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WORKING GROUP ON SHRIMP FISHERIES OF THE  
NORTHEASTERN SOUTH AMERICA  
PANAMA CITY, PANAMA, 23-27 APRIL 1979  
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Interregional Project for the Development of Fisheries  
in the Western Central Atlantic

Proceedings of the  
Working Group on Shrimp Fisheries of the  
Northeastern South America  
Panama City, Panama, 23-27 April 1979

by

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DEVELOPMENT OF FISHERIES IN THE WESTERN CENTRAL ATLANTIC

The Interregional Project for the Development of Fisheries in the Western Central Atlantic (WECAF), which was initiated in March 1975, entered its second phase on 1 January 1977. Its objectives are to assist in ensuring the full rational utilization of the fishery resources in the Western Central Atlantic through the development of fisheries on under-exploited stocks and the promotion of appropriate management actions for stocks that are heavily exploited. Its activities are coordinated by the Western Central Atlantic Fishery Commission (WECAFC) established by FAO in 1973. The Project is supported by the United Nations Development Programme (UNDP) and the Food and Agriculture Organization of the United Nations as the Executing Agency.

As in the initial phase, two series of documents will be prepared during the second phase of the Project to provide information on activities and/or studies carried out. This document is the twenty seventh of the series WECAF Reports. The other series of documents is entitled WECAF Studies.

W.F. Doucet  
Programme Leader

FOREWORD

The Proceedings of the Working Group on Shrimp Fisheries of Northeastern South America has been published under WECAF Reports 27 and 28. WECAF Report 27 includes the report of the Working Group as well as the national reports and Report 28 contains the contributed papers for the meeting.

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## SUMMARY

A Working Group to assess the state of exploitation of the shrimp fisheries off Guianas-Brazil, determine suitable management measures and define research needs and priorities was convened in 1979 by the WECAF Project.

The Working Group reviewed the current status of the shrimp resource and fisheries, as requested. Some signs, but not conclusive indications, of overfishing of the stocks were noted. A general conclusion is that the shrimp stocks of this area appear to be about fully utilized but that good management can preserve the present biological and economic viability of the fishery. The Group suggested a number of management goals and regulatory options for consideration by the countries concerned. Achievement of the task of principal concern to the Group, that of providing scientific advice for fishery management, is dependent on improving the available scientific data base. In this regard, the Group made specific recommendations. Implementation of these recommendations will be necessary if further scientific predictions on the status of the stock are required.



1. Summarized Conclusions and Recommendations

(a) Stock Evaluation

Although abundance indices for Venezuelan and Brazilian fleets operating in the extreme areas of the region have not shown any decreasing trend, fleets fishing in the central part (Guyana, Suriname and French Guiana) have experienced marked reductions in their c.p.u.e.s. Decreasing values have been recorded from 1966 onwards.

The analysis of catch and effort data, covering practically all fleets operating in the zone between the Orinoco and Amazon Rivers, during the period 1960-78, indicate that the fishery appears to be about fully utilized.

(b) Management

The Working Party agreed that there are reasons for adoption of a common management scheme by coastal countries concerned. The Party recommended that countries consider the adoption of common management measures and regulations to protect small shrimps (limited fishing in nursery grounds) and control the amount of fishing effort (fixed number and type of boats licensed to fish). The Party also pointed out the imperative and urgent need for coastal countries to define their goals for management of this fishery before any management scheme be agreed upon and implemented throughout the area.

(c) Research Needs and Programmes

The Working Group agreed that there are two subjects that need priority attention in any future research programme:

- fishery statistics
- shrimp tagging.

(1) Fishery Statistics

The meeting was compelled to do a rather crude analysis of catch and effort statistics due to inadequate information available on species compositions, artisanal catches and fishing grounds.

To correct this situation the Working Party recommended the improvement of data collection and reporting so as to have a uniform and consistent set of data. It also recommended the establishment of a common reporting system. The Party recommended specifically that countries collect information on species composition of the catches, days at sea and fishing grounds.

The Party requested that the WECAF Project assess the suitability of the ongoing statistical programmes carried out by the countries participating in the fishery and propose improvements to be made to such programmes to satisfy requirements arising from the adoption of a common reporting system.

As regards the distribution of statistical information to permit users from various countries participating in the fishery to have easy and timely access to it, the Party considered that only a central regional data bank could provide opportunely the information required and recommended that a regional data bank should be established. The Working Party requested that the WECAF Project convene a group to develop a proposal to establish a Central Data Processing System and estimate the cost of implementing such system. Results of the study will be considered at the next meeting of the WECAFC Working Party on Fishery Statistics.

(2) International Cooperative Tagging Programme

It was considered that a tagging programme would provide much of the missing information on growth rates, mortalities and species distribution to be used in a better assessment of the state of exploitation of the resource.

The Working Party recommended that countries participating in the fishery carry out a cooperative tagging programme. Such a programme could be done with the assistance and coordination of a regional body such as the WECAF Commission or the WECAF Project.

The Party also requested that the WECAF Project establish a small working group to prepare a proposal and a plan for this tagging programme.

In order to obtain the best results from this tagging programme, a short survey of nursery ground and artisanal fisheries in the area needs to be made. The Party obtained the assistance of the Southeast Fisheries Center of the NMFS (U.S.A.) to perform the survey. It was also suggested that the WECAF Project could collaborate in this work.

2. Report of the Working Group on Shrimp Fisheries of Northeastern South America, Panama City, Panama, 23-27 April 1979

2.1 Introduction

Offshore shrimp fisheries along the northeast coast of South America (Guianas-Brazil) began in 1959, after government sponsored exploratory surveys had located shrimp populations in these areas and the interest of fishermen and industry was stimulated. The fisheries grew rapidly. Annual landings of over 19 000 t whole weight were reached in 1968-70 and again in 1973 and 1977. The number of vessels also increased steadily and exceeded 500 in the years following 1972. In the seventies fishing patterns in these fisheries changed as a result of changes (a) in national jurisdiction policies, which affected access of some vessels to their accustomed fishing grounds, and (b) in fuel prices, which also caused shifts in fleet distributions. The consequences of these changes on the conservation and management of the shrimp fisheries are discussed in this report.

At its second session held in Panama in May 1978, the Western Central Atlantic Fishery Commission (WECAFC) strongly supported plans for a meeting of a special working group with the goal of reviewing and analysing the current status of the shrimp resources and fisheries along the northeast coast of South America. It requested that special attention be paid at this meeting to developing a cooperative shrimp research programme in this area, including international shrimp tagging experiments.

The WECAF Project made arrangements for a meeting of persons with interest and expertise in this regional fishery to consider the problem. The meeting was held on 23-27 April 1979 in Panama City, Panama, the headquarters of the WECAF Project. The number of invitations was limited by the Project's budget, but 18 experts were invited from 11 countries. In making its selection, the Project attempted to find experts from countries that participate in the fishery. The participants, who attended in their personal capacity and not as representatives of their Governments, were asked to bring national fishery data and to report on their countries' fisheries, fishery statistical data systems and fishery research programmes.

The Convenor and Chairman of the meeting was Dr. A.C. Jones. The Secretary was Mr. L. Villegas. Participants in the meeting, staff support members, and observers are listed in Appendix 1. The agenda adopted by the Working Party is in Appendix 2.

The specific objectives of the meeting were: (1) to evaluate and report on the status of the shrimp stocks of the area and the effects of fishing on them; (2) to suggest for discussion, consideration and possible recommendation by the WECAF Commission to countries concerned, the different management objectives that might be decided upon for this fishery; (3) to provide technical advice as to which kinds of regulations would be required to meet these objectives; and (4) to recommend to the Commission the specific research and statistical programmes that would provide the data and information necessary to carry out the regulatory programme.

## 2.2 The Exploited Population

The high seas shrimp fishery that takes place off the northeast coast of South America extends from Trinidad to south of the Amazon River (Fig. 1). It is based on four species: brown shrimp (Penaeus subtilis), pink-spotted shrimp (P. brasiliensis), pink shrimp (P. notialis) and white shrimp (P. schmitti).

Genetically different stocks are not likely to exist within the species Penaeus brasiliensis, P. notialis and P. subtilis on the Guianas-Brazil fishing grounds. This opinion is based on the probable relationship between the movement of penaeid larvae and the pattern of oceanic currents in this area. Geographic genetic subdivisions may occur in these species when considered over their entire range, although there do not appear to be any stocks of these species occurring in isolated water masses within the management area. P. schmitti should be considered separately because of its preference for nearshore and estuarine water where there is a higher probability of separated water masses and, therefore, of the gene flow being discontinuous.

Genetic unity of a shrimp species over an area is not equivalent to unity of fishing stocks because of the difference between responsiveness of population abundance and responsiveness of gene frequencies. Therefore, it may still be necessary at some time to examine the subject of stock structure within species for the area under management.

Information on the species composition of catches of adult and juvenile shrimp can be obtained by applying biochemical genetic techniques. This method can reliably separate individuals of different shrimp species of sizes ( $\leq 1.5$  cm) at which morphological differences may be difficult to observe. This technique appears to be especially promising for validating the species identifications of small juveniles collected in nursery grounds or caught by artisanal fisheries.

There are differences in the bathymetric and geographical distribution of the four shrimp species. Adult brown, pink-spotted and pink shrimp are found mainly at 27-82 m (15-45 fathoms), although the juveniles of at least some of these species inhabit shallow estuarine waters. Brown, pink-spotted and pink shrimp occur in the offshore (marine) waters throughout the region but, according to the results of U.S.A. surveys, no important quantities of pink shrimp are caught off eastern French Guiana and Brazil. White shrimp are found only in waters less than 37 m (20 fathoms). White shrimp occur throughout the region but commercial concentrations have been found only off Trinidad-Venezuela-Guyana and off Pará-Maranhão (Brazil). As no or few white shrimp are found in the catches from off Suriname, French Guiana and Amapá (Brazil), it is possible that there are two separate stocks of white shrimp in the region.

Species compositions of the catches of the various national fleets are different, based on the results of the U.S.A.-Guyana sampling at Georgetown, the catch data reported by the Japanese, and limited information available from Brazilian and Venezuelan landings.

Brazilian catches were composed mainly of brown shrimp (90 percent in 1976-78). U.S.A. landings (1976-78) also were composed mainly of brown shrimp (50-70 percent), followed by pink-spotted shrimp (20-40 percent) and pink shrimp (less than 10 percent). However, Japanese landings for the period 1970-77 were reported to be composed of 60-80 percent pink-spotted shrimp. These differences in the species composition of the catches could not be explained satisfactorily with the information available at the meeting. Venezuelan landings have a higher percentage of white shrimp than landings from other countries, due to the fact that their fishery north of the Orinoco River takes place to a large extent in shallow water.

