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and species collected from May to June 1992 are shown in Table 5.

Table 5. Data on collection of juvenile fishes at rearing sites.

DATE	PLACE	SPECIES	QUANTITY	OBSERVATION
May 15, 92	Posorja	Robalo	0	According to local fishermen Robalo can be caught during June-September
May 22, 92	Puerto del Morro	Robalo	0	According to fishermen Corvinas and Robalos can be caught all year round
May 25, 92	Sabana Grande	Robalo	0	According to fishermen Robalo can be caught mainly during October
Jun. 1-2, 92	Puerto del Morro Red de cerco	Robalo/Corvina	21 Juveniles	Fishes were caught during low tide, they got stressed and died
Jun 4, 92	Palmar/Red de cerco	Robalo	50 Juveniles	Fishes were obtained from a shrimp pond, good survival was observed
Jun 12-13, 92	Machala (Bravito) Atarraya	Robalo	61 Juveniles	Fishes were transported by air and ground
Jun. 17, 92	Palmar/ Trasmallo	Robalo Lenguado	30 5	Fishes were caught from pond reservoir with trasmallo. Survival was low.
Jul. 2/92	Bahía de Caraquez/ Bolsos	Robalo	168 Juveniles	After one week survival was 3%

Stress problems caused due to transportation and handling of juvenile organisms were studied in two transportation assays which are described as follow:

3.0 Seed production and rearing mangement

3.1 Initial trials on transportation of snook juveniles

One of the snooks called "Robalo" (*Centropomus nigrescens*) is a potential fish for pond cultivation in Ecuador (unpublished data). However, the collecting technique of the species for not only spawners but also juveniles has not yet been established. Before carrying out an artificial

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fertilization in captivity, it is important obtaining information on the way fish juveniles are collected and also how they are brought into a mature age.

Materials and method

The "Robalo" juveniles were obtained from one shrimp pond around Machala on June the 3rd and Manta on July the 2nd, 1992. The first samples were transported by two means, *viz.* airplane and car, whilst second set only by car.

Packing method for both were basically the same:

1) Five juveniles with 15-25 cm in standard lenght were accommodated with 5-7 liters of oxygen saturated sea water.

2) A plastic bag containing animals with sea water was inflated with oxygen and accommodated in a carton box.

3) Before shipping, sea water temperature was lowered 3-5 °C namely to 21 to 23 °C.

4) Animals from Manta underwent a preliminary experiment. They were immersed in sea water containing 50 and 200 mg/l of a type of anesthetic, "FA 100" (Tanabe - Seiyaku Co., Ltd, Japan).

Transportation procedures and survival

Machala

A total of 65 juveniles were packed at 11h55 and afterward they were transfered by boat and car to Machala Airport, arriving at 12h20. Then the juveniles packed were divided into two groups to be transported by: light airplane and jeep-type car. At 13h22 airplane and car left at the same time there for Ayangue Airport and the Centro Nacional de Acuicultura e Investigaciones Marinas (CENAIM) laboratory.

1) The light airplane arrived at Ayangue Airport al 14h22 and the car arrived at the labolatory 14h40, taking four and an half hours.

Upon arriving one out of 38 were found dead (i.e 97.4% survival rate)

2) The jeep - type car reached the labortatory at 18h00, taking eight hours in total. Three out of 27 were found dead giving 88.9% survival rate.

2. Manta

On July the 2nd, a total of 27 juveniles were packed and immediately left (14h15) Manta for CENAIM, arriving at it at 17h25, taking three hours and ten minutes. Upon arrival from 27, 21 juveniles were counted as being found dead (i.e 22.2% survival rate).

On July the 22nd at 13h45, a total of 70 juveniles were packed: 60 without anaesthetic and two sets of five individuals each, which were submerged into sea water containing 50 and 200ppm of anesthetic (see above). Immediately after left for CENAIM laboratory, the car arrived at 17h15, taking three and an half hours. Upon arrival, one out of 5 with 200ppm of anesthetic was found dead, showing 98.3% survival rate, but the rest died the following mornig. Others with/without anesthetic were all alive resulting in 100% survival rate.

Discussion

During collection and packing juveniles it was observed that most of the animals were injured showing broodspots and scale-removed skins due to 1) rough handling, 2) harvesting method and 3) vigorous motility of the fish juveniles during hand collection. Therefore, an improvement of the rough handling and collecting techniques should be necessary for a large scale trasnportation.

Aside from the skin damage, the heavy mortality on July the 22nd (Manta) migth be caused by the relatively extremely low water temperature 14 °C.

This exercise has shown that a large mass of juveniles for rearing purposes could be transported for long hours (~ eight hours) being anesthetized or not, with a high survival rate. Thus, from the economical point of view, to carry out an experiment on density and durability of the juveniles is highly necessary to obtain the final conclusion on this technique. Relationship between body weight and standard length of juvenils snook *Centropomus nigrescens* are shown in Figure 3.

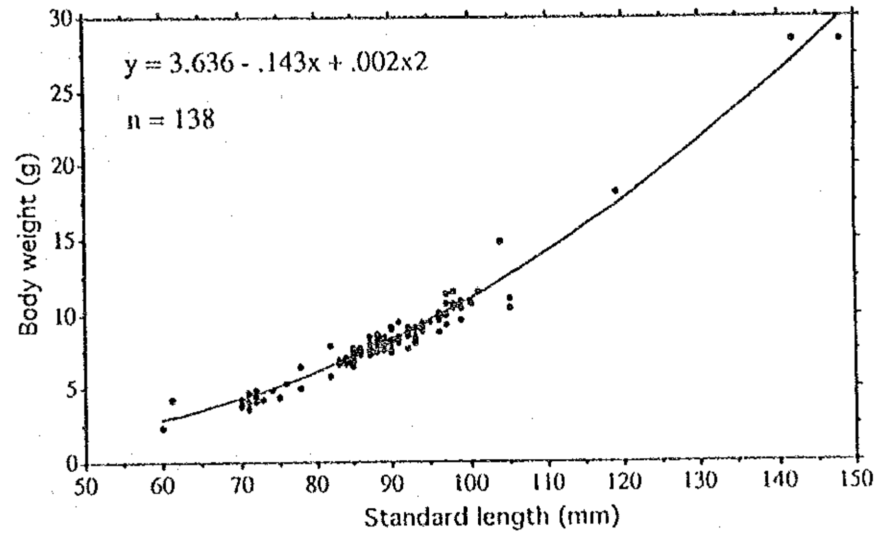

Fig. 3. Relationships between body weight and standard length of "Robalo" *Centropomus nigrescens* juveniles

3.2 Wild fry transport and rearing experiment

Two experiments were carried out during the period starting on October 28 and November 10, 1991. The 304 wild larvae of *Achirus* sp. were collected with a triangular net, at shore waters in front of the CENAIM.

The larvae were stocked in three fiberglass aquaria (60x30x36cm), filled with 50 l filtered sea water, at a density of 1.3, 2 and 2.8 larvae/l in the aquaria A1, A2 and A3, respectively. The average length of the larvae used were 3.9 mm with an average wet weight of 0.2 mg.

The larvae were fed once a day with rotifers (5 individuals/ml) and artemia nauplii (5 - 10 individuals/ 10 ml), furthermore algae were added to be used as a food for the remaining rotifer. Once the metamorphosis occurred the diet was complemented with shrimp meat and freeze-dried squid. Two hours after feeding, a botton cleaning and 50% water change were done to prevent contamination.

Results and discussion

In the first experiment (A1) the average length and wet weight were 13.0 mm (Fig. 4) and 12.3 mg, respectively with a mortality rate of 20.6% (Fig. 5), and there was a critical period when the metamorphosis occurred (migration of the eye), that started in both experiments at the 5th day of rearing. In the second experiment the average length and wet weight were 12.5mm (Fig. 4) and 12.0 mg, respectively, with a mortality of 97.0% (A2) and 100% (A3) (Fig. 5). The average temperature during the experiment was 24.5°C.

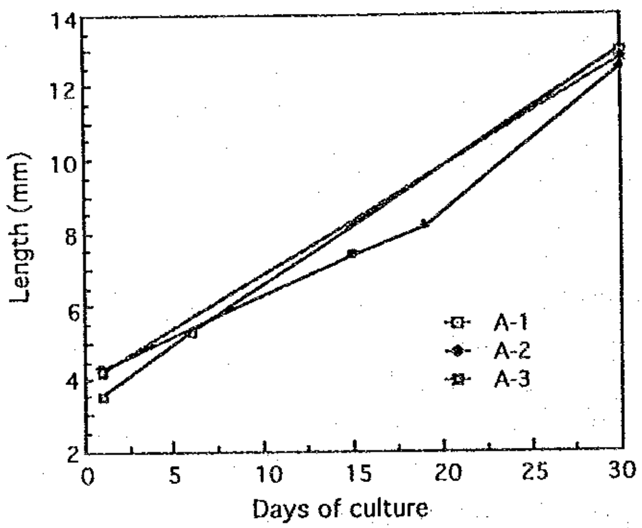

Fig. 4. Average total length of *Achirus* sp for 30 days

In the second experiment (A2, A3) a high mortality occurred due to a bloom of bacteria and fungi.

