Sr. Dr. Angel Duarte Valverde, Presidente
Sr. Dr. Nelson Tavares de Almeida, Gerente
Robles Nº. 107 y Chambers
Telef. : 330532 - 330557
Casilla : 15186
Telex : 3667
Ciudad : Guayaquil.-

5º. CONSERVAS ALIMENTICIAS ECUATORIANAS S.A. (CONALEC).-

Sr. Ab. Rómulo López, Gerente
Km. 8 1/2 Vía Daule
Telef. : 350777
Casilla : 7368
Cable : CONALEC
Ciudad : Cuayaquil.-

6º. CORPORACION INDUSTRIAL PESQUERA S.A. (COINPE).-

Sr. Bolívar López Jara, Gerente
V.M. Rendón y Pichincha, esq. Edif. K2.
Telef. : 392504 - 396551
Casilla : 2214
Cable : COINPE
Ciudad : Guayaquil

7º. CONSERVERA DEL PACIFICO C.A. (COPAC).-

Sr. Arq. Hugo Delgadillo, Gerente
Baquerizo Moreno Nº. 111 y 9 de Octubre, 5to. piso
Telef. : 307290 - 307391
Casilla : 6661
Cable : COPAC
Tlx. : 3206 - COPAC-ED

8º. CONSERVERA SANTA ROSA CIA. LTDA.-

Sr. Angel Duarte Valverde, Gerente
Robles Nº. 107 y Chambers
Telef. : 330532
Casilla : 15186
Telex : 308 - 3667
Ciudad : Guayaquil.-

9º. CONSERVERA TROPICAL.-

Sr. Hans Nottbohm, Gerente
Los Esteros, Manta
Telef. : 610139 - Manta
Casilla : 4783
Ciudad : Manta - Manabí

10º. EMPACADORA ECUATORIANA DE PRODUCTOS DEL MAR C.A. (EPROMAR).-

Sr. Lcdo. Carlos Andrade A., Gerente General
Chimborazo Nº. 418, 5to. piso
Telef. : 528836
Casilla : 6096
Cable : EPROMAR
Telex : 3364 EPROMAR-ED

11º. EMPRESA PESQUERA POLAR S.A.-

Sr. Carlos Cacao Zelaya, Gerente
Robles Nº. 107 y Chambers
Telef. : 341222 - 340851
Casilla : 9411
Cable : POLAR
Telex : 3206 COPAC-ED

12º. EXUMAR S.A.-

Sr. Julio César Salazar B., Gerente
Alm. Luis Molestina Villafuerte, Presidente
Villafuerte Nº. 703 e Imbabura
Telef. : 303244
Casilla : 10446
Cable : EXUMAR
Ciudad : Guayaquil.-

13º. EMPACADORA Y PROCESADORA DEL PACIFICO C.A.-

Sr. Dr. Roberto Machuca, Gerente
Primero de Mayo Nº. 206 y Quito, tercer piso
Telef. : 397480 - 397489 - 378751
Casilla : 936
Cable : EMPACA
Telex : 3439 EMPAC-ED
Ciudad : Guayaquil.-

14º. ENLATADORA ECUATORIANA DE ALIMENTOS CIA. LTDA.-

Sr. Alberto Negrón Fisher, Gerente
Sucre Nº. 203, 5to. piso, Ofic. 2
Fábrica: Calle 1era. y 5ta. Mapasingue - Gquil.
Telef. : 351481
Casilla : 4647
Cable : SOLIMAR
Ciudad : Guayaquil.-

15º. FRIGORIFICO DEL MAR CIA. INDUSTRIAL LTDA. (FRIGOMAR).-

Sr. Ing. Ramiro Cárdenas, Gerente
Los Esteros, Manta
Telef. : 610175
Casilla 4822
Ciudad : Manta.-

16º. HARINAS DEL MAR S.A. (HARIMAR).-

Sr. Econ. Guillermo Sarmiento Pineda, Gerente
Ilanes y 1era. Condominio de Viviendas y Jardines,
Bloque Nº. 1, 3er. piso, Dpto. 4.
Telef. : 384144 - 386190
Casilla : 8602
Telex : 2501 Dator-ED-HARIMAR
Ciudad : Guayaquil.-

17º. INDUSTRIAL PESQUERA MONTEVERDE C.A. (INPESCA).-

Ing. Gunther Lisken Buenaventura, Gerente
Sr. Econ. José Bodero - Sub-Gerente Exportador
Carchi Nº. 702 y 9 de Octubre, Edif. Salco, 5to. piso
Telef. : 396111
Casilla : 4093
Cable : INPESCA
Tlx. : 3268 INPESCA-ED
Ciudad : Guayaquil.-