Size composition of the catches of U.S.A. and Japanese fleets are slightly different during the period considered (1975-77), despite the fact that small shrimp were abundant in the catches of both fleets during 1977 and the category 31/40 tails per pound was the predominant one. Such differences could be attributed to differences in the fishing grounds visited. While most of the U.S.A. landings came from Guyanese and Brazilian waters, Japanese activities were concentrated off Guyana and French Guiana.

Brazil reported that juvenile brown shrimp are taken throughout the year by the artisanal shrimp fishery in Maranhão-Pará (Brazil). U.S.A. data also indicate that small brown shrimp predominate in the catches off Amapá (Brazil) and eastern French Guiana, especially in March and April. A second area of occurrence of small shrimp off Guyana is also indicated in the U.S.A. catch data. These observations suggest that young shrimp are being recruited onto the fishing grounds principally to these areas.

There is no information available on growth, mortality or migration of postlarval, juvenile or adult shrimp, except that postlarvae of *P. subtilis* enter a coastal lagoon near Cayenne in February-March at a total length of 1 cm and migrate to the sea after two-three months at about 7 cm total length.

As in other shrimp populations, U.S.A. and Brazilian studies have shown that female brown, pink-spotted and pink shrimp reach larger sizes than males. Whereas male brown and pink-spotted shrimps were more abundant than females in landings at Georgetown, pink shrimp females were more abundant than males.

### 2.3 Environmental Factors

Environmental factors are believed to have a major influence on the abundance and distribution of shrimp populations. Some information indicates that white and brown shrimp live on mud substrate, with a relatively high organic content, and pink shrimp live on a sand substrate. Annual temperature variations are relatively small in this region (approximately 7°C for surface waters and 6°C for bottom waters). Nevertheless, seasonal variations in temperature may have effects on growth rate that are important for population analysis.

Despite the fact that there may well be a relationship between rainfall and subsequent fishing success, information presented at the meeting was

insufficient for a decision to be made on the direct effect of the amount of rainfall in a particular country and later increases in catches in corresponding offshore areas. Further studies on this subject are planned.

The Guiana Current that flows along the coast from east to west and covers an area as wide as 200 mi is also a factor that presumably influences shrimp distribution. The Current, with a major contribution from the Amazon River, separates from the coast near Cayenne to follow the continental break off Guyana, and its influence is rather weak westward of the Maroni River. The inshore-offshore water movement in the shelf off Suriname implies the existence of a certain degree of upwelling at some distance from the coast. Very little information is available on the presence of countercurrents or eddies in this current system.

#### 2.4 The Fishery

Encouraged by the results of exploratory surveys between 1944 and 1958, commercial fishing for shrimp in offshore areas of the region started in 1959. U.S.A. trawling fleets and trawlers of local nations were the first to fish commercially. Other fleets from the Caribbean region and distant countries, such as Japan and Korea, joined this fishery in the sixties. All national fleets have been based at ports within the region. The number of trawlers in the fleet is shown in Table 1, for the period 1961-1978, according to the country where they land their catches.

The first processing plants were built in the late fifties and sixties in Paramaribo, Cayenne, St. Laurent, Georgetown, Port of Spain, and Bridgetown. Later, processing facilities were established at Belem and Venezuelan vessels utilized facilities at Guiria and Cumaná.

The present shrimp fleet off the Guianas, Brazil and Venezuela consists chiefly of Florida-type trawlers that are fairly modern and uniform in terms of size and fishing gear. The vessels are mostly between 21 and 23 m (70-75 ft) in length and are rigged to use two trawls.

Prior to the enforcement of extended national jurisdictions, the fishing fleets operated without restrictions throughout the region and during every month of the year. In 1970 Brazil declared a 200 mi economic zone. From 1972 to 1978 Brazil required foreign vessels fishing her waters to have permits issued under bilateral agreements. The number of fishing permits was limited and there were seasonal and other types of restrictions.

In December 1977 these agreements between Brazil and foreign governments expired and in following years no foreign flag vessels fished for shrimp in Brazilian waters. In 1977 Guyana, Suriname and French Guiana initiated licencing systems. These restrictions forced fleets to trawl only off their respective countries of operation. Prior to the establishment of extended national fishing jurisdictions by each coastal country, many vessels fished Brazilian grounds at the beginning of the year, followed by French Guiana and Suriname grounds by the middle of the year and Guyanese grounds in the latter months of the year. Other vessels fished



in the same area throughout the year or followed no particular pattern, fishing wherever they could find shrimp. The offshore fishery is directed primarily toward exploitation of brown, pink-spotted and pink shrimp although white shrimp are also taken.

## 2.5 Stock Evaluation

### 2.5.1 General Trends

After the advent and expansion of the fishery during 1960-65 nominal commercial landings by several nations from the offshore Brazil-Guianas have remained fairly constant in the range of 15 000-20 000 t whole weight during the period 1968-78 (Table 2). The number of vessels, however, has varied considerably from about 350 to 650. The overlay of the number of vessels in the fishery and the recorded catch (Fig. 2) do not indicate that overall catch has decreased in later years concomitantly with an increase in total fleet size. Rather, these data indicate that despite considerable increases in fleet size since 1968, the 1978 catch level of 15 000 t has not increased much. These statistics do not account for: (1) possible future changes in inshore environmental phenomena which could affect recruitment to offshore areas; (2) possible future increases in unrecorded juvenile catches resulting in a depressed yield per recruit and thus decreased long-term yield; (3) concomitant changes in abundance from area to area or species to species which may have been offset by fleet mobility in the past.

### 2.5.2. Trends in Specific Fisheries

Several national and area-specific fishery fleets exist, and separate statistics from these fleets exhibit different trends (Tables 3 and 4). It is likely, therefore, that the separate fleets are, for the main part, exploiting different portions of the total resource.

A Brazilian fishery exists both inshore in nursery areas south of the Amazon and offshore along the entire northern coast of Brazil. The offshore landings are 90 percent P. subtilis by weight, and biological samples from the nursery areas show that the composition inshore is 80 percent P. subtilis by number. Data from that estuarine nursery area indicate that recruitment is continuous throughout the year. Nursery areas have not been found along the coast of Brazil north of the Amazon. The offshore Belem-based fleet fished along the northern coast of Brazil during 1969-73. During that period the average annual number of vessels increased from 1 to 37 while the catch per vessel and per day varied without an evident trend (Fig. 3). In 1969-73 the catch increased from 34 to 1 062 t (tail weight) and then dropped to 942 t in 1974. Beginning in 1974, the area of Tutoia to the south and in close proximity to the nursery area was exploited by the offshore fleet. Since that time, the fleet has fished both areas to maximize catch rates. Catch per vessel has increased from 28 t in 1975 to 32 t in 1978 while average fleet size has varied from 25 to 52 vessels. The catch per day has also increased. Since the highest catch rates are experienced at opposite times of the year on the Tutoia and the northern Brazil grounds, the practice of switching between the two areas from season to season within each year may be expected to continue.

Unlike the Brazilian catch, the Japanese catch is taken entirely offshore and is composed mostly of adult P. brasiliensis (80 percent). The fleet has fished throughout the entire coast, although the areas where most of the shrimp were caught have changed considerably. During the period 1970-72 most shrimp were caught in Statistical Areas 74-75 with 65-70 vessels. High catches were taken not only in Area 74 but also far to the north in Area 69 during 1973-75 with 102-128 vessels. During 1976-77 the fishery shifted to the south into Areas 76-77 and the number of vessels dropped to 67-70. The catch per unit effort (Fig. 4) generally decreased throughout the period 1966-present, even though the fleet changed fishing locations to prevent decreased catch rates. This long-term drop strongly indicates that a general decreasing trend in the abundance of P. brasiliensis is ongoing.

Before 1977 fleets based in French Guiana, Guyana and Suriname fished over the entire shelf off these countries for several species and over a range of depths. About 70 percent of the catch was P. subtilis and 23 percent P. brasiliensis during 1972-74, as indicated by the catch of U.S.A. vessels. The overall drop in kilogrammes caught per day fished from French-Guiana-based vessels concomitant with decreasing effort could well reflect the drop in abundance of P. brasiliensis as indexed by the Japanese CPUES, and a general gradual decrease in overall offshore abundance of P. subtilis. That trend is corroborated by catch per vessel abundance indices of Guyana and Suriname-based fleets (Fig. 5).

### 2.5.3. Summary

Estimates of MSY were not made. Such estimates based on the available data would not be realistic because:

- (1) the magnitude of the inshore fishery on juveniles in nursery areas is not monitored;
- (2) information is not available on the apparent change in species composition of offshore catches throughout the time period concerned;
- (3) information on species-directed effort necessary to develop reliable accurate measures of CPUE indexes of abundance for the various species that are consistent throughout the time period were unavailable.

Gross statistics (Fig. 2) indicate, however, that: (1) total offshore catch has dropped from the maximum level of earlier years; (2) the 1978 catch level can be maintained at the present level of fishing effort; (3) the total catch can probably be increased somewhat from the 1978 level, with a considerable increase in fleet size; and (4) similar high total catches were obtained with lower levels of effort than in 1978.

Statistics from individual national fisheries indicate that:

- (1) the abundance of P. subtilis off Brazil has not decreased;

- (2) the abundance of P. brasiliensis off northern grounds (Statistical Areas 69-77) has decreased over the past few years; and
- (3) the abundance of P. subtilis off northern grounds (Statistical Areas 69-77) may have undergone a gradual decrease.

## 2.6 Groundfish Stocks

### 2.6.1 Surveys

Since 1945 numerous experimental and exploratory fishery surveys have revealed the existence of groundfish stocks in commercial quantities. These cruises are mentioned in the U.S.A., Brazil, and French Guiana national reports. UNDP/FAO and national surveys suggest an existing resource of 350 000 t. While catch rates for these surveys vary with season, depth, time of day and fishing power of vessels, results indicate:

- (1) production is consistently highest in inshore (< 40 m) areas and increasing depth is generally associated with reduced trawl catches;
- (2) for trawl surveys, day-time catches average higher than night-time;
- (3) riverine discharges are correlated with fish abundance in inshore areas;
- (4) coastal waters off Suriname yield consistently higher catches than other areas;
- (5) species compositions vary continuously inshore-offshore but distinct groups can be defined and related to benthic features; inshore trawl catches tend to be marketable species and industrial species dominate offshore.

### 2.6.2. Commercial Exploitation

Over 200 000 t of demersal finfish are conservatively estimated to be lost as by-catch in the regional shrimp fishery.

Vessels operating out of Guyana are responsible for approximately 80 000 t of by-catch. Since 1974 the Guyana Government has requested each shrimp vessel to deliver 909 kg (2 000 lb) of fish with its landings. Four Venezuelan stern trawlers operate mainly for demersal fish (especially Cynoscion sp.) in this area, and Cuban vessels also receive fish from shrimpers in waters off Guyana.