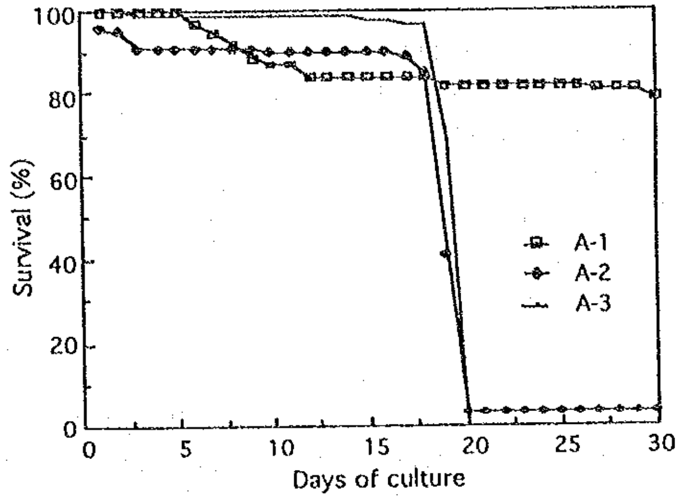

Fig. 5. Survival rate of *Achirus sp* for 30 days

The daily mean length increment was 0.43 mm in the first experiment and 0.42 mm in the second. These are high increments if we compare them with the results obtained in growing tests of flat fish larvae reported in other countries; thus, Yasunaga (1971) working with *Paralichthys olivaceus* obtained daily increment in length of 0.24mm; growing experiments in which with *P. adpersus* showed an increment of 0.21 mm. Silva and Flores, 1987 reported.

3.3 Food organims culture

The purpose of this experiment is to determine the highest growth rate of rotifers *Brachionus plicatilis* fed with three different types of food.

Materials and Methods

Four two-liters flasks were used to culture rotifers with filtered sea water and animals were stocked at a density of 16 individuals/ml for three flasks, and the last one at 0.8 individuals/ml as a control.

In the experiment, *Tetraselmis maculata, Isochrysis galvana* and bread yeast were used as food. Rotifers in control were feed whit *T. maculata* with the same density. Feeding was done once a day at the rate of 150,000 algae cells/ml and 1g of yeast/10^6 rotifers, the yeast was dissolved in freshwater and then added to the culture media.

The water change was done when the number of rotifers carring eggs decrease less than the 40% of the total population, and/or the culture media seemed to be contaminated.

Results

The rotifers produced a higher increase with *T. maculata*. On the other hand, rotifers fed with bread yeast and *I. galvana* showed a decrease in the population density and a heavy contamination (Fig. 6).

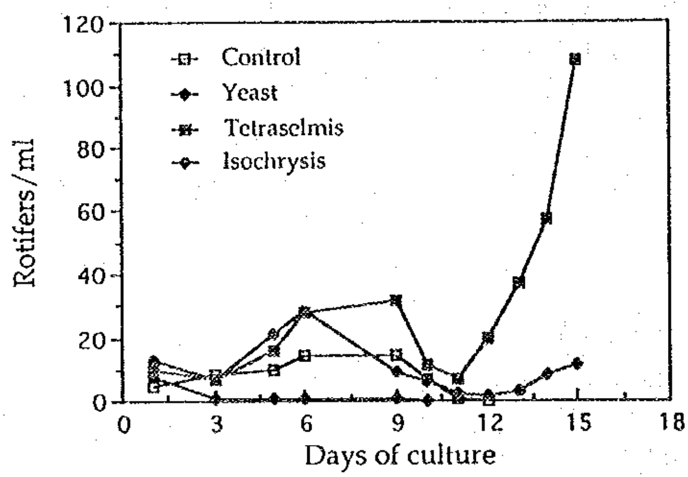

Fig. 6 Growth of rotifers during the experiment

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SHRIMP FRY COLLECTING GEAR USED IN ECUADOR TODAY

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Abstract

Along the Ecuadorian coast, shrimp fry collectors gear have been used for more than ten years. Those consists of six gear, namely three stationary and three mobile. The construction and dimension of these gear are explained and illustrated as well as the way of manner they are employed. Some ecological notes of shrimp fry are given. This gear prove to be useful to collect fish fry for fish culture. Finally some recommendations on how to improve handling fry for their better survival rate are suggested.

Key words: Fishing gear, Shrimp fry collection.

Introduction

In Ecuador during 1991, statistics shows that the annual production of shrimp was 125,865 metric tons, of this amount 79,407 metric tons were exported with a selling value of ca. US$ 491 millions. Shrimp raised in farms accounted for 89% of the total production (anonymous, 1992).

Surveys of wild fish fry along the Ecuadorian coast were carried out to determine whether there are fish fry available for farming as seedling or not. During these surveys the authors noted the existence and use of six types of shrimp fry collecting gear. These tools presently used by local fry collectors are worthwhile to be studied from both the manner by which they are operated and the ecological impact of their use. However, it is a concern that in the near future most of these gear in use might be abandoned due to a low profitable catching effort as well as lack of natural resources and/or environmental change which in part could not permit the fry survival. Therefore, it is important to keep a record of these unique gear.

This paper describes various types of shrimp fry collecting gear, all of which have been used for more than 10 years in Ecuador. There are a few notes on the effects of using these collecting gear on the coastal ecology.

Furthermore, this study provides not only basic information on shrimp fry collection at the present, but also those on fish fry. The later is important for the potential fish culture in Ecuador.

Materials and methods

The shrimp fry collecting gear described here were observed during the field surveys on wild fish fry (seedling) which was conducted almost throughout the Ecuadorian coast line, northward to Esmeraldas and southward to Machala, from 1990 to 1992 (Fig. 1).

Illustrations made by a scientific illustrator, Mr. Angelo Banda, were based mainly on actual (*in situ*) observations by him and partly on color photographs taken by the first author. The gear observed were classified into two groups: stationary and mobile. This grouping is in accordance with the description of Motoh (1980).

Descriptions

As mentioned above, six types of gear were observed during the survey period. The all gear had commonly red net with mesh size of 0.8 - 1.0 mm. According to local fry collectors, the reasons of using synthetic red nets are 1) to easily recognize shrimp fry during collection and 2) apparently more resistant to become sullied than other nets with different colours.

1. Stationary gear

i) Fry filter net-Type A

The fry filter net, locally known as "Rizo", is made of main and guide nets, one big buoy, one piece of wooden stick, one anchor and several accessories (Fig. 2). The total length of the net (main + guide nets) and width is ca. 5m each. Unlike the mobile gear (see below), This net requires water current accompanied by moderate waves whose average height 0.6 m around San Pedro (Villalba - Flor, 1989). This gear is usually located near the shore in water down to a depth of 1.8 m. A portable anchor is positioned obliquely to the shore line against the current. The mouth of the net is kept open with 10 - 12 pieces of lead sinkers and a few synthetic buoys. Instead of moving the gear, the fry are carried with the current into the net. Every 1 - 1.5 hours the collector removes the contents of the codend (terminal portion of the net) which entraps penaeid fry, and brings them to shore for sorting. The contents also have fish fry species among others, for example flatfish " Lenguado " (*Paralichthys* spp.) and snook " Robalo " (*Centropomus nigrescens*) which are candidates for cultivation in earthen ponds. After sorting the remains that contain the above mentioned and other species fry, larvae are disposed away on the beach. The same applies to the cases of the remains obtained by other gear mentioned below.

This gear is adapted to the behavior of the penaeid fry " camarón blanco " (*Penaeus vannamei* and *P. stylirostris*) when migrating and/or being transported by wind and tidal currents approaching the shore waters. This is particularly true when the water is turbid during high tide.
This gear was found at Crucita near Manta (Fig. 1).

ii) Fry filtering net - Type B
This gear, locally called " Lomimos " or " Chinchorro " (Fig. 3), is also usually placed near the shore and also at/near the mouth of brackish water rivers down to depth of 1.3 m. It consists of triangular shaped net with a length and width of 4.5 m and 3.5 m, respectively, two or three styrofoam buoys and two pieces of wooden poles. The technique for collecting fry is completely the same to the previous gear, Type - A.

This gear was found at Tonchigue and Palmar (Fig. 1).

iii) Fry filtering net Type - C

Locally known as " Tijera " (meaning scissors, see Fig. 4), this gear comprises a triangular shaped bag net with 3.5 m in length and 2.5 m in width with local variations, two bamboo or wooden sticks, a piece of synthetic rope and a small anchor. The collecting function of this net is the same to the above mentioned types. However, theoretically, this gear is adapted to only the tidal currents approaching the river mouth, mangrove swamp and further upstream. Therefore, it is situated at the mouth of brackish water rivers and exactly operated when tide floods.

This gear harmonizes with the behavior of shrimp fry when migrating and/or transported by tidal currents to brackish water area.

This type was found at Palmar.

2. Mobile gear

i) Triangular net or scissors net

Locally called " Tijera " (meaning scissors), this simple gear is a kind of push net with dimensions of 2.5 - 3.5 m long and 2.2 - 2.9 m wide (Fig. 5). The net includes a flattened conical bag net made of fine meshed nylon netting (ca. 60 cm in length) and two pieces of wooden poles. A wooden nail or synthetic rope connects the poles at their intersection and allows them to be worked in as scissors - like manner. The distal end of each pole has a runner or shoe which is adz - shaped (12 cm in diameter) and made of balsa plastic or styrofoam.

This triangular net is commonly operated at everywhere visited as a large scoop net by one person wading in waist deep water, parallel either to the shoreline or riverside.

ii) Fry seine

The fry seine, locally "Vaca" (meaning cow) or "Trasmallo", is a kind of large hand net with dimension ca. 7m long and 2.7m wide (Fig. 6) The net consists of fine nylon netting with a codend as well as a guiding portion (3.2m in length and 1.2m in width) and two wooden poles (1.4m). This is operate in share waters up to collector's waist, along sandy beach by two persons holding opposite sides and dragging the net slowly, parallel to the shore line.