18º. INDUSTRIA ECUATORIANA PROCESORA DE ALIMENTOS C.A. (INEPACA).-

Sr. Carlos Zárate, Gerente
Telef. : 610388 - 610709 - 610886
Casilla : 4881
Cable : INEPACA - MANTA
Telex : 4364 [illegible]
Ciudad : [illegible]

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19º. INDUSTRIA PESQUERA JAMBELI C.A.-

Sr. Julio Hidalgo Febres-Cordero, Gerente
5 de Junio Nº. 501 y Colombia
Telef. : 330100
Casilla : 8647
Cable : JAMBELI
Telex : 3634 - JAMBELI-ED
Ciudad : Guayaquil.-

20º. INDUSTRIA PESQUERA COUTRNY MAR CIA. LTDA.-

Sr. Francisco Cedeño, Gerente
Urdesa: Circunvalación Sur Nº. 1017 y Jiguas
Telef. : 386418
Casilla : 3936
Cable : COUNTRYMAR
Ciudad : Guayaquil.-

21º. INDUSTRIAL MARITIMA PESQUERA C.A. (IMARPECA).-

Sr. Ing. Jorge Gagliardo B., Gerente
Orellana Nº. 211 y Panamá, 5to. piso
Telef. : 307745 - 300600
Casilla : 7522
Cable : IMARPECA
Telex : 3625-IMARPE-ED
Ciudad : Guayaquil.-

22º. INDUSTRIA DE ENLATADOS ALIMENTICIOS (IDEAL).-

Sr. José Agudo Alvarez, Gerente
Montecristi, Km. 8 1/2 Carretera Portoviejo
Telef. : 612276 - 612278
Casilla : 4798
Ciudad : Manta.-

23º. INDUSTRIAS DEL MAR LUBAR.-

Sra. Marjorie Ubillus de Barcia, Gerente
Km. 4 1/2 , Carretera Manta - Portoviejo
Telef. : 610531 - 613629
Casilla : 3799
Oficina : Manta.-

24º. INDUSTRIA CONSERVERA DE LA PESCA CIA. LTDA. (INCOPES).-

Sr. José A. Castro Alvarez, Gerente
Calle 3era., Cdla. Mapasingue
Telef. : 350973
Casilla : 2027
Cable : INCOPES
Ciudad : Guayaquil.-

25º. INDUSTRIAL VALDIVIA CIA. LTDA. (INDUVAL).-

Sr. Segundo Cisneros E., Gerente
Malecón Y Pnargote - Libertad
Telef. : 393184 - Gquil.
772948 - Libertad
Casilla : 3777 - Gquil.
Oficina : Libertad.-

26º. LA PORTUGUESA S.A.-

Sr. Lcdo. Bernardo Higgins, Gerente
Venezuela Nº. 306 - 308 y Chile
Telef. : 341400
Casilla : 116
Cable : LA PORTUGUESA
Telex : 043319 LAPORT-ED
Ciudad : Guayaquil.-

27º. NEGOCIOS INDUSTRIALES REAL S.A. (NIRSA).-

Sr. Eduardo Aguirre, Gerente
Todos los Santos y V.E. Estrada, tercer piso - Urdesa Central
Telef. : 388200
Casilla : 1269
Cable : REALSA
Telex : 3377 REALSA-ED
Ciudad : Guayaquil.-

28º. NOREPESCA C.A.-

Abdón Calderón Prieto., Promotor
Gran Pasaje, 3er. piso, Ofic. Nº. 305
Telef. : 306244
Casilla : 843
Ciudad : Guayaquil.-

29º. PROTEINAS DEL MAR C.A. (PROTEICA).-

Sr. Jorge Taramelli, Gerente
Km. 1/2 Aven. Juan Tanca Marengo
Telef. : 272300
Casilla : 8337
Cable : PROTEICA
Telex : 3164 BAITAR-ED
Ciudad : Guayaquil.-

30º. PRODUCTOS DEL MAR S.A. (PROMASA).-

Sr. Enrique Baquerizo V., Gerente
Cdla. 9 de Octubre, calle 6ta. Nº. 602 y Aven. 6ta.
Telef. : 612180 - 431739 - 383983
Casilla : 8
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31º. PESQUERA DEL PACIFICO C. LTDA.-

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32º. PROMOCION NACIONAL DE TRANSACCIONES S.A. (PRONAT).-

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33º. PESQUERA SANTA ELISA S.A. (PESES).-

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34º. PESQUERA FERNANDEZ S.A.-