In waters off Suriname, 6-10 semi-commercial flag vessels provide an estimated 1 t of fish daily. The main species caught are sea trout (Cynoscion virescens), croaker (Micropogon furnieri), dog trout (Macrodon ancylodon) and butter-fish (Nebris microps).

Approximately 30 Venezuelan snapper boats handline in offshore waters (50-90 m) off French Guiana, but no commercial trawling for fish in these waters is done. Off north Brazil, no commercial trawling for fish takes place.

## 2.7 Fishing Regulations

The present regulations of the coastal countries affecting shrimp fishing were reviewed. The information that was available to the participants (Appendix 3) indicated that the regulations in effect relate mainly to national jurisdictions and licencing requirements. Some countries (French Guiana and Brazil) are attempting to limit total fishing effort through catch and vessel limitations. This appears to be a very reasonable approach to proper management, although the lack of scientific data on which to base estimates of productivity makes the application of the approach somewhat imprecise. In general, needless biological regulations (e.g., the application of size limits to an offshore fishery) have not been applied.

## 2.8 Possible Management Measures

In the document on possible regulatory measures on shrimp fisheries (Boerema, Contributed Rep. 4-8) it is pointed out that, despite the fact that the knowledge of the shrimp fishery off the Guianas and northern Brazil is still very incomplete, there is a need to consider management measures at this time. This opinion is based on the fact that it is likely that some segments of the fishery are already fairly heavily exploited.

The underlying reasons for management are the wise and rational utilization of the resource on a continuing basis. The goals for management of this shrimp fishery could be:

- (1) maximum yield of shrimp over time;
- (2) maximum yield of fish over time;
- (3) maximum economic return;
- (4) maximum employment, or
- (5) a combination of the other four goals.

While the meeting recognized the fact that adoption of any management scheme remains basically the responsibility of the coastal countries concerned (as their goals for management could well be different from each other), it is imperative and urgent that such goals in each country be defined and common management measures agreed upon and implemented throughout the area where the resource is exploited.

Effective management of this resource will require that the stocks of shrimp be managed throughout their range. Since the stocks of shrimp

extend along the coasts of several countries and the fishery also is distributed along the entire coast, fishing activities in waters under the jurisdiction of one country will affect those parts of the stocks living in waters of the remaining countries.

Some concern was expressed by participants about the granting of licences in a particular country without taking into account the number of licences given in other countries sharing the resource, as such action could well result in excessive fishing pressure on part of the resource. This situation gives support to the need for regional management.

Basically, management of shrimp fisheries can be grouped into two types of regulatory measures:

- (1) protection of young shrimp: increase in the mesh size of nets, establishment of size limits for landed shrimp, establishment of closed seasons during the recruitment period, and establishment of closed areas where small shrimp predominate;
- (2) regulation of the amount of fishing: establishment of closed seasons, limitation of the amount of catch, and limitation of fishing time and effort.

Without the establishment of management goals, any recommendations for regulatory action are inappropriate. However, the feasibility of various measures was discussed.

Any management scheme adopted to regulate the shrimp fishery in the Guianas-Brazil area needs to take into account the effect of estuarine fisheries on the yields obtained by offshore fisheries observed in other regions. If these effects are determined to be significant, then some control of estuarine fisheries may be necessary. Protection of small shrimp while in estuaries will have an impact on artisanal fishing communities situated in estuarine areas, especially if the activities of these communities cannot be shifted to other productive work.

Increased mesh size of nets is a more valuable management tool for artisanal fisheries operating in estuarine areas than for industrial fisheries operating in offshore areas. Selectivity experiments for shrimp trawls have shown that appreciable amounts of small shrimp are still retained by fairly large meshes. In addition, the loss of valuable fish could represent a diminution in economic return for some segments of the fishery.

The establishment of minimum size limits often results in the discard of undersized dead shrimp, without bringing any positive benefit to the resource.

Closed seasons at the peak of the recruitment period benefit the juvenile shrimp and, at the same time, reduce fishing effort. Closed seasons during other periods of the year also reduce fishing effort but seasons

need to be carefully chosen, taking into consideration the combined effect of recruitment and growth and their regional variations.

Catch quotas for short-lived animals with large annual variations such as shrimp have little practical value, as the amount of data needed to set appropriate annual quotas is excessive. A more direct way to control the amount of fishing on the stock is to regulate the number and type of boats participating in the fishery. The determination of the permitted fishing effort needs data which are less difficult to obtain than those for catch quotas.

The number and type of boats authorized to fish inside a particular zone would require the introduction in the country of a system for licensing fishing vessels.

## 2.9 Research Needs and Future Research Programmes

### 2.9.1. Research Needs

From the review of the data presented at the meeting it is evident that a good deal of information is still lacking to permit a proper analysis to be made of the state of exploitation of the stock. Participants agreed that all missing information is not equally important and, therefore, priorities should be established in future research programmes.

Due to lack of data on species composition, the shrimp resource has been treated up to now as a single stock, although there are four different species in the catches. It follows that information on species composition of the catch is essential for proper evaluation of the fishery. Countries should take steps to collect data. Various fleets participating in the fishery do not have the same relative efficiency on the same level of fishing power per unit vessel, so that it will also be necessary to standardize fishing effort in terms of a certain class of vessel.

The application of different models in stock evaluation studies was reviewed thoroughly. A surplus production model needs relatively simple data viz., catch by species and standardized estimates of fishing effort. It provides estimates of MSY and the appropriate level of fishing. The yield per recruit model needs more sophisticated data (growth and mortality) and provides information on a species basis of the optimal size of the animal to be harvested and on the fishing effort that will optimize the yield. The Working Party concurred that the surplus production model might be adequate for the level of information available at present but that a yield per recruit model would permit better management of the fishery. The additional data requirements of a yield per recruit model need to be taken into account when developing future research programmes.

### 2.9.2. Future Research Programmes

In order to establish research priorities the meeting reviewed the input information needed for each model (Appendix 4) and discussed the limitations of the available data.

The group agreed that there are four fields that have high priority in any future research programme:

- (1) data collection for catch and effort statistics;
- (2) data processing for catch and effort statistics;
- (3) tagging operations;
- (4) surveying of nursery grounds and artisanal fisheries;

- (1) Collection of catch and effort statistics

The collection of catch and effort statistics will provide the basic input for the surplus production model. The collection of catch data should be the full responsibility of each country in agreement with item 14 of the report of the First Meeting of the WECAF Commission Working Party on Fishery Statistics which was fully endorsed by the WECAF Commission (Appendix 5). In addition, the meeting considered that the report on fishing effort by statistical areas should be the responsibility of the flag country of a particular vessel. Future collection of catch and effort statistics must also include information from artisanal fisheries for shrimp and from fisheries for other species that might take shrimp as a by-catch.

The need to have a uniform statistical reporting system to supply the information required was stressed. As at the present time several countries participating in the fishery have reporting systems, it is necessary to develop a common system within a reasonable time period. The Working Party recommended that an adequate reporting system be established and implemented by all countries participating in the fishery. The Working Party suggested that the WECAF Project should render necessary help to its member countries in developing such a system (Appendix 6, items (a) and (b)).

- (2) Data processing of catch and effort statistics

The Working Party examined the national data relating to this shrimp fishery. While most of the countries are attempting to collect common data by logbook and trip-reporting systems, it was felt that the shrimp fishery in this area could not be assessed solely at the national level. It requires a regional approach which necessitates regional compilation of data. This should be done by a regional body such as the WECAF Project or the WECAF Commission. While the working details can be left to the executing body, it is recommended by the Working Party that a regional data bank should be formed which will undertake final processing of raw data collected at the national level. By centralizing processing of data, the time lag between the collection of data in the field and their publication at the national and regional levels will be reduced. National data collected by uniform methods could be fed to a common computer programme to print standardized statistical reports which could serve national and regional needs. These tabulations would lead to publication of a regional

statistical bulletin. Thus, the regional bulletin would be a by-product of the central processing system and would not be a mere compilation of summary data published at national level.

The Working Party also requested that the WECAF Project convene a group to develop a proposal to establish a Central Data Processing System for consideration at the next meeting of the WECAF Commission Working Party on Fishery Statistics.

### (3) Tagging

The value of mark-recapture studies to determine stock boundaries, migration patterns, growth and mortalities was recognized by the Working Party. It was pointed out that inshore and offshore tagging presented quite different logistical problems and that field operations for both types need to be planned carefully. In addition, a successful tagging programme is completely dependent on a recovery programme, and this also requires much planning and work.

The Working Party recommended that countries carry out a cooperative tagging and recovery programme in order to obtain information on migrations and other biological characteristics of the shrimp stocks (Appendix 6, item (c)).

The Working Party has identified the essential elements and requirements of a tagging programme that could be carried out with the participation of the various countries concerned and with coordination supplied by the WECAF Project's staff. With the potential cooperation and financial support of the interested member Governments of the WECAF Commission, and with some additional financial support from external agencies, the programme could be carried out effectively and useful results derived.

The Party requested that the WECAF Project establish a small group to develop a proposal with detailed plans for an international shrimp tagging programme in the Guianas-northern Brazil region in order to ensure the necessary coordination between the parties concerned.

Provisional commitments to participate in such a programme were obtained from scientists of Brazil, French Guiana and the U.S.A. The U.S.A. can provide expertise in shrimp tagging, training in the U.S.A. for tagging operators and processing of recovery data. French Guiana can meet the cost resulting from offshore tagging in their national waters (vessel time, tags, rewards and tagging crew). Brazil can provide vessel time, tags, rewards and tagging crew for tagging done in Brazilian national waters. (It is expected that the French tagging programme will start in 1980 and the Brazil tagging programme is proposed for 1981.)

### (4) Survey of nurseries and artisanal fisheries

There is great lack of information on this subject. While recognizing



that the collection of catch and effort statistics to be carried out by coastal countries needs to include information on artisanal fisheries, there is an urgent need to have immediate information on both nursery grounds and artisanal fisheries for a better planning of the tagging programme recommended in this report. Therefore, the Working Party requested the Southeast Fisheries Center (SEFC), NMFS of the U.S.A. to undertake a short survey to determine the localization of the nurseries and estimate the magnitude of the artisanal fisheries. The Working Party also suggested that the WECAF Project collaborate with SEFC in this endeavour.

#### Acknowledgements

The Working Party voiced its appreciation to Mr. L.K. Boerema for preparing a report especially for this meeting. The group regretted that he was not able to attend in person, since he retired from FAO in April 1978. His long interest in shrimp fisheries and his many contributions to shrimp fishery evaluations in this region and other parts of the world and his personal interest in the Guianas-Brazil fishery were noted in this group.