The manner of construction as well as the size varies according to locality. This fry seine was found at Tonchigue, San Pedro and Nuevo Pilo (Fig. 1).

iii) Fry strainer or fry skimmer

This fry strainer, locally called " Panga " (meaning olinghy), is a unique device operated by a small engine powered boat called " Bongo " in the local argot. The collecting system, including two triangular nets with length and width of ca. 2.5 m and ca. 5 m, respectively is deployed by the sides of motorized boat which is usually operated by two men. The net to each side is tied to a bamboo frame and is securely attached to the board of the boat. As the boat moves forward, the nets set in place.

This contrivance is operated in shallow coastal waters at ca. 500 m distance off shore, regardless of tidal and wave conditions. It is needless to say that this system would not work under rough sea conditions. Among the six types of gear mentioned above, only this is operated at deeper waters 5 - 10 m.

Discussion

The stationary as well as mobile gear described and illustrated here are well adapted to the behavior of penaeid fry such as white shrimp, "camarón blanco" of which the early post-larvae (fry) inhabit shore - and brackish waters such as river mouth and mangrove areas. On the other hand, fry lure made of grass and twigs such as those for collecting *P. monodon* in the Philippines (Motoh, 1980) are not existing in Ecuador. This is quite reasonable from the ecological point of view, because the post-larvae of white shrimp mostly obtained in Ecuador, belonging the subgenus *Litopenaeus*, have no clinging habit of any objects unlike *P. monodon* in Southeast Asia which belongs to subgenus *Penaeus* (Motoh, 1988).

It is interesting to note here that most of the collecting gear used in Ecuador are basically similar to those of the Philippines and this matter casts at us whether the gear in Ecuador was introduced with modification from Southeast Asia or independently invented in this country. Because the fry collection here has been started in 1962 (Hirono, 1989), quite later than those in Southeast Asia. At the present none of fry collectors can answer this question. Concerning this matter, according to the local fishermen, the mobile strainer " Panga " was invented at Palmar three or two years ago.

During the present field survey, it was observed that the fry collectors, after selecting shrimp fry, discarded remaining planktonic organism onto the dry sand. It is reasonable to deem that the discarded " waste " contained plenty of potentially useful fish fry as well as crabs. Therefore, the authors strongly recommend the following:

1) Fry sorting should be done carefully, since some smaller post-larvae are overlooked at naked eyes.
2) The handling on collecting and sorting should be gently done because some 20% of shrimp fry are dead or injured badly during shrimp fry collection, mainly due to rough handling. Further damage to shrimp

fry must not be inflicted during transportation to shrimp farms by providing sufficient oxygen and more tender handling.

3) After sorting out shrimp fry, the remaining organisms such as finfish and crab fry must be returned to the sea which only a few meters away from their sorting place to help conserving natural resources.

Acknowledgements

The present authors wish to express their sincere gratitude to Dr. Franklin Ormaza - González, investigator of the CENAIM, for his valuable review of this manuscript. Special thanks go to Mr. Angelo Banda, for preparing the illustrations without which this work would be far from useful.

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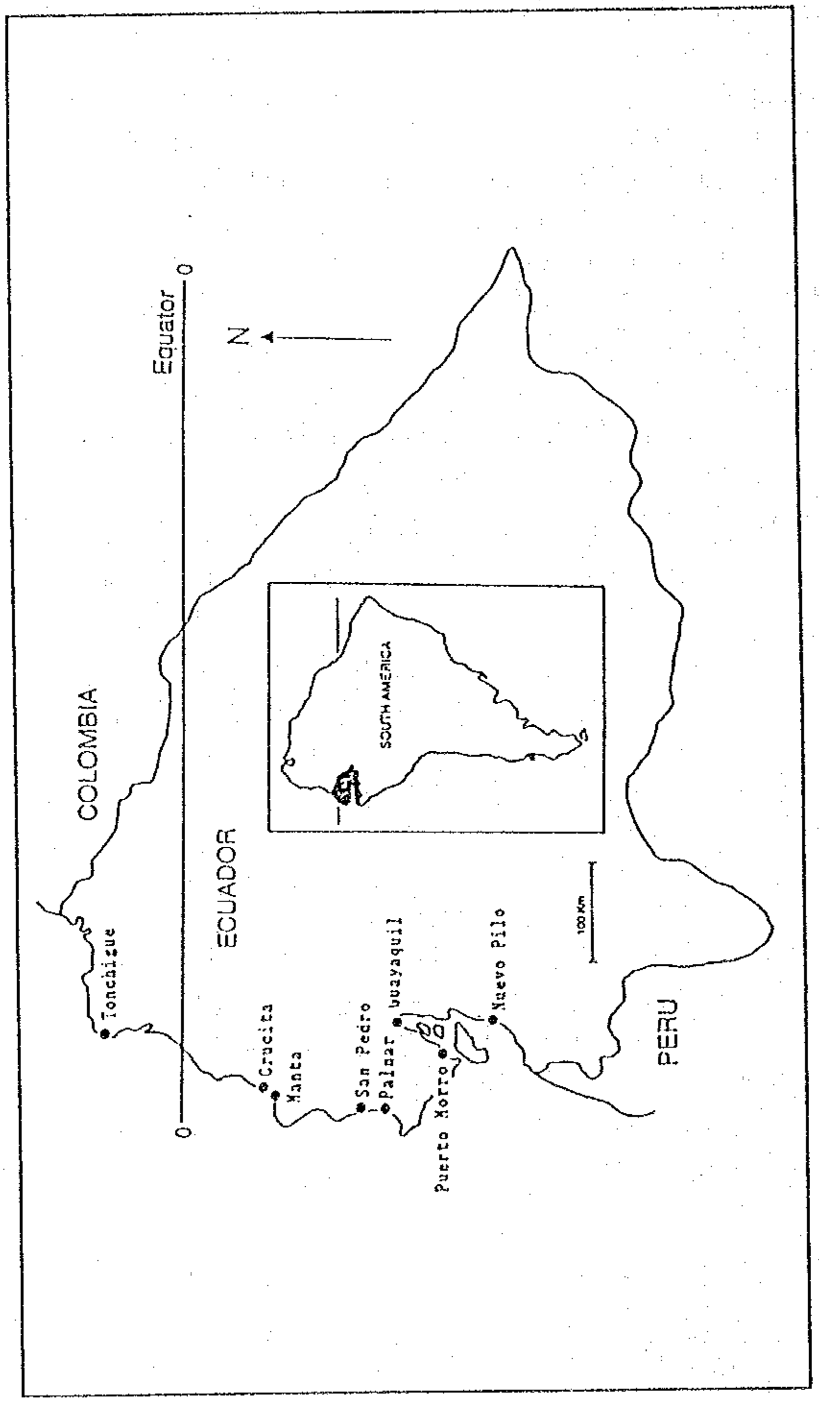

Fig. 1 Map showing sites visited for survey of fry collecting gear.

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FRY FILTER NET "RIZO"

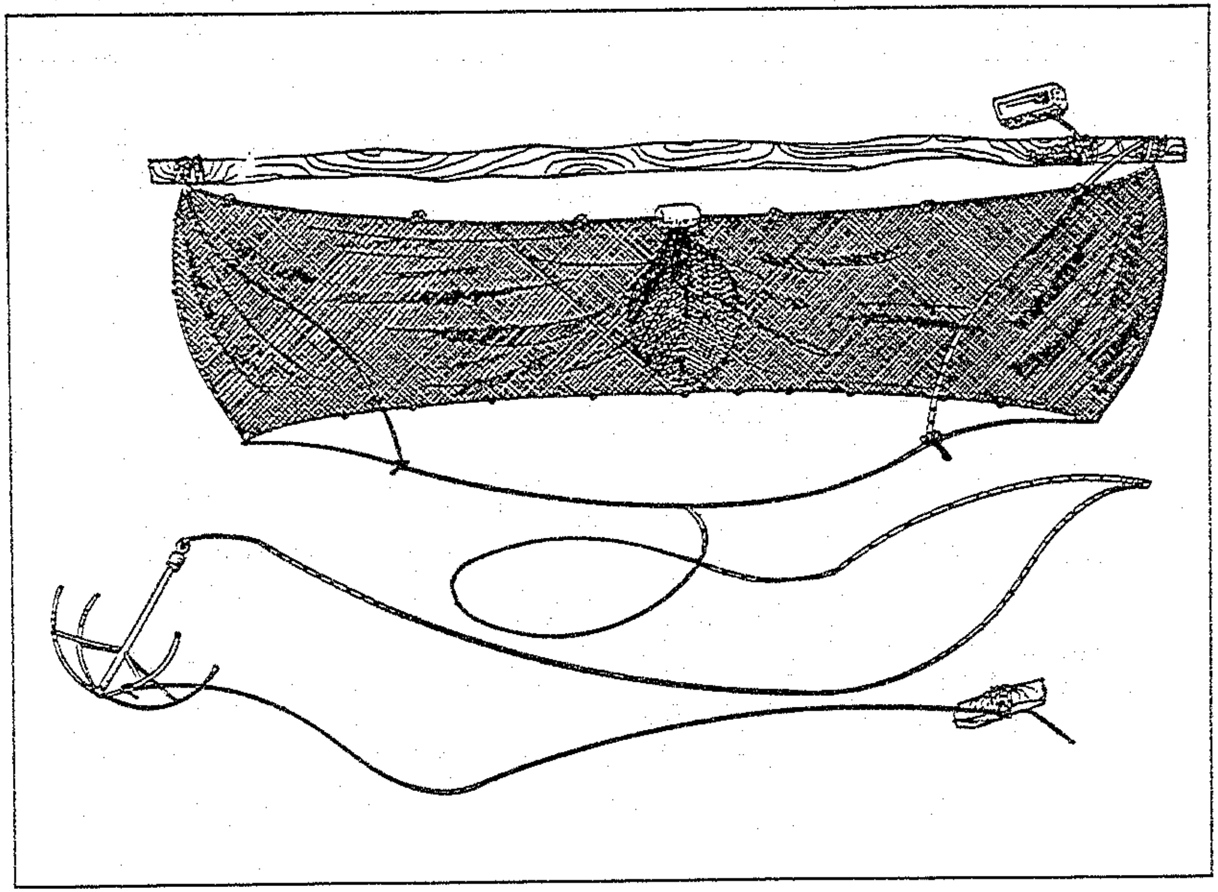

Fig. 2 A: Frontal view of "Rizo". The width of the net opening is about 5 m.