Sr. Manuel Ferreira Fernández, Gerente
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35º. PRODUCTOS LA CORONA.-

Sr. José Largacha Cevallos, Gerente
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36º. PESQUERA MANABI.-

Sr. Julio Chevasco, Gerente
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37º. PESQUERA REYES CIA. LTDA.-

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38º. PESQUERA BONANZA.-

Sr. Econ. Juan Brescia, Gerente
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39º. PRODUCTOS SI KIERO.-

Sr. Dr. Jaime Núñez del Arco, Gerente
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40º. PROCESADORA DE ANCONCITO DE PRODUCTOS DEL MAR S.A. (PROAMPROMAR).-

Sr. Abg. Carlos Andrade Arosemena,, Gerente
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41º. SOCIEDAD ECUATORIANA DE ALIMENTOS FRIGORIFICOS MANTA S.A. (SEAFMAN).-

Sr. Ramón González Artigas, Gerente
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DEPARTAMENTO DE COMERCIALIZACION.-

GCM/lmg.
20-X-82.

APPENDIX C: TARIFF SCHEDULES OF THE U.S. FOR SHRIMP IMPORTS

CSF	Item	Stat. Suffix	Articles	Units of Quantity	Rates of Duty		
					1	LDDC	2
			Shellfish, fresh, chilled, frozen, etc. (con.)				
			Oysters:				
			In airtight containers:				
	...30	00	Smoked	Lb.	6.5% ad val.	Free	7.5% ad val.
	114.30	05	Other	Lb.	4.5% ad val.		12.5% ad val.
	114.40		Other		Free		Free
		20	Seed oysters	bu.			
		40	Other	Lb.			
	114.45		Other shellfish		Free		Free
		10	Abalone	Lb.			
			Lobsters				
		15	In airtight containers	Lb.			
			Other:				
		20	Live lobsters	Lb.			
		25	Rock lobster tails	Lb.			
		30	Other	Lb.			
		37	Scallops	Lb.			
			Shrimp:				
		45	Shell-on	Lb.			
			Peeled				
		50	In airtight containers	Lb.			
			Other:				
			Not breaded:				
		57	Raw	Lb.			
		61	Other	Lb.			
		72	Breaded	Lb.			
		90	Other	Lb.			
			Shellfish juices in airtight containers:				
	114.50	00	Clam juice	Lt.	8.5% ad val.		35% ad val.
A	114.55	00	Oyster juice	Lt.	4.2% ad val.	Free	13% ad val.

Note: For explanation of the symbol "A" or "A*" in the column entitled "CSF", see General Headnote 3(c).

APPENDIX D: U.S. AND ECUADOREAN SHRIMP PRICE COMPARISONS

Comparison of Prices of Ecuador White and Gulf of Mexico Brown Frozen Headless Shrimp - 1980-85

Count/lb	JANUARY			APRIL			JULY			OCTOBER		
	Ecuador	G of M	Difference	Ecuador	G of M	Difference	Ecuador	G of M	Difference	Ecuador	G of M	Difference
	1985											
U-15	8.50	7.75	0.75									
16-20	7.10	6.55	0.55									
21-25	6.05	5.55	0.50									
26-30	5.15	4.90	0.25									
31-35	3.75	3.60	0.15									
36-40	3.60	3.45	0.15									
41-50	3.40	3.15	0.25									
51-60	3.30											
61-70	3.05	2.90	0.15									
	1984											
U-15	7.95	7.65	0.30	8.30			8.70	8.50	0.20	8.70	8.10	0.60
16-20	7.30	7.10	0.20	7.70			7.75	7.45	0.30	7.50	6.45	1.05
21-25	6.50	6.15	0.35	6.65	6.80	(0.15)	6.30	5.90	0.40	6.15	5.45	0.70
26-30	5.35	5.45	(0.10)	5.60	5.75	(0.15)	5.30	5.15	0.15	5.15	5.05	0.10
31-35	5.00	5.10	(0.10)	5.10	5.35	(0.25)	5.05	4.75	0.30	4.50	4.10	0.40
36-40	4.45	4.80	(0.35)	4.30	4.60	(0.30)	4.15	3.85	0.30	3.85	3.55	0.30
41-50	3.95			4.05	4.15	(0.10)	3.75	3.40	0.35	3.50	3.25	0.25
51-60	3.75	3.75	---	3.85	4.00	(0.15)	3.70	3.15	0.55	3.30	3.15	0.15
61-70	3.15			3.25			3.05	2.70	0.35	3.05	2.90	0.15