Table 1 Number of Shrimp Trawlers Fishing Each Year in the Guianas-Brazil Shrimp Fishery, (1961-78). Vessels are Listed According to Country Where Based, Except for Cuba, and May Represent More Than One Country of Registry. Cuban Vessels were Attached to Mothership Based in Guyana.

YEAR	BARBADOS	TRINIDAD	VENEZUELA	GUYANA	CUBA	SURINAME	FR. GUIANA	BRAZIL	TOTAL
1961	-	-	-	60	-	40	-	-	100
1962	-	-	-	72	-	24	-	-	96
1963	-	-	-	89	-	25	33	-	147
1964	30	-	-	81	-	25	51	-	187
1965	24	-	-	96	-	25	58	-	203
1966	32	43	-	105	-	34	67	-	281
1967	32	58	-	113	-	50	89	-	342
1968	35	48	-	134	-	55	90	-	362
1969	36	63	-	142	-	51	110	1	403
1970	25	78	-	162	-	55	83	18	421
1971	-	60	-	160	-	45	60	21	346
1972	-	55	-	175	-	55	60	25	370
1973	6	42	107	200	-	63	68	37	523
1974	21	39	66	202	11	106	62	55	562
1975	20	50	88	209	14	140	45	25 <sup>1/</sup>	591
1976	0	66	90	190	6	165	31	38 <sup>1/</sup>	586
1977	0	77	129	157	13	192	42	48	658
1978	0	-	58	148	13	165	78	52	514

<sup>1/</sup> In 1975 and 1976, these vessels fished south of the Equator, outside the U.S.A.-Brazil Agreement Area.

Table 2    Number of Vessels and Landings (t, whole weight)

<u>Year</u>	<u>No. of vessels</u>	<u>Landings</u>
1960	-	2 785
1961	100	3 095
1962	96	4 371
1963	147	7 430
1964	187	9 262
1965	203	11 230
1966	281	15 475
1967	342	17 222
1968	362	19 259
1969	403	19 136
1970	421	19 081
1971	346	15 500
1972	370	16 126
1973	523	19 606
1974	562	18 136
1975	591	15 581
1976	586	16 926
1977	658	19 615
1978	514	15 447

Table 3 Nominal Offshore Catch (t, tail weight) and Average Annual Fleet Size in the Guianas-Brazil Shrimp Fishery

Year		Barbados	Trinidad	Venezuela	Guyana	Suriname	F. Guiana	Brazil	Korea	Japan	Cuba
60	Catch	-	-	-	1 618	173	-	-	-	-	-
	Boats	-	-	-	-	-	-	-	-	-	-
61	Catch	-	-	-	1 788	203	-	-	-	-	-
	Boats	-	-	-	60	40	-	-	-	-	-
62	Catch	-	-	-	2 325	486	-	-	-	-	-
	Boats	-	-	-	72	24	-	-	-	-	-
63	Catch	145	-	-	2 740	629	1 265	-	-	-	-
	Boats	-	-	-	89	25	33	-	-	-	-
64	Catch	672	-	-	3 168	775	1 343	-	-	-	-
	Boats	30	-	-	81	25	51	-	-	-	-
65	Catch	858	-	-	3 651	1 008	1 796	-	-	-	-
	Boats	24	-	-	96	25	58	-	-	-	-
66	Catch	1 089	1 082	-	4 330	1 335	2 117	-	-	-	-
	Boats	32	43	-	105	34	67	-	-	-	-
67	Catch	988	1 539	-	4 099	1 150	3 302	-	-	-	-
	Boats	32	58	-	113	50	89	-	-	-	-
68	Catch	1 166	1 941	-	4 155	1 559	3 565	-	-	-	-
	Boats	35	48	-	134	55	90	-	-	-	-
69	Catch	938	2 027	-	4 749	1 577	2 983	34	-	-	-
	Boats	36	63	-	142	51	110	1	5	-	-
70	Catch	607	7 984	-	5 356	1 603	2 208	516	-	2 619	-
	Boats	25	78	-	162	55	83	18	5	71	-
71	Catch	0	1 518	-	4 374	1 398	2 068	612	34	2 541	-
	Boats	-	60	-	160	45	60	21	5	68	-
72	Catch	0	944	-	4 873	1 596	2 065	842	133	2 661	-
	Boats	-	55	-	175	55	60	25	10	65	-
73	Catch	210	687	907	5 443	1 791	2 468	1 062	278	3 468	-
	Boats	6	42	107	200	63	68	37	21	102	-
74	Catch	392	820	492	5 086	2 022	1 479	942	871	3 748	203
	Boats	20	39	66	202	106	62	55	55	128	11
75	Catch	-	753	1 024	3 899	3 167	937	709	1 126	2 337	132
	Boats	20	50	88	209	140	45	25	82	123	14
76	Catch	-	1 542	956	3 082	3 872	951	944	2 447	1 909	158
	Boats	0	66	90	190	165	31	38	110	70	6
77	Catch	-	857	1 373	3 518	4 015	1 503	1 151	2 799	1 790	159
	Boats	0	77	129	157	192	42	48	130	67	13
78	Catch	-	45	540	3 258	2 813	1 354	1 670	-	-	162
	Boats	0	-	58	148	165	78	52	-	-	13

Table 4 Indexes of Offshore Abundance Developed from Commercial Fisheries Statistics  
Annual Catch (t, tail weight) per Average Number of Vessels

Year	Barbados	Trinidad	Venezuela	Guyana	Suriname	F. Guiana	Brazil	Cuba	Korea	Japan	Güiría/Cumana	Korea*	Japan <sup>†</sup>	Brazil (Belem)	Japan	U.S.A., F. Guiana	U.S.A. Total kg/hour *
60															183		
61				29.8	5.1										267	204	
62				32.3	20.3										285	171	
63				30.8	25.2	38.3									178	189	
64	22.4			39.1	31.0	26.3									159	195	
65	35.8			38.0	40.3	31.0									151	153	
66	34.0	25.2		41.2	39.3	31.6									145	138	
67	30.9	26.5		36.3	23.0	37.1							12.4	127	145	144	
68	33.3	40.4		31.0	28.3	39.6				36.9			12.0	184	139	144	
69	26.1	32.2		33.4	30.9	27.1	34.0			37.4			11.9	144	145	141	9.1
70	24.3	25.4		33.1	29.1	26.6	28.7			40.9			11.9	159	156	177	11.2
71		25.3		27.3	31.1	34.5	29.1		6.8				8.8	98	123	99	6.7
72		17.2		27.8	29.0	34.4	33.7		13.3				8.0	131	93	105	6.4
73	35.0	16.4	8.5	27.2	28.4	36.3	28.7		13.2	34.0	126		8.8	127	95	102	7.0
74	18.7	21.0	7.4	25.2	19.1	23.9	17.1	18.5	15.8	29.3	109		8.0	127	94		
75		15.1	11.6	18.7	22.6	20.8	28.4	9.4	13.7	19.0	133		5.9	132			
76		23.4	10.6	16.2	23.5	30.7	24.8	26.3	22.2	27.3	131	8.8	6.1	132			
77		11.1	10.6	22.4	20.9	35.8	24.0	12.2	21.5	26.7	153	6.0					
78			9.3	22.0	17.0	17.4	32.1	12.5			126	5.7		221			

\* only Jan-June 1978.

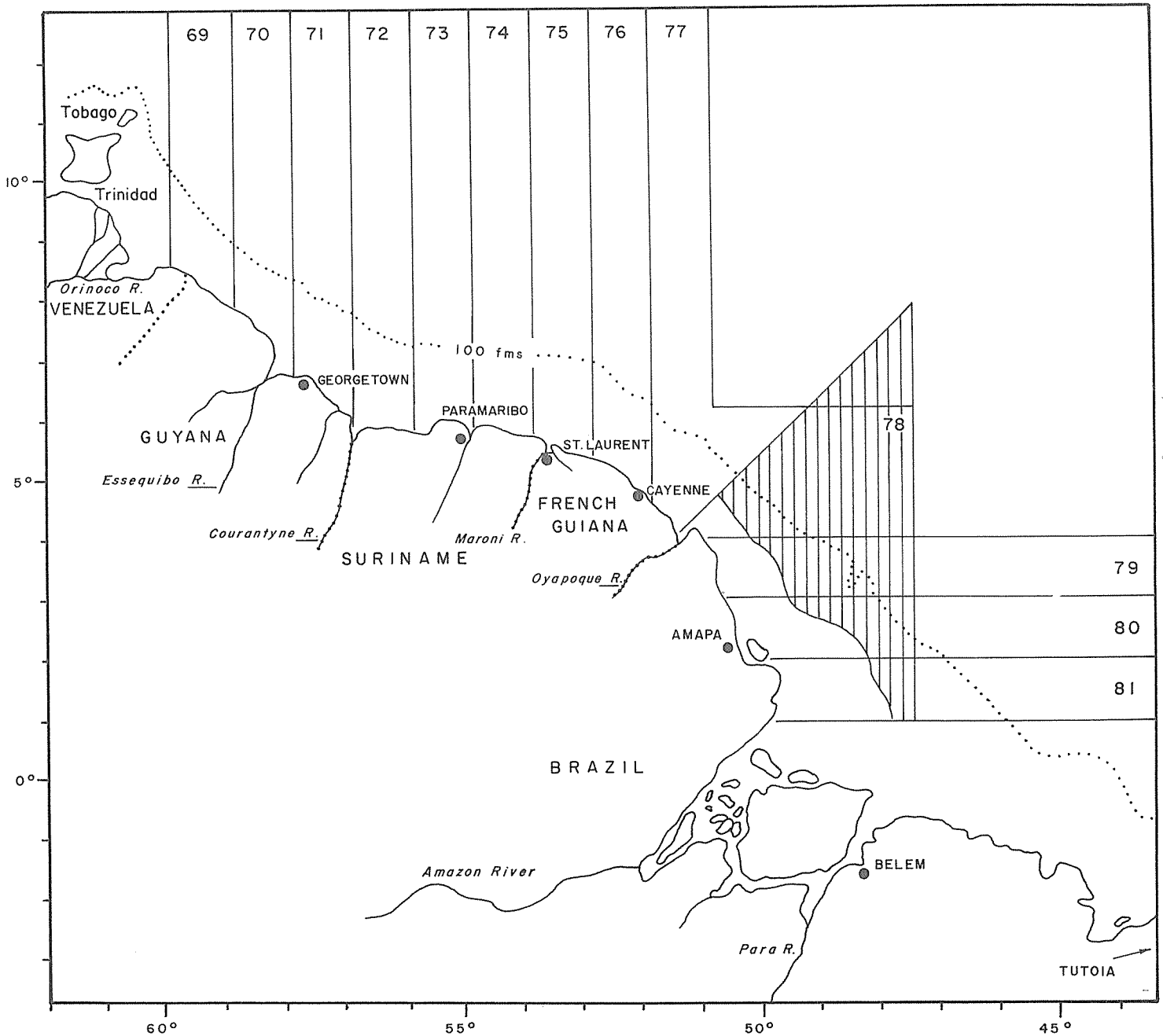


FIGURE 1. - MAP OF SHRIMP FISHING GROUNDS ON NORTHEASTERN COAST OF SOUTH AMERICA .