FRY FILTER NET "RIZO"

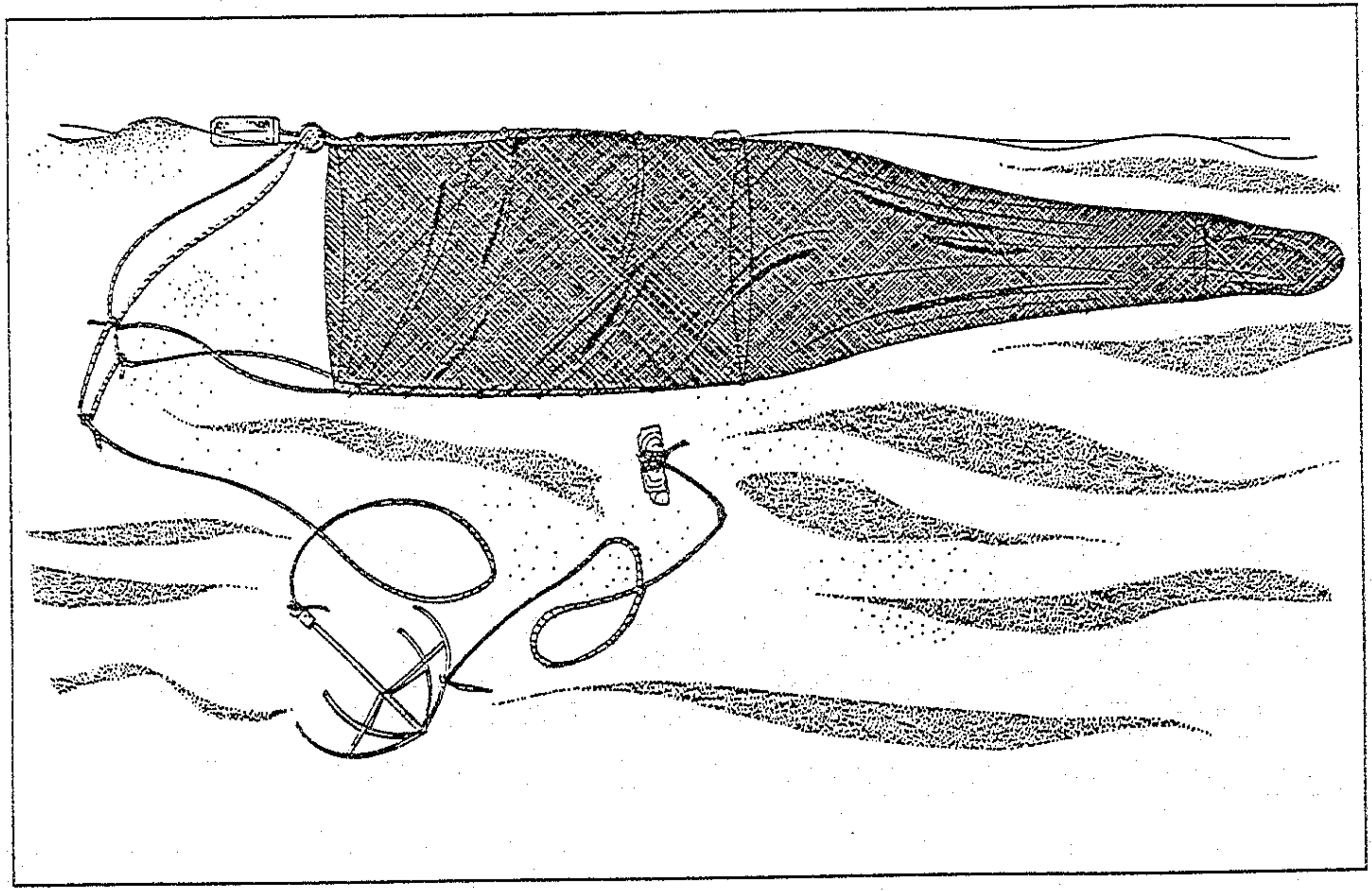

Fig. 2 B: Lateral view of "Rizo". The height and total length of the net are about 0.5 and 5m, respectively.

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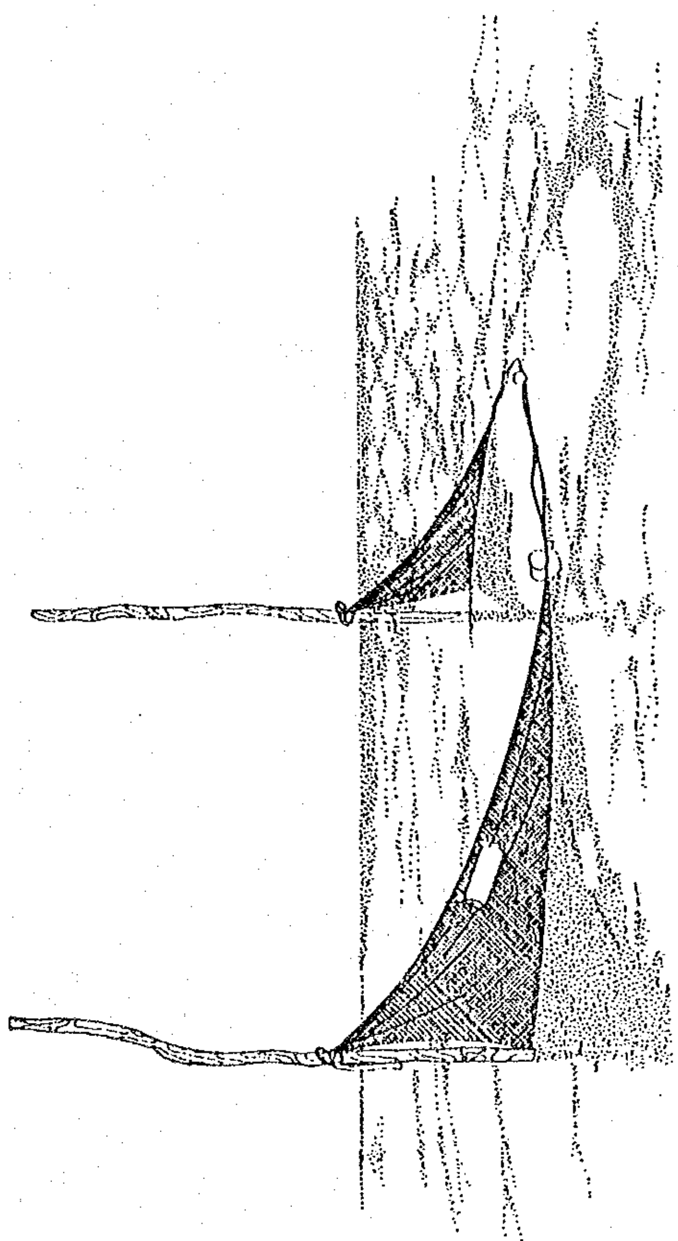

Fig. 3 Operational view of fry filter net "Lomismo" or "Chinchorro"
The distance between each pole is about 3.5m.

FRY FILTER NET "TIJERA"