1983

0-15	7.65	7.50	0.15	7.50	7.40	0.10	7.60	7.65	(0.05)	7.45	7.30	0.15
16-20	7.40	7.40	---	7.15	7.20	(0.05)	7.55	7.55	---	7.30	6.90	0.40
21-25	7.15	7.20	(0.05)	6.80	7.00	(0.20)	7.35	7.35	---	6.85	6.10	0.75
26-30	6.60	6.65	(0.05)	5.85	6.10	(0.25)	6.05	6.20	(0.15)	5.65	5.60	0.05
31-35	5.80	5.80	---	5.45	5.55	(0.10)	5.55	5.75	(0.20)	5.35	5.35	---
36-40	5.35	5.40	(0.05)	5.17	5.25	(0.08)	5.27	5.45	(0.18)	5.10	5.05	0.05
41-50	4.80	4.85	(0.05)	4.65	4.75	(0.10)	4.85	5.00	(0.15)	4.50	4.55	(0.05)
51-60		4.45		4.15	4.25	(0.10)				3.70	3.70	---
61-70	4.00	4.10	(0.10)	3.87						3.25	3.25	---

1982

0-15	7.15	7.15	---	6.70	6.90	(0.20)	6.60	6.60	---	7.30	7.30	---
16-20	6.30	6.30	---	6.70	6.75	(0.05)	6.60	6.50	0.10	7.25	7.15	0.10
21-25	5.50	5.35	0.15	6.25	6.35	(0.10)	6.35	6.15	0.20	6.95	6.75	0.20
26-30	4.50	4.55	(0.05)	5.90	6.15	(0.25)	5.95			6.55	6.55	---
31-35	4.15	4.35	(0.20)	5.65	6.00	(0.35)					5.65	
36-40	3.70	3.75	(0.05)	5.15	5.50	(0.35)	5.00	4.55	0.45	4.95	5.10	(0.15)
41-50	3.35	3.35	---	4.65	4.90	(0.25)		3.80			4.60	
51-60	3.05	3.15	(0.10)	4.10	4.40	(0.30)		3.35		4.00	4.15	(0.15)
61-70	2.70	2.80		3.20	3.50	(0.30)	2.85	2.85	---		3.70	

1981

		1/										
0-15	5.60	5.40	0.20	6.15	6.15	---	6.35	6.45	(0.10)	6.70	6.80	(0.10)
16-20	5.35	4.95	0.40	6.05	6.10	(0.05)	6.30	6.35	(0.05)	6.50	---	
21-25	5.10	4.55	0.55	5.80	5.85	(0.05)	5.80	5.70	0.10	5.45	4.60	0.85
26-30	4.35	4.20	0.15	4.85	4.85	---	4.70	4.55	0.15	4.30	3.85	0.45
31-35	3.60	3.60	---	3.90	4.00	(0.10)	3.75	3.65	0.10	3.75	3.75	---
36-40	3.45	3.45	---	3.75	3.80	(0.05)	3.55	3.30	0.25	3.30	3.30	---
41-50	3.30	3.25	0.05	3.50	3.55	(0.05)	3.30	3.05	0.25	3.00	3.00	---
51-60	3.02	3.05	(0.03)	3.30	3.45	(0.15)	3.10	2.85	0.25	2.80	2.85	(0.05)
61-70	2.82	2.80	0.02	3.15			2.90	2.65	0.25	2.65	2.60	0.05

1/ December 31

1980

		2/										
0-15	6.15	6.10	0.05	5.55	5.25	0.30	5.30	5.30	---	5.40	5.00	0.40
16-20	5.90	5.75	0.15	5.10	4.95	0.15	5.10	5.00	0.10	5.05	4.65	0.40
21-25	5.80	5.70	0.10	4.85	4.90	(0.05)	5.05	4.90	0.15	4.90	4.35	0.55
26-30	5.45	5.50	(0.05)	4.65	4.75	(0.10)	4.50	4.50	---	4.40	4.20	0.20
31-35	5.00	5.10	(0.10)	4.45	4.50	(0.05)	3.90	3.85	0.05	3.65	3.65	---
36-40	4.30	4.20	0.10	3.80	3.80	---	3.70	3.70	---	3.45	3.45	---
41-50	3.80	4.00	(0.20)	3.40	3.65	(0.25)	3.45	3.40	0.05	3.25	3.25	---
51-60	3.20	3.35	(0.15)	3.10	3.10	---	3.00	3.00	---	3.00	3.05	(0.05)
61-70	2.95	3.05	(0.10)		2.80		2.75	2.70	0.05	2.80	2.80	---

2/ January 18

Source: National Marine Fisheries Service