US - BRAZIL FISHING AGREEMENT ZONE .

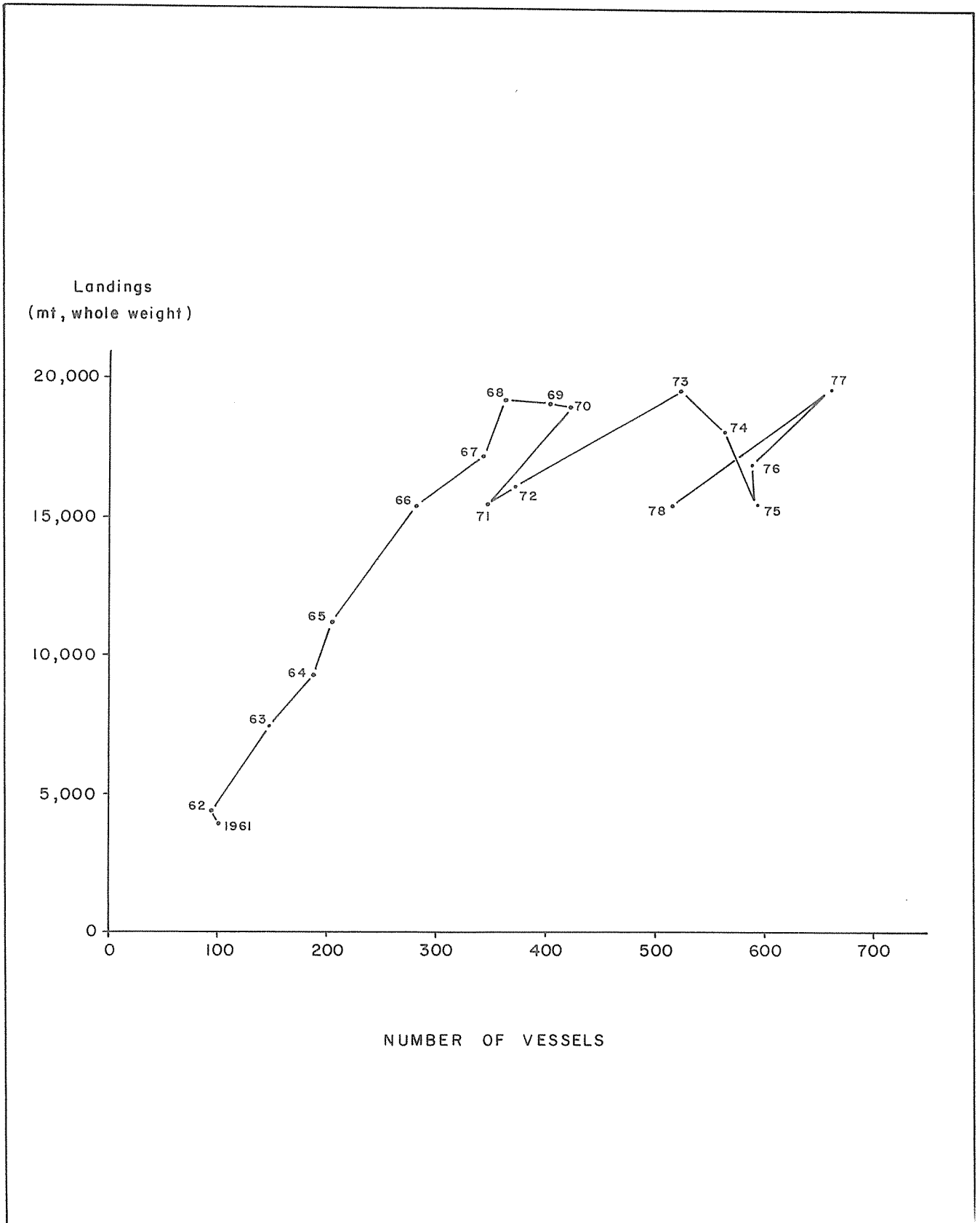


FIGURE 2. - RELATIONSHIP BETWEEN TOTAL LANDING AND TOTAL NUMBER OF VESSELS IN THE GUIANAS - BRAZIL SHRIMP FISHERY.