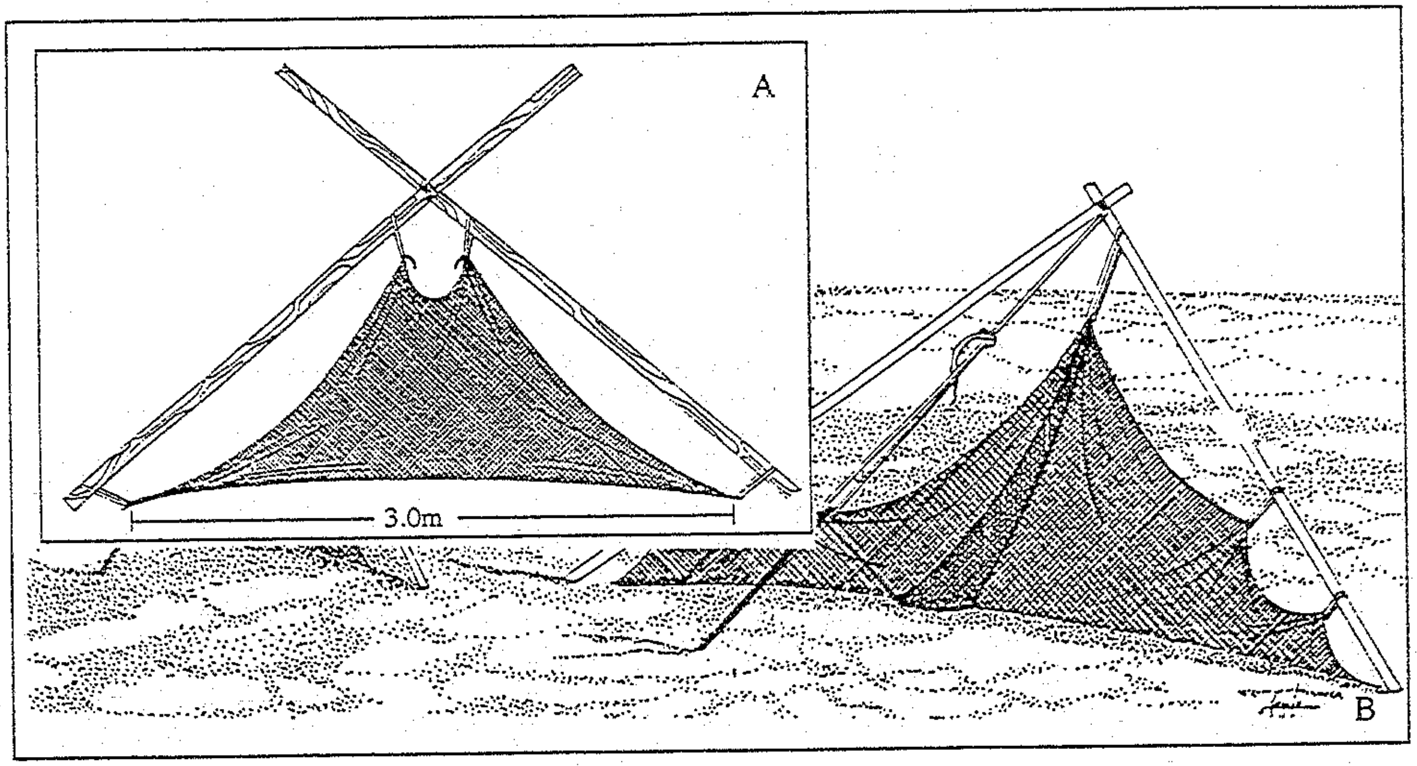

Fig. 4 A: Schematic frontal view. The width of the opening is about 2.5m at its base.

B: Operational view. Sometimes this type of gear is operated together with each other forming a line.

TRIANGULAR NET OR SCISSORS NET "TIJERA"

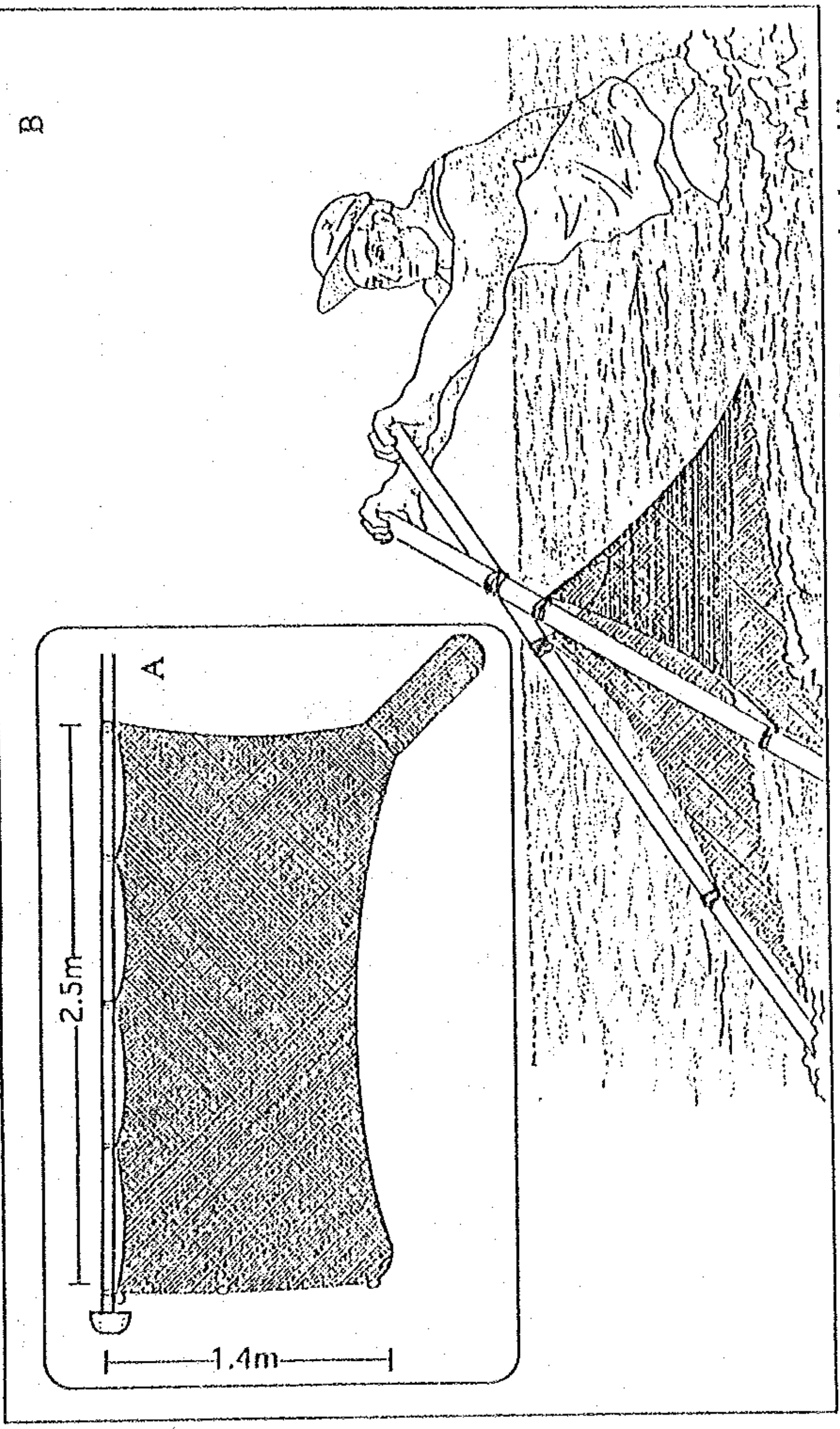

Fig. 5 A: Lateral view. The depth and length are about 1.4m and 2.7m respectively, while the condend is about 30cm.

B: Operational view.

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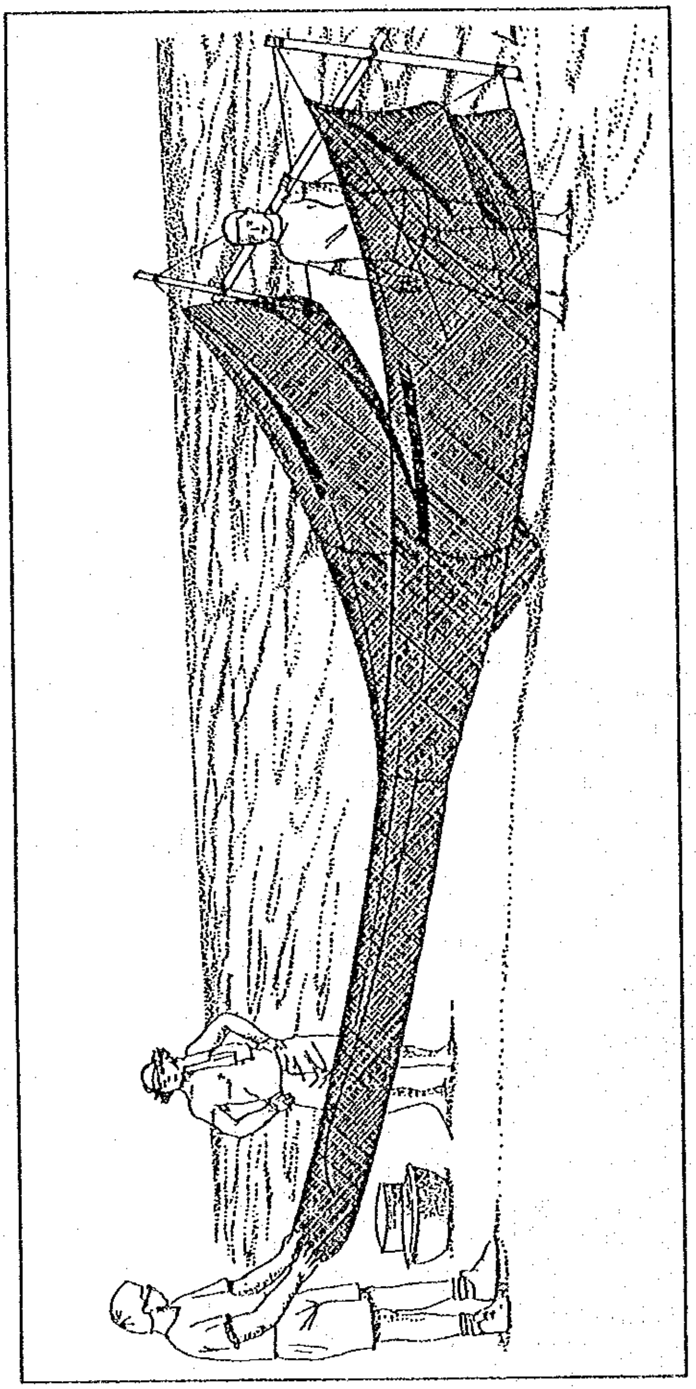

Fig. 6 Semi-operational view of fry seine "Vaca" or "Trasmallo"
The height and width of the net opening are 0.8 and 2.7m, respectively, and the total length is about 7m

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FRY STRAINER OR FRYSKIMMET "PANGA"

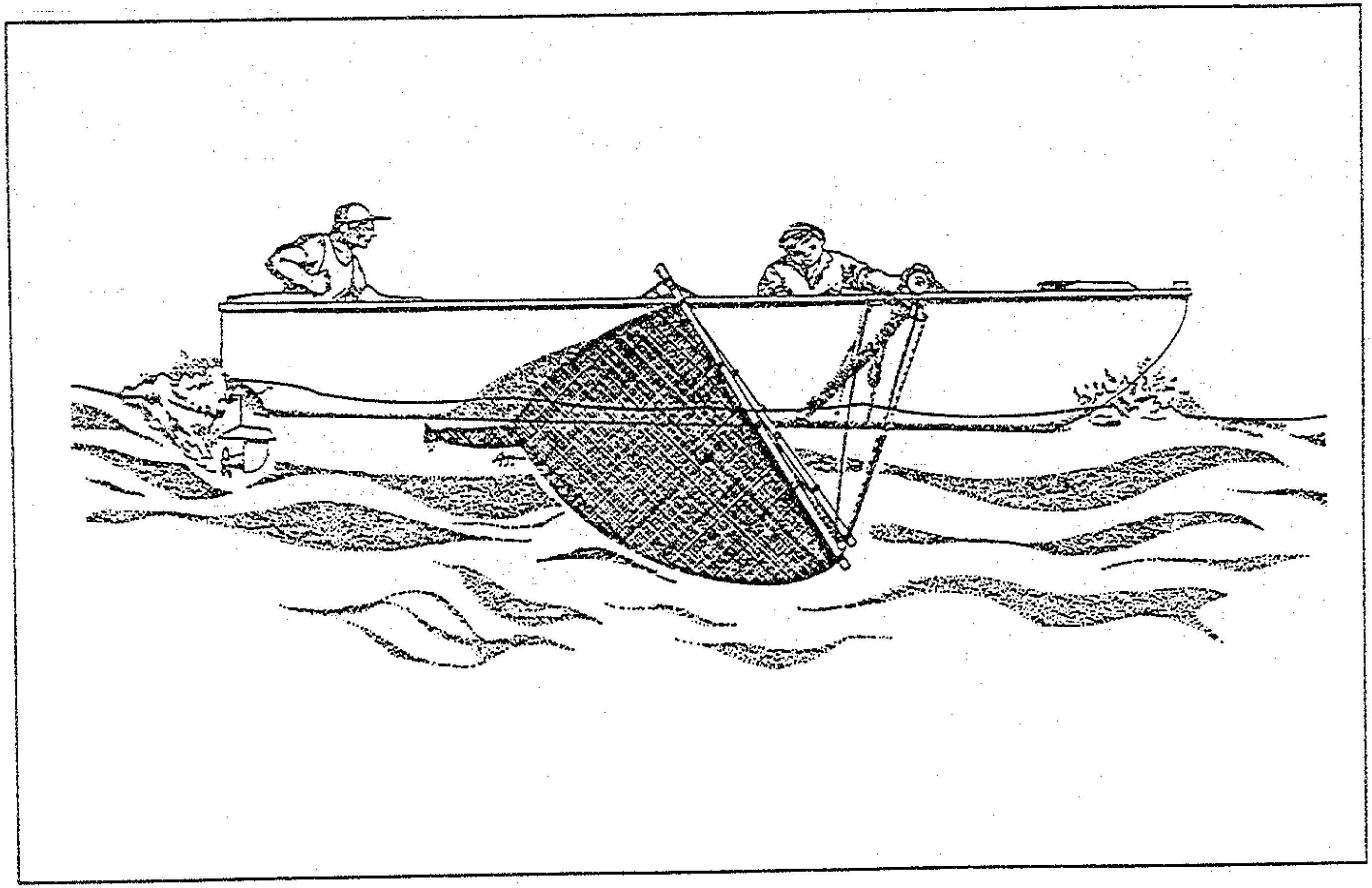


Fig. 7 A: Lateral view in operation. The total lenght of the net is about 3m..

FRY STRAINER OR FRYSKIMMET "PANGA"

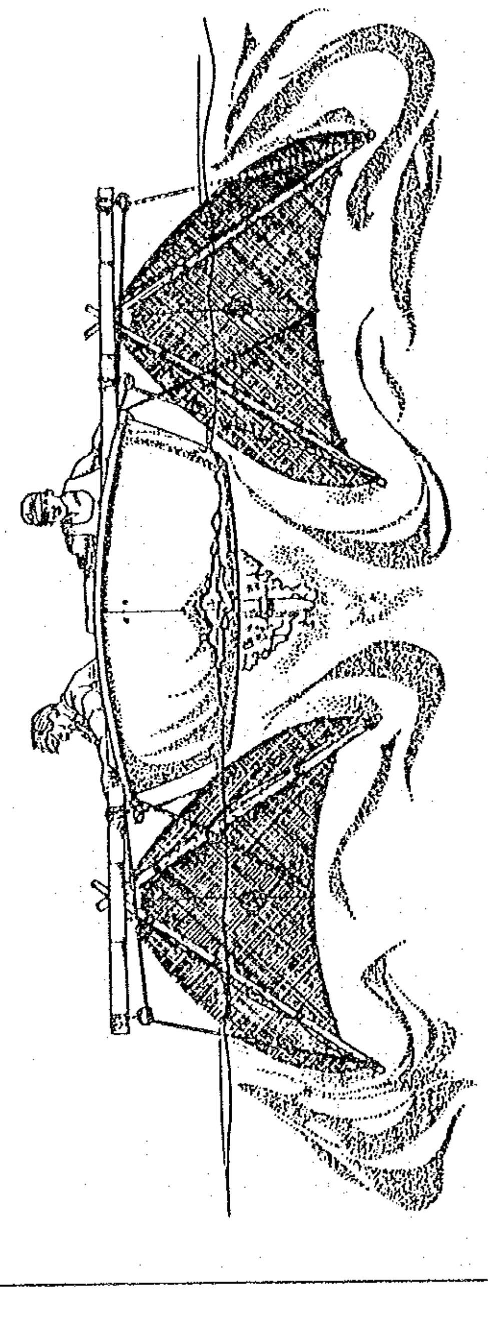
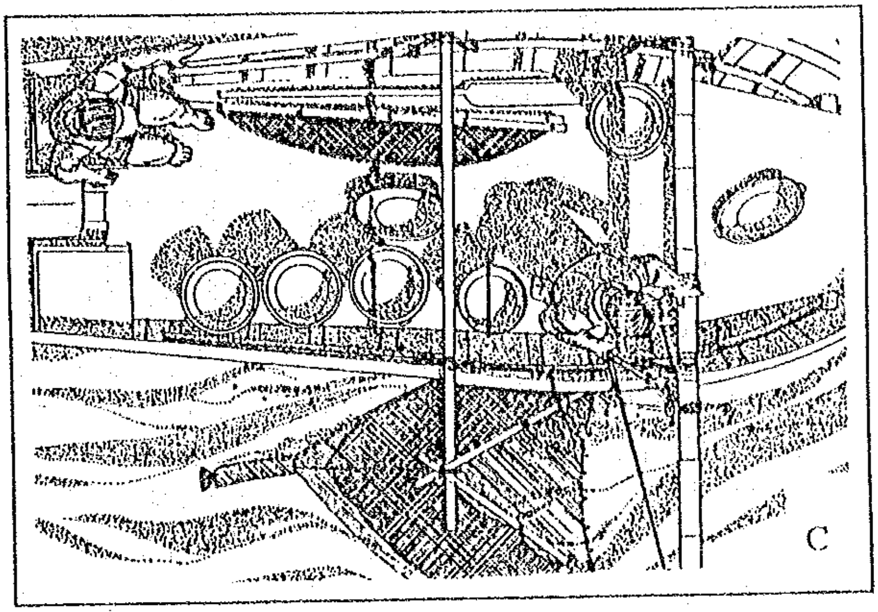


Fig. 7 B: Frontal view in operation. The width of the opening is about 2.5m.



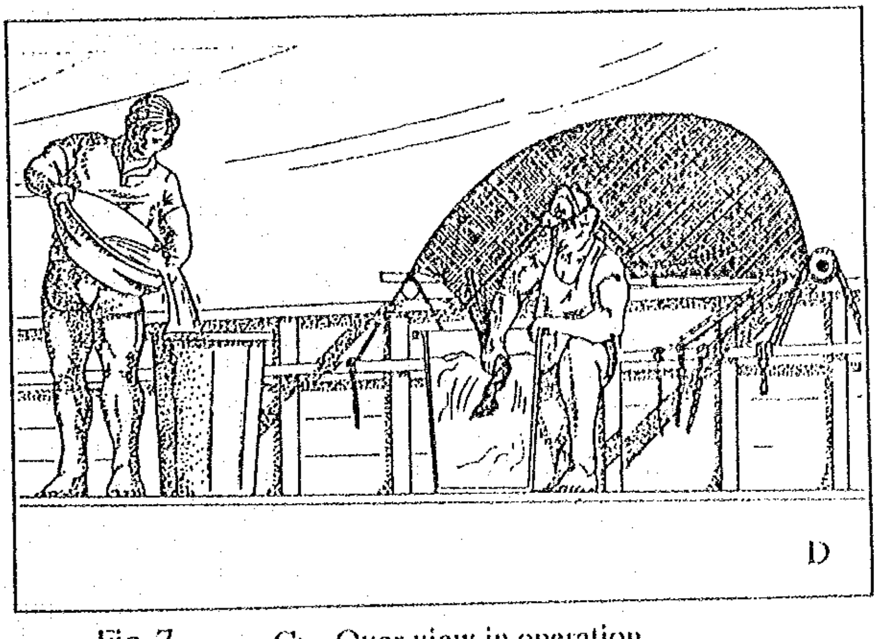


Fig. 7 C: Over view in operation
D: Operational view in harvesting fry

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RELATIONSHIP BETWEEN FISH AND SHRIMP LARVAE CATCHES

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National Aquaculture and Marine Research Center

Abstract

Marine organism collection was performed with horizontal trawler fishing, with scissors shape like nets, at a fix station, in San Pedro Bay (2°S, 80°45'W), in front of the National Aquaculture and Marine Research Center (CENAIM), between May and July 1991.