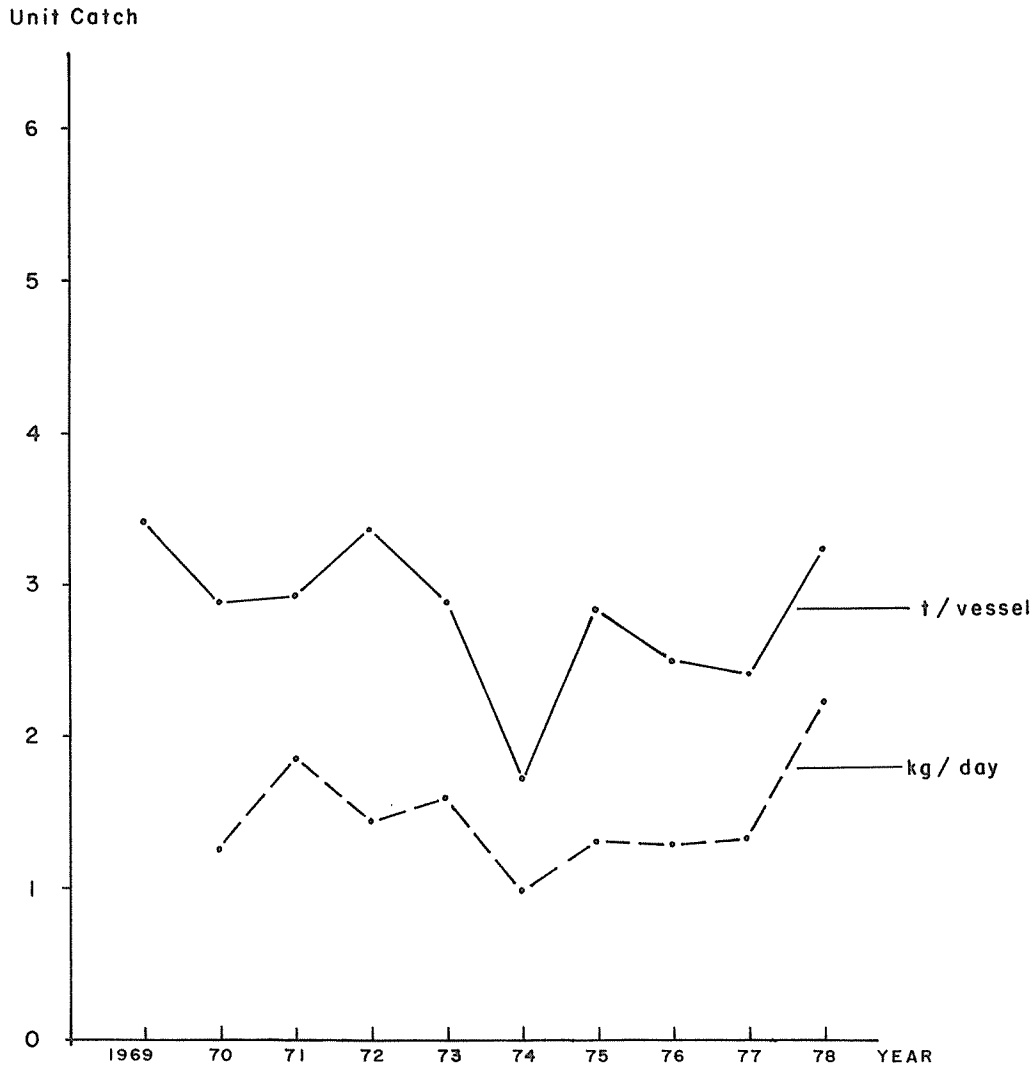


FIGURE 3. - CATCH PER UNIT FISHING EFFORT TRENDS OF THE BRAZILIAN FLAG SHRIMP FLEET



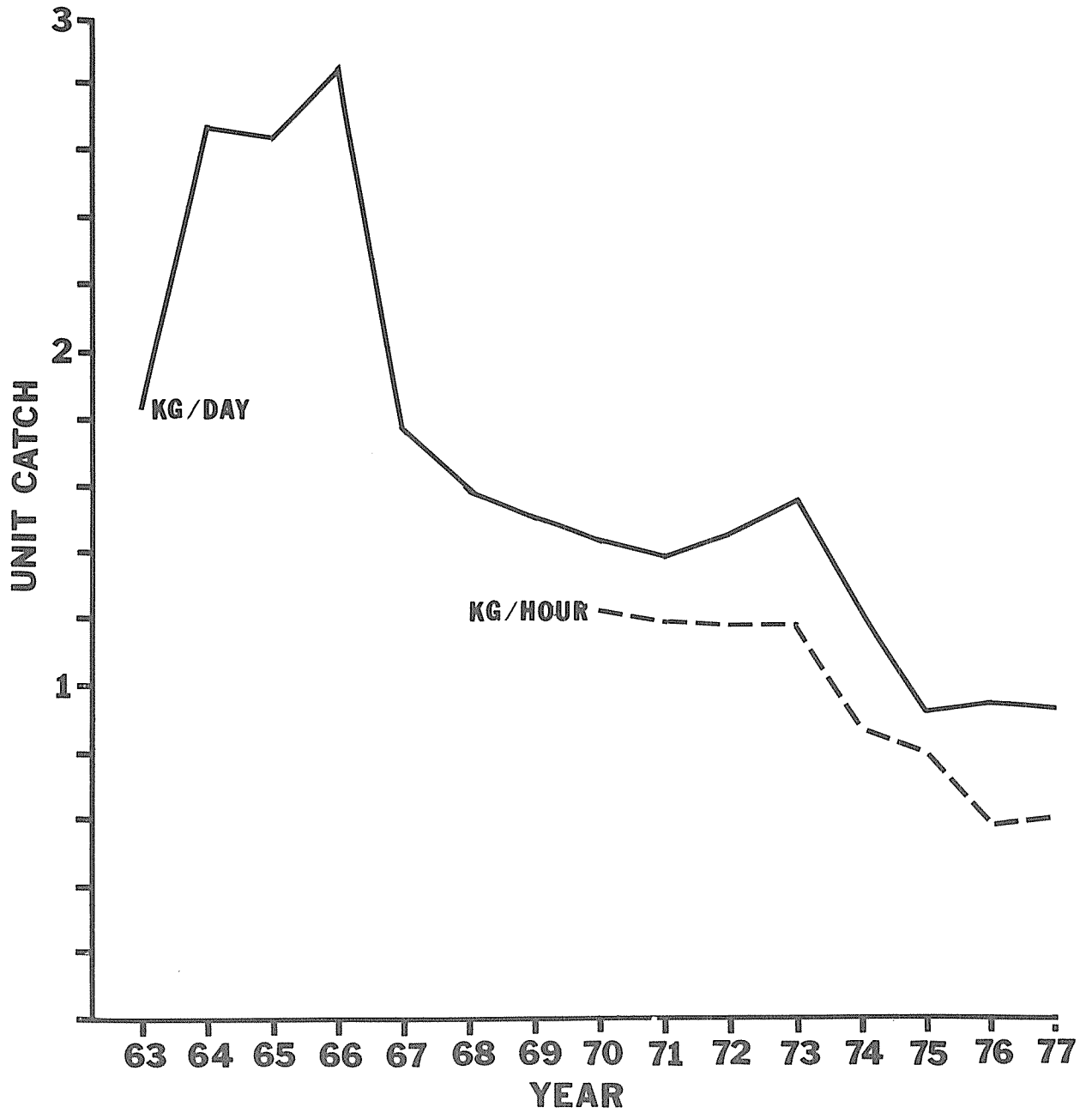


FIGURE 4. - CATCH PER UNIT FISHING EFFORT TRENDS OF THE JAPANESE FLAG SHRIMP FLEET

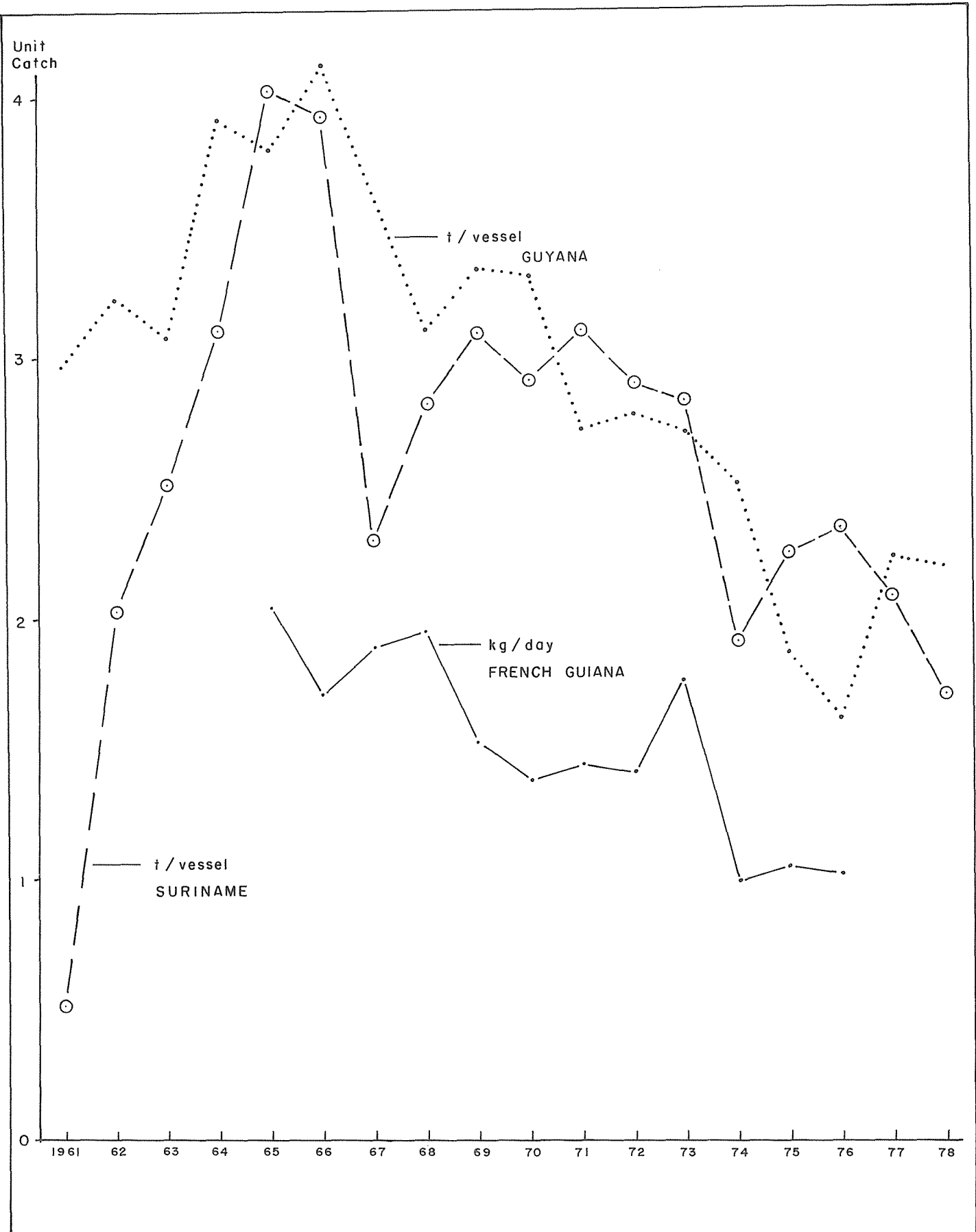


FIGURE 5. - CATCH PER UNIT FISHING EFFORT TRENDS OF SHRIMP FLEETS BASED IN GUYANA, FRENCH GUIANA AND SURINAME (TAIL WEIGHT)

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Agenda

1. Opening of the Meeting
2. Adoption of the Agenda and Arrangements for the Session
3. Election of the Chairman and the Secretary
4. Review of the Existing Information on the Fishery
5. Stock Evaluation
6. Coastal Countries' Regulations
7. Possible Management Measures
8. Research Needs and Future Research Programmes
9. Conclusions and Recommendations
10. Preparation of a Final Report Including National and Special Reports
11. Adoption of the Report

Coastal Countries' Regulations Affecting Shrimp Fisheries in the Guianas-Brazil Area<sup>1/</sup>

Country	Extended Fishery Jurisdiction and Licensing Requirements	Closed Season	Area Restriction	Catch or Effort Limitations	Shrimp Size Limitations	By-Catch Landings
Venezuela	No 200 mi claim at present; Government exerts jurisdiction by area over shrimping activity	None	None, except no trawling inside 2 mi	None	None	No regulations, food fish landed according to market demand
Guyana	Jurisdiction extended to 200 mi on 14/10/77. Licence fees for foreign-owned Guyana-based vessels (US\$ 5 000); foreign-based vessels (US\$ 39 200) and Guyana-owned Guyana-based vessels (US\$ 2 000); 12 mi territorial sea	None	None, except foreign vessels must fish outside 12 mi	None	None	Shrimp vessels required to land 2 000 lb of by-catch per trip; not strictly enforced
Suriname	Jurisdiction extended to 200 mi on 10/12/78. No licence scheme; 3 mi territorial sea	None	None	None	None	No regulations, food fish landed according to market demand
French Guiana	Jurisdiction extended to 200 mi in January 1977 by EEC. Licensing from France, no fee required at present; 12 mi territorial sea	None	None, except no shrimping permitted in lagoons or lagoon outlets; no trawling inside 3 mi	Total annual quota of 3 000 t set for 1978. Permanent licences issued to French Guiana-based vessels. Temporary licences, based on fishing days, issued to foreign-based vessels until total quota is reached.	None	No regulations, food fish landed according to market demand
Brazil	Jurisdiction extended to 200 mi in 1970. Foreign fishing under licensing scheme permitted until 31/12/77. Since 1/1/78 only joint ventures and leasing arrangements permitted	None (closed season for foreign boats enforced in 1972-77)	None	Limited entry, only 250 vessels allowed in the region Tutoia-Amapá; present fleet composed of 52 vessels.	None	No regulations, food fish landed according to market demand

1/ All countries appear to have plans for implementing stricter regulations

Data Needed for Stock Assessment

Type of Information	Data Needed for Stock Assessment		Yield per recruit Required	Optional
	Surplus production Required	Optional		
1. Total catch.....	X			
Species.....	X			
Area.....	X			
Depth.....				
Size.....				
Fishery.....	X			
2. Total effort (artisanal fishery).....	X			
No. of fishermen				
No. of boats				
3. Measured fishing effort for portion of offshore catch.....	X		X	
Area.....	X		X	
Hours fished.....		X		X
Days at sea.....	X		X	
4. Annual vessel characteristics.....	X		X	
5. Stock boundaries.....	X		X	
Nursery areas.....			X	
6. Growth and mortalities.....			X	
Season.....			X	
Area.....			X	
Species.....			X	
7. Environmental data.....			X	

Appendix 5

Report of the First Session of the  
Western Central Atlantic Fisheries Commission (WECAFC)  
Working Party on Fisheries Statistics  
Panama City, Panama, 16-17 May 1978

Item 14

"In order to ensure full reporting and at the same time prevent double counting the Working Party suggested that each country should report to FAO their national production under three subheadings as follows:

- (a) catch landed in domestic ports by national or chartered vessels
- (b) catch landed in foreign ports by national or chartered vessels, by country of landing
- (c) catch landed in domestic ports by foreign vessels indicating the name of the foreign countries."

Appendix 6

Recommendations

1. Collection of Fishery Statistics

Because it is necessary that countries continue to collect statistics on landings, effort, and size and species composition of the shrimp catch by their flag vessels in order to provide information to analyse the status of the resource and fishery, and

Because it will be necessary that the methods and formats for collecting and recording the data be consistent, so as to facilitate the combination and processing of the data preparatory to stock analysis, and

Because the Working Party has agreed on the minimum statistical data that are required to analyse the state of the resource and fishery to prevent possible overfishing and to promote optimum management of the fishery,

The Working Party recommended that

(a) The countries concerned give consideration and emphasis to their fishery statistics data collection programmes to ensure that the necessary data are, in fact, collected in a uniform and consistent way, and

(b) Countries submit either unprocessed data forms or processed data elements in a timely manner to a WECAFC regional data facility that would prepare a regional statistical bulletin.

Several measures of fishing effort are presently in use: number of vessels, days at sea, days fished, and hours fished. Some countries find it possible to collect more precise measures of fishing effort than others; however, it is desirable to have one single measure that is comparable between all fleets. Therefore, it was recommended that

(c) All countries collect at least for every vessel trip information on days at sea and also on fishing grounds. Days at sea can be calculated from departure and return dates and this information can be collected with little additional work along with information already reported on landings by size category. If information on days at sea and information on area fished by statistical zone(s) were available for all trips, analysis of the fishery would be greatly facilitated.

The Working Party suggested that the WECAF Project assists the countries by making available technical advice to the various national statistical programmes as to how consistent data can best be collected by the present programmes - the WECAF Project provides the next meeting of the WECAFC Working Parties on Stock Assessment of Shrimp and Lobster Resources and on Fishery Statistics with report on the adequacy of and improvements to be made to such statistical programmes to satisfy requirements arising from the adoption of a common reporting system.



## 2. Determination of Species Composition

The Working Party found that the species composition of the catches varied considerably between national fleets. Also changes in the species composition of the one fleet between 1976 and 1977 were noted. It is clear that the various fleets fish in different areas, which change from time to time, and thus target their fishing effort on different species.

It is therefore recommended that the countries take the necessary steps to collect statistical information on the species composition of the landings of the boats based in their ports, preferably by trip, but at least on a total catch basis, to facilitate the calculation of fishing mortality on a species basis.

It is urged that port sampling schemes as the one in use at Georgetown, Guyana, be extended to other ports of the region.

## 3. International Cooperative Tagging Programme

Because the available information indicates that it is likely that the shrimp off the coast of northeastern South America may range beyond the boundaries of a single country, and

Because these stocks thus may be considered migratory in the sense that the stock cannot be managed as a single biological unit over its total range except on a regional basis, and

Because any management measures applied by the countries concerned should be consistent and in accord with regional management needs,

The Working Party recommended that

(a) The various countries concerned cooperate to obtain additional information on the migrations of shrimp stocks throughout the region, and

(b) The countries with assistance and coordination from the WECAF Commission and the WECAF Project carry out a cooperative tagging and recovery programme that will provide this information on migrations and other biological characteristics of the shrimp stocks.

National Report 3.1

Brazilian Report on Shrimp Fishery

Superintendencia do Desenvolvimento da Pesca (SUDEPE)  
Brasilia, Brazil

1. Historical Review of the Fishery

The shrimp fishery of the Brazil-Guianas area started off the coast of Guianas in 1959 after the two exploratory fishing cruises carried out by the R/V OREGON.

The high catch rates obtained by the shrimp fleet based in the Guianas stimulated a rapid growth of the fishery, attracting fleets from several countries. Later the foreign fleets extended their area of operation and in 1960 they commenced the fishery on the coast off Brazil.

With the extension of the Brazilian territorial limit to 200 mi, the Brazilian authorities entered into the first shrimp fishing agreement on 9 May 1972, with the United States of America. Later, similar agreements were made with Barbados, Suriname and Trinidad who also showed interest in participating in this fishery.

After 1969, the Brazilian fleet started operations in that area and nowadays there is a large processing industrial park localized in Belem. But the low catch rates in the area stimulated the displacement of the fleet to the area of Tutoia, in State of Maranhão. This happened in the middle of 1974.

In 1975, the National Superintendency for Fishery Development - SUDEPE - commenced an intensive work to collect all the available historical data of the fishery and established a system to collect catch and effort data to determine the CPUE, and a sampling programme for the nursery grounds and industries.

Since 1978, with the end of the agreements, SUDEPE established the maximum fishing effort for the national fleet operating in the area between the limits of French Guiana and the true mark line of 19°, taken from Ponta de Atalaia (in the mouth of Rio Parnaíba), at 250 shrimp boats, in order to maintain the economic level of the fishery.

This paper presents a summary of the operations of the Brazilian shrimp fleet in northern Brazil, analysing the trends and the seasonal fluctuations in catch and effort in the period 1976-1978.

2. Current Status of the Fisheries in Brazil

At the beginning of operations, in 1969, the Brazilian fleet was restricted to five boats, reaching a total of 38 and 48 boats in 1976 and 1977 respectively. The length of these boats varies between 19 and 22 m and the horse power between 335 and 480. In the majority of the cases the boats are made of steel, with a crew of six fishermen.

Besides this, in 1976, the Brazilian Government gave licences for the operation of 155 foreign boats in the agreement area, 99 with U.S.A. flag, 17 with Suriname flag, 17 with Barbados flag and 17 with Trinidad & Tobago flag.

With the end of the agreement on 31 December 1977, only Brazilian boats remain fishing in the area and in 1978 the fleet was composed of 52 boats.

### 3. Trends in Annual Landings and Effort

The landing data, compiled since 1969, when the Brazilian fleet started operations, indicate an annual catch of 2 755 t in 1978 (Table 3.1.1).

The fishing grounds are not exactly known. In the middle of 1974 the fleet concentrated its operations in the area of Tutoia, Maranhão, but since 1978 the fleet has been operating in all the area.

The monthly trends, from 1976 to 1978, indicate the best catches to be in the period March-July. Although this trend presents a marked oscillation, this is due to the best catches in the area of Amapá being in the period March-August.

Annual catch rates have also shown an oscillation. In 1971, the landings per day at sea reached 303 kg decreasing to 162 kg in 1974. In the period 1975-77 there was observed no significant variation in the catch rates which remained around 220 kg. Due to the low number of boats operating in 1978, a sharp increase in the catch rates was observed (Table 3.1.2).

### 4. Composition of the Catches

Four species of penaeid shrimp contribute to the fishery: Penaeus aztecus subtilis, P. brasiliensis, P. duorarum notialis and P. schmitti. In the referred area, P. subtilis is dominant (90 percent) and P. brasiliensis is second in abundance. P. duorarum is apparently very scarce in the catches. P. schmitti is primarily an inshore species that is rarely encountered in the deep-water of the area.

The size distribution of the catch, in the period 1976 to 1978, presented classes varying from 15 tails per pound to 71 tails per pound. The class 31/40 was dominant.

### 5. Fishery Monitoring

The record of statistics data on catch and effort is made through two basic systems:

- Recording of Landing Data: consists of the collection of the following information for each boat: departure and arrival date; total and composition by category of the landing. The categories are divided into nine weight classes - 61/70 tails per pound; 51/60; 41/50; 36/40; 31/35; 26/30; 21/25; 16/20; 15 and category "A" that consists of the weight in pounds of the damaged catch.

~ "Mapa de Bordo" System (Logbook): Very similar to the American logbook system. It was introduced in 1974 but the results are not so good yet. Some modifications are being made in order to improve the performance of the system.

#### 6. Shrimp Research Programme

The main objective of the shrimp research programme carried out by SUDEPE is to provide assistance to fishery management.

Nowadays, the record of biological data is made through landing samplings in the industries and the nurseries. In the first case, information on catch composition by size and sex is collected. The second objective is the collection of monthly information on the composition and length distribution of the artisanal catch.

Table 3.1.1 Shrimp Landings in Brazil, 1976, 1977 and 1978 in the Northeastern South America Shrimp Fishery (5°S to 10°N latitude)

	<u>1976</u> (t)	<u>1977</u> (t)	<u>1978</u> (t)
<u>Total Landings</u> <sup>1/</sup>	<u>1 558</u>	<u>1 899</u>	<u>2 755</u>
<u>Landings by Size Category</u> (tails/lb)			
15 or less	5.3	5.7	24.6
16-20	28.1	56.9	200.9
21-25	84.9	197.5	422.4
26-30	161.6	303.9	360.5
31-40	348.0	495.7	506.0
41-50	290.6	290.6	360.2
More than 50	291.4	129.2	203.5
<u>Landings by Species</u>			
Brown ( <u>Penaeus subtilis</u> ) <sup>2/</sup>			
Pink-spotted ( <u>P. brasiliensis</u> ) <sup>2/</sup>			
Pink ( <u>P. notialis</u> ) <sup>2/</sup>			
White ( <u>P. shmitti</u> )			
Sea bob ( <u>X. kroyeri</u> )			
Scarlet Prawn ( <u>Plesiopenaeus edwardsianus</u> )			
<u>Landings by Month</u>			
January	201.8	164.0	83.5
February	150.8	181.2	193.4
March	188.1	243.2	198.4
April	129.6	218.9	250.4
May	97.4	193.6	397.5
June	77.0	161.6	387.1
July	105.8	190.0	298.9
August	83.1	144.1	251.0
September	96.8	121.8	145.9
October	143.2	55.8	209.7
November	130.8	58.5	150.2
December	153.2	166.7	189.2

1/ Landings in Brazil (Conversion factor = 1.65)

2/ Combined landings for these three species may be reported if appropriate.

Table 3.1.2 Shrimp Catches of Brazil Flag Vessels in 1976, 1977 and 1978  
in the Northeastern South America Shrimp Fishery (5°S to  
10°N latitude)

---

	<u>1976</u> (t)	<u>1977</u> (t)	<u>1978</u> (t)
Total Catches	1 557.6	1 899.4	2 755.2
Total Effort	7 390	8 730	7 571
(Effort Unit: Day at Sea) kg/day at sea	210.8	217.6	363.9
Catches by Area <sup>1/</sup>			
Statistical Zone 69			
70			
71			
72			
73			
74			
75			
76			
77			
78			
79			
80			
81			

---

1/ See attached Figure 1 (page 20) for Statistical Zones.

National Report 3.2

Informe Nacional de Cuba

Centro de Investigaciones Pesqueras  
La Habana, Cuba

3.2.1 Historia de la Pesquería

La pesquería del camarón se inició en febrero de 1974, contando al principio con once barcos, dos congeladores de fabricación francesa y nueve neveros de fabricación española, a los cuales se le unieron posteriormente un congelador y un nevero de fabricación cubana. A principios de 1976, se sustituyeron los neveros existentes por otros de nuevo tipo de fabricación cubana, de manera que actualmente la flota cuenta con un total de 13 barcos.

El arte de pesca utilizada es el chinchorro doble con copo de malla de 20-22 mm.

3.2.2 Captura y Esfuerzo

Como puede verse en la Tabla 3.2.1, las capturas mensuales se aumentaron en 1974 desde 4,7 t en febrero hasta 41,9 t en junio, cayendo en julio a 18,8 t. Esta caída se debió a que la flota debió pescar el camarón pequeño (principalmente el camarón tití o "sea bob") el cual es muy abundante en ciertas zonas, comenzando a explotar otras áreas donde abunda camarón de mayor talla, la captura anual ha estado en los últimos años alrededor de las 160 t. El esfuerzo mensual (Tabla 3.2.2) ha variado entre 120 y 300 barcos/días con un promedio de cerca de 230 barcos/días, obteniéndose los mayores valores al principio y final del año, ya que en esa época los rendimientos son menores y así contribuye a elevar la captura. La captura por barcos/día a partir de julio de 1975 (Tabla 3.2.3) se ha mantenido entre 30 y 60 kg/barcos/días, con un promedio de alrededor de 50 kg/barcos/días.

3.2.3 Especies

Las especies capturadas son el camarón café (Penaeus subtilis), el camarón tigre (P. brasiliensis), el camarón acaramelado (P. notialis), el camarón blanco (P. schmitti) y el camarón tití (Xiphopenaeus kroyeri). La pesca se realiza tanto de día como de noche, según la zona y la profundidad. En aguas someras se practica la pesca diurna, capturándose fundamentalmente camarón café, blanco y tití. En aguas profundas se pesca de noche, siendo las especies capturadas camarón tigre, acaramelado y además café en mayor cantidad.

En general los camarones capturados por la flota cubana han sido de talla mediana.

Estadística de Captura y Esfuerzo  
Zona: Guyana  
Especie: Camarón Cola

	Año	Enero	Febrero	Marzo	Abril	Mayo	Junio	Julio	Agosto	Septiembre	Octubre	Noviembre	Diciembre	Total
<u>Tabla 3.2.1</u> Captura (t)	1974		4,7	14,9	20,4	38,4	41,9	18,8	11,6	16,8	13,4	10,4	11,5	202,8
	1975	9,7	6,9	12,3	15,0	13,3	9,1	10,1	14,6	10,9	13,2	11,3	5,3	131,7
	1976	5,4	6,2	9,1	14,1	15,7	15,7	13,9	16,6	12,1	15,1	20,5	13,2	157,3
	1977	17,3	9,4	9,8	12,3	17,2	13,8	10,8	9,6	12,6	12,4	18,2	15,6	159,0
	1978	16,7	8,2	16,5	15,0	16,5	13,4	16,1	19,7	15,3	6,2	12,3	5,7	161,6
<u>Tabla 3.2.2</u> Esfuerzo (día/pesca)	1974		124	207	204	229	208	204	184	183	189	176	235	2 143
	1975	208	179	256	250	257	215	249	298	267	313	257	93	2 842
	1976	130	143	171	210	215	229	283	292	247	260	262	295	2 717
	1977	282	213	214	266	290	211	219	234	216	244	274	327	2 990
	1978	286	225	301	280	280	231	267	274	238	141	282	198	3 003
<u>Tabla 3.2.3</u> Captura/ Esfuerzo (kg/día/ pesca)	1974		38	72	100	168	201	92	63	92	71	59	49	95
	1975	47	39	48	60	52	42	41	49	41	42	44	50	46
	1976	42	43	53	67	69	69	49	57	49	58	78	45	58
	1977	61	44	46	46	59	65	49	41	58	51	66	48	53
	1978	58	36	55	54	59	58	60	72	64	44	44	29	54



National Report 3.3

Study of the Penaeus Shrimp Stock of the  
Continental Shelf of French Guiana

Institut Scientifique et Technique des Pêches Maritimes  
Centre de Recherches "Antilles-Guyane"  
Cayenne, French Guiana

Summary for 1978

In 1978, the activities carried out by the Laboratory of Cayenne for research on the Penaeus shrimps, on the continental shelf of French Guiana, followed two main directions:

- study of the fishery, and implementation of a statistical data collection network, to obtain a better knowledge of the stock and M.S.Y;

- study, by research cruises, of some particular parameters of the shrimp populations. For example, geographical and bathymetrical distribution of the main species (P. aztecus and P. brasiliensis), variations in yields, size compositions and sex-ratio of the populations and by-catch,

3.3.1 Study of the Fishery in 1978

The purpose of this study was to know the effort, the annual total catch and the evaluation of the catch by unit effort.

(a) Effort

An estimation of the effort, expressed in number of days at sea, was made possible, from early 1978, by the fixing of quotas inside the exclusive economic zone of 200 m.

In accordance with these quotas (fixed by EEC at more than 3 000 t for 1978) fishery licences were issued:

- permanent licences: these boats had to land their catches at Cayenne;

- temporary licences: those boats were permitted a maximum number of fishing days.

The utilization rate of the permanent licences was 86 percent so the total effort for 1978 is calculated to be 32 000 days at sea.

(b) Total Catch for 1978

Because some boats do not land at Cayenne and do not respect the EEC recommendations, the total catch cannot be known with accuracy. However, we could calculate it from the landings of the U.S. shrimp boats based at Cayenne.

Their average yield was 141 kg of heads-on shrimp per day at sea. So, with an effort of 32 000 days at sea, the total catch would have been, in 1978, 4 512 t of whole shrimps, or 2 820 t of tails.

(c) Yields

The daily yields fluctuated from 104 to 227 kg of heads-on shrimp per day at sea. The lowest values were registered during July and October; the highest in May and June. The average, as previously stated, was 141 kg of heads-on shrimp.

The comparison with other years (173 kg in 1976, 189 kg in 1977) shows a marked diminution of the yield. This decrease may be a consequence of the fact that the Brazilian waters were totally closed.

That could explain also, at least in part, the increase of the size of the shrimp. The large shrimps (categories U/10 and 10/15), which are more abundant off Guiana than off Brazil, were also proportionally more numerous in the 1978 catches.

(d) Implementation of a Data Collection System - Laboratory Programme for 1979

As fishing logs were only introduced in late October 1978, it has not been possible to determine the amount of fishing carried on outside French Guiana by boats with permanent licences and, consequently, to know their catches.

During 1979 the main effort will be to analyse the fishing logs and the landing data of the 81 permanent boats which have to land at Cayenne, and to utilize the data given by the temporary boats to the local authorities.

With these data, it should be possible to get better information about:

- the effort of fishing days, by month and by area;
- the catches by month, area and species;
- the yields per fishing day;
- the size distribution of the catches..

3.3.2 Work at Sea

During 1978, the Cayenne Laboratory staff has been able to do two research trips of 20 days aboard shrimp trawlers based at Cayenne.

Thirty-seven trawls have been completed during the first cruise from 10 to 30 March, mostly by night, with a total of 222 fishing hours.

Forty eight trawls have been completed during the second (18 by day and 30 by night), with a total of 174 fishing hours.

A standard shrimp trawl was used. The operations took place on the whole of the continental shelf, between the Oyapoque and Maroni Rivers, and at depths from 24 to 80 m.

Each catch was sorted and weighed by species (fish and shell fish). The most interesting species were sexed and measured (particularly the *Penaeus*).

A preliminary report was written for each cruise. The March cruise report gives the average yield per hour (shrimp and fish) by area and by bathymetrical stratum. The November cruise report gives the yields per hour, by area, by depth, for day and for night, for the two main shrimp species.

We are now analysing the data. The results will be published before the end of 1979, and could serve as a special report at the next meeting of the Working Group.

The Laboratory will organize a cruise for 1980. This cruise will deal almost exclusively with tagging of *Penaeus*.

National Report 3.4

The Japanese Shrimp Fishery off Northeastern South America

by

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In this paper, the shrimp fishery by Japanese flag vessels off northeastern South America is reviewed historically. Japanese flag vessels mean the fishing vessels which operate in accordance with the fishing licence issued by Fisheries Agency of Japan.

1. Trend in Number of Vessels

The fishery began in 1959 with three fishing vessels (Hirao, per, comm). The number of vessels that operated are shown in Table 3.4.1. They increased in 1973 and decreased abruptly in 1976. The increase in 1973 was due to the increase in the number of fishing licences issued and the decrease in 1976 resulted from the financial difficulties of the fishing companies engaged in this fishery caused by the oil crisis.

2. Trend in Annual Catch

Annual catches are also given in Table 3.4.1. The catch increased in 1973 with the increase in the number of vessels operated, attained the maximum in 1974, and decreased thereafter with the decrease in fishing effort and CPUE. Annual catches in 1976 and 1977 were about 50 percent of that in 1974.

3. Areas of Fishing

From 1970 to 1977 Japanese flag vessels operated in the Statistical Zones 69-81 and 0°-1°N area (Fig. 3.4.1). As indicated in Table 3.4.2 and Fig. 3.4.2, the main fishing grounds were the middle grounds and east grounds in 1970-72, the west grounds, middle grounds and east grounds in 1973-75 and the west grounds, east grounds and rock in 1976 and 1977. These changes are considered to have been caused by the selection of the fishing grounds which have more abundant shrimp stocks.

Japanese flag vessels have hardly operated in the Gullies since 1971 because the 200 mi territorial zone was enforced by Brazil in 1971. In 1977, a large number of Japanese flag vessels were shut out from the east grounds, rock and west grounds because of the 200 mi fishing zones enforced by French Guiana and Guyana in 1977.

4. Seasonal Fluctuations in the Catches

Specific seasonal fluctuations in the catches could not be identified in 1970-74 (Table 3.4.3 and Fig. 3.4.3). The decreases in the catch in

the latter half of 1975 and 1977 were due to the decrease in fishing effort. The decline in the catch in the second half of 1976 came from the seasonal change of the fishing grounds in this year.

#### 5. Size Composition of the Catches

The catches of "More than 50" and 41-50 were small from 1970 to 1972 but their proportion increased from 1973 onward (Table 3.4.3 and Fig. 3.4.4). This change appears to have been caused by the change of the main fishing grounds.

#### 6. Species Composition of the Catches

The catches consisted of four species, pink-spotted, Penaeus brasiliensis, brown shrimp, P. subtilis, pink shrimp, P. notialis and white shrimp, P. schmitti but the latter two species were rare in the catches of Japanese flag vessels. Table 3.4.3 and Fig. 3.4.5 show that the percentage of pink-spotted (including small amounts of pink) has remained around 80 percent since 1971. The relatively high percentage of brown in 1970 is considered to be due to the fact that a considerable amount of shrimps was caught off northern Brazil in this year.

#### 7. Discards of Small Shrimp

No shrimp has been discarded by Japanese flag vessels (Kawashima, per. comm.).

#### 8. Fishing Effort

Days fished, number of hauls and hours hauled increased in 1973 and 1974 and decreased thereafter (Table 3.4.1 and Fig. 3.4.6). The decrease in 1975 is due to the fact that in the second half of this year a lot of vessels stopped their operation or transferred their base port to Cartagena as a result of the oil crisis.

#### 9. Catch per Unit Effort

As shown in Table 3.4.1 and Fig. 3.4.7, catch per day fished, catch per haul and catch per hour decreased from 1974 onward. There seems to be the possibility that the shrimp stocks off Guyana-French Guiana might have decreased in these years.

#### 10. Bibliographic References

Jones, A.C. and A. Dragovich, The United States shrimp fishery off north-  
1977 eastern South America (1972-1974). Fishery Bulletin 75(4):  
703-16.

Table 3.4.1 Catch Effort and CPUE of Japanese Flag Vessels in the Shrimp Fishery off Northeastern South America<sup>1/</sup>

Year	Number of Vessels Operated	Days Fished (10 <sup>3</sup> )	Number of Hauls (10 <sup>3</sup> )	Hours Hauled (10 <sup>3</sup> )	Shrimp Catch (