The shrimp and fish larvae distributions have the same shape, but shrimp abundance is much higher than fish one, and both especies were more abundant during new moon periods (dark ones).

The shrimp larvae found belong to the genus Penaeus (90%), while fish ones were distributed as follows: Snook (46.8%, Centropomidae family), Jennies (16.4%, Gerreidae Family). They were also found the following families: Carangidae (4.1%), Gobiidae (2.6%), Haemulidae (2.6%), Scianidae (1.5%), Engraulidae (1.1 %), and less than 1% of Mugilidae, Atherinidae, Nomeidae families.

The relationship between shrimp and fish larvae found were, 58:1 in May, 9:1 in June and 29:1 in July, with an average 32:1 for the sampling period. Their sizes fluctuated between 5-12 mm (shrimp larvae) and 5-20 mm (fish larvae).

One of the reasons for this relationship might be the difference between the escape velocity that allows fish to avoid the sampling nets. This 32:1 average does not mean that fish population is not being affected by shrimp catches. We have to consider the following : i) we don't know if fish have gone or not already through a natural selection process, and the catches are decreasing their survival rate; ii) shrimp and fish have different reproduction rates, and iii) if an average of 1,890 million/month (Chua and Kungvankij, 1990) shrimp larvae are caught along the coast, then using the 32:1 average for shrimp/fish larvae distribution, 60 million fish larvae would also be caught, amount that represents an important fisheries.

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Introduction

During the catches of penaeid shrimp larvae, it is also caught the so called "garbage", which not only contains organic matter but some other crustaceans (crabs, isopoda, etc.) and fish larvae and post-larvae.

At the beginning, the The national Fisheries Direction, proposed, that during the shrimp larvae catches , all this garbage should be eliminated, but actually it is recommended to put it back to the sea, because this elimination could have some influence over the fisheries, not only on the place they were carried on but along the fisheries zone in general.

It is still unknown the biology and reproduction rates of the fish species involved in the shrimp larvae catches, and this paper is not oriented towards determining whether the fish larvae catches and their mortality is affecting or not their fisheries, but to do the first steps in the determination of this incidence and use it as a baseline to evaluate the resource.

The shrimp larvae are collected in the waters between the surf zone and the shore, by fishermen (called "larveros") that use nets of different designs" chayos", "chinchorreras" and butterfly and scissors shape like.

At the beginning of the Shrimp Culture development in Ecuador, the shrimp larvae were collected at the estuarine zones, but since 1980 this activity was extended along the surf zone and areas under the oceanic influence along the coastal front (Zapata & Fierro, 1988). The largest collections were obtained during the spring tides, and their largest abundance was found during the warm periods, when the coastal current "El Niño" flows southward (a warm current different from the El Niño, event).

After their catches the shrimp larvae are store with the garbage in plastic containers and cleaned. This cleaning means that anything different from shrimp larvae is thrown away, before selling it to the middleman or direct buyer. The objective of the present paper is to determine the real influence of shrimp larvae catches over fish larvae and post-larvae ones, to eliminate any speculation about such influence and its quantification.

Materials and Methods

The samples were collected between May-June 1991 at a fix station in the San Pedro bay, in front of the CENAIM (Figure 1), every fifteen days.

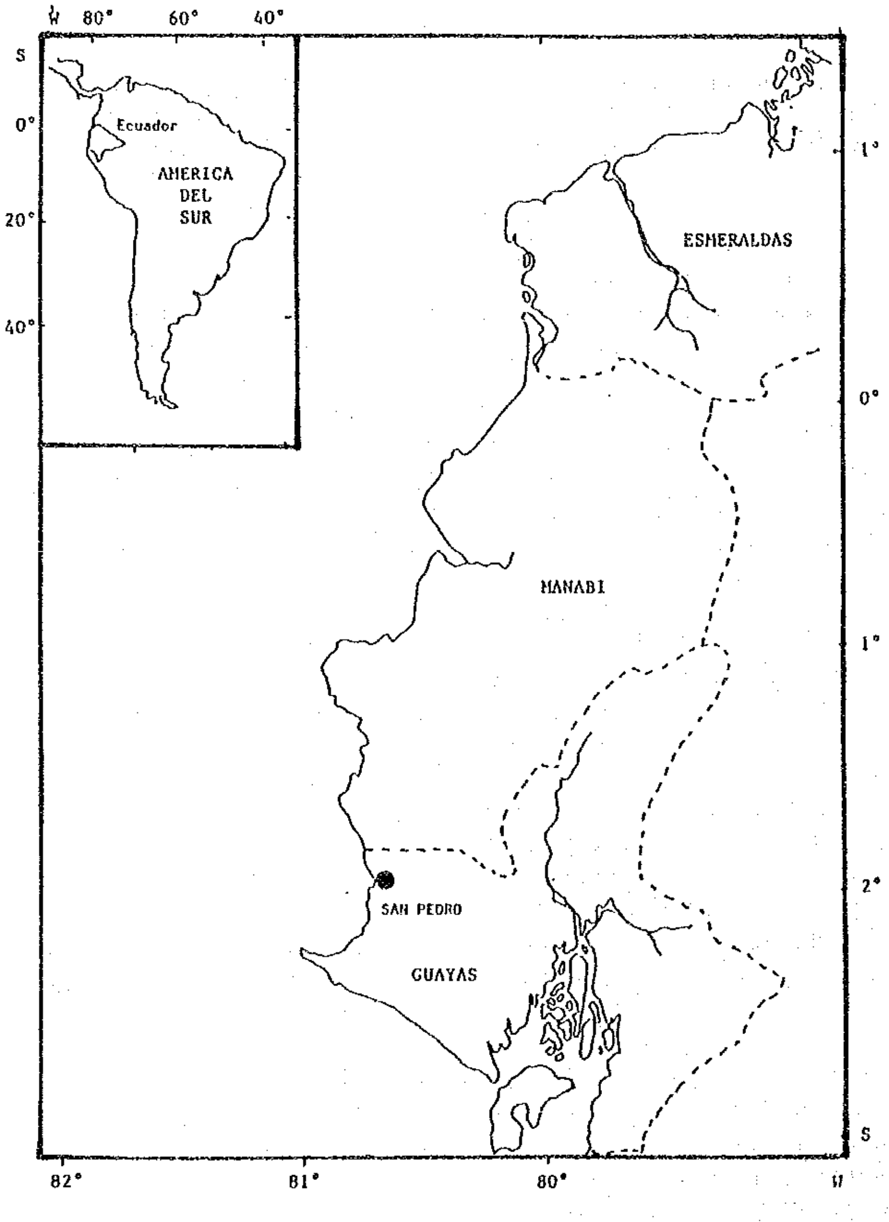

Figure 1.- Sampling Station at San Pedro Bay, Guayas-Ecuador

The samples were collected using the scissors shape like nets, covering distances of 100 meters, with 6 replicas each between 14h00-16h00 hours, every time. The samples were preserve with 4% formaldehyde and store for their lab analysis.

A frequency distribution analysis was done to determine fortnightly and monthly abundance for shrimp larvae and fish larvae and post-larvae, using as the total amount the sum of the catches in each of the replicas.

The nearshore temperature and salinity were also sample to see if they have any influenced on the abundance and distribution of the catches.

Results

The abundance distribution of fish larvae has a similar behavior to the one for shrimp larvae during May and June, while it is different in July (Figure 2)

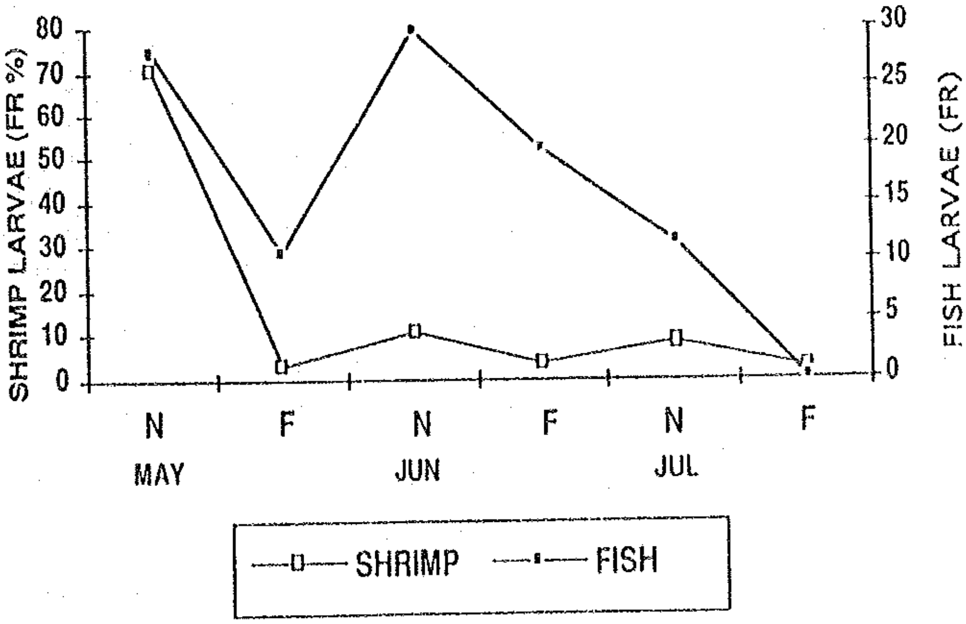

Figure 2.- **Frequency Distribution of Fish and Shrimp Larvae (FR=frequency). N= new moon, F = full moon.**

During these months, the catches are largest over the new moon (N) periods than during the full moon (F) ones as we can see in figure 3, and shrimp catches are 1-2 orders of magnitude higher than fish ones.

During the sampling period the temperatures and salinities were 27.2ºC-34.5, 24.8ºC-34.4 and 23.9ºC-34.2 during May, June, and July respectively. A decrease in temperature was accompanied by a increase in the abundance of shrimp larvae and viceversa (see Figure 4). A temperature influence on fish larvae and post-larvae, has been observed in oceanic areas, with an increment of their abundance during the warm periods (December-March) which are the spawning season. It is difficult to find fish larvae during El Niño events when the temperatures are even higher than normal (Cornejo & Acosta, 1986, 1987; Acosta, 1988). The opposite behavior is observed in shrimp larvae, it becomes abundant during El Niño events (Chua & Kungvankij, 1990). In our case, this did not happen, probably because we have to consider that the sampling period is the transition between the warm and cold seasons: the warm water replenish northward while the cold tongue starts its develop, and so does the equatorial front (Cornejo-Rodríguez M.P., per. comm.).

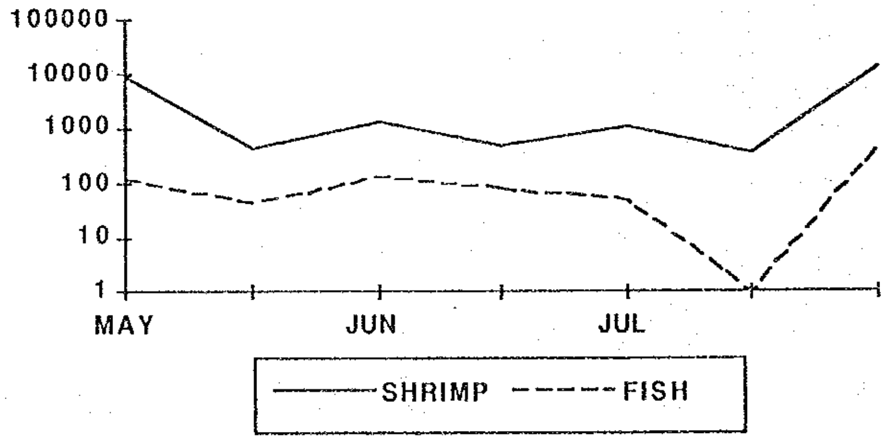

Figure 3.- Difference between Shrimp and Fish Larvae Distribution (logarithmic vertical scale).

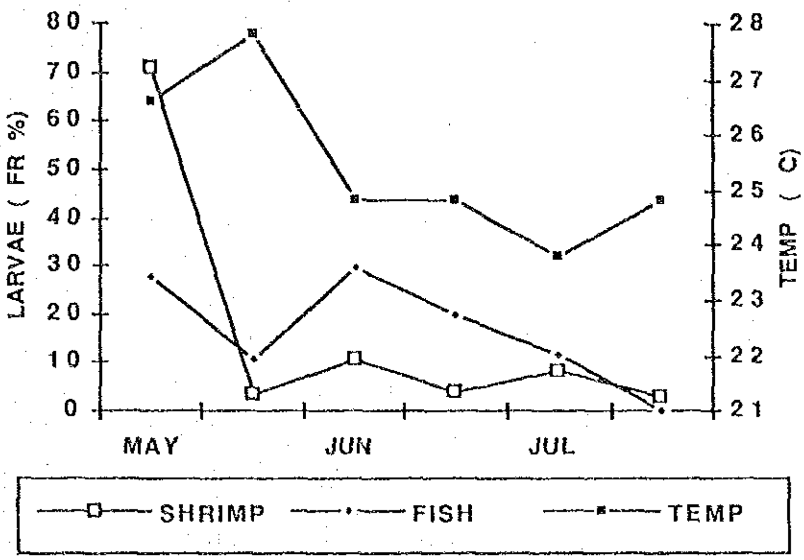

Figure 4.- Frequency distribution for Shrimp and Fish Larvae, against surf zone temperatures.

The most abundant species during the sampling period were (figure 5): Soleidae with Achirus sp. (halibut; 52,6%),Centropomidae, with the genus Centropomus sp. (snook, 28,7%), Gerreidae, with the genus Gerres sp. y Eucinostomus sp. (jennies 10,2%), and the rest corresponding to 8,5% of the total: Gobiidae (goby, fillfin goby), Mugilidae (mullet), Sciaenidae (drum, kingfish,croaker, others), Engraulidae (anchoa, anchovy), Haemulidae, haemulon sp. (Pomadasydae; grunts), Atherinidae (silverside), Nomeidae y Carangidae (pampanos, Pacific moonfish, etc.).

Larvaes of the following families: Clupeidae, Engraulidae and Mugilidae has been record by Martínez et al (1991) during shrimp fisheries. Some of the families, like Sciaenidae and Carangidae are accompanying species of shrimp adults (Martínez et al, 1991; Rubio, 1992), and we could supposed that they would always be present in the shrimp catches.

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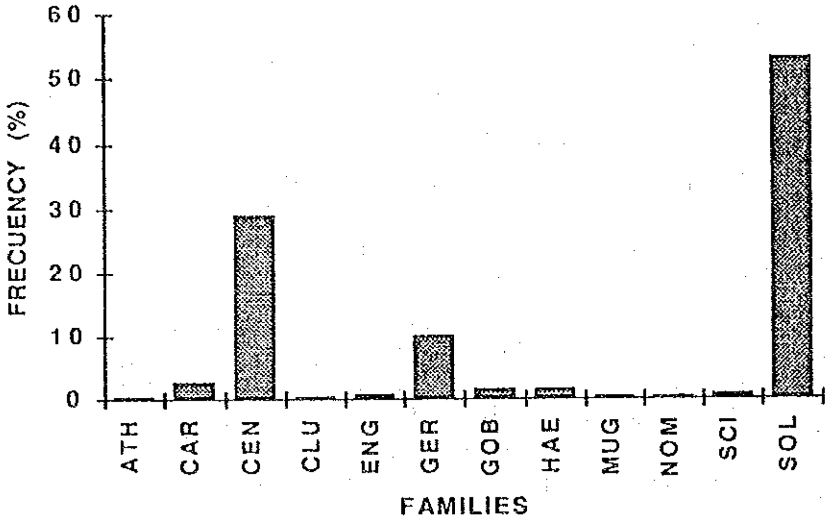

Figure 5.- Species Distribution between May and July 1991; (ATH)Atherinidae; (CAR) Carangidae; (CEN)Centropomidae; (CLU)Clupeidae; (ENG)Engraulidae; (GER)Gerreidae; (GOB)Gobiidae; (HAE)Haemulidae; (MUG)Mugilidae; (NOM)Nomeidae; (SCI)Sciaenidae; (SOL)Soleidae.

The sizes of shrimp and fish larvae are similar, they vary in the ranges 5-12 mm and 5-20 mm, respectively; therefore we would expect that the probability of being caught would be the same. However we found that the relationship between the number of penaeid shrimp larvae and fish larvae and post-larvae caught is 58:1 (May), 9:1 (June) and 29:1 (July), , with an average of 32:1, for the whole period. This relationship in the catches is probably due to:

a) The difference between the "escape" velocity , that allows the fish to avoid the nets at a higher speed.

b) As a consequence of their speed, fish larvae and post-larvae probably, have more chances to avoid going through the surf zone, where they could be under the pressure of the littoral transport.

c) Maybe the sampled area is not a "nursery" one for fish, only for shrimp.

d) A difference in the abundance of the food available for fish in comparison to that for shrimp (more for shrimps). Even though shrimp larvae was found on the fish stomach (neither identified nor counted), being shrimps the reason for fish to go to the surf zone, and its catches an accident.

Discussion and Conclusions

From the present job, we can conclude that:

1.- The shrimp larvae and fish larvae/post-larvae are similar during the sampling period (May-July).

2.- It does not exist a clear relationship between fish larvae/post-larvae distribution and local temperatures; but there is the opposite between shrimp larvae and temperature.

3. The most abundant fish larvae/post-larvae belong to Soleidae (46.8%), Centropomidae (28.7%) and Gerreidae (10.2%).

4.- "Apparently" there is a small influence between the number of penaeid shrimp larvae and fish larvae and post-larvae caught, with a shrimp/fish larva relationship as follows: 58:1 (May), 9:1 (June) and 29:1 (July), 32:1 average.

However, it is still possible that shrimp larvae catches do affect the fisheries, in spite of that for each fish larvae, 20 or 50 of shrimp larvae are caught because we have not considered the following:

a) We don't know yet if the fish larvae/post-larvae collected have already gone through a natural selection process; if this is true then the shrimp catches might decrease their survival rate.
b) The reproduction rates for shrimp and fish larvae in their natural environment are different, so their distribution.

c) According to Chua and Kungvankij (1990), there exists 90,000 artisanal fishermen, each one collects 3,000 alive shrimp larvae per day, seven days a week, and in general 7 days per month, this means 21000 daily per person or a total of 1,890 millions monthly; using the average relationship, the corresponding fish larvae and post-larvae would be around 60 millions/month, amount that represents an important fishery, and that is being eliminated unless we educated the "larveros", to put them back into the ocean.

There is still a need of the knowledge of the biology and ecology of shrimp larvae and fish larvae and post-larvae, mainly about their reproduction characteristics.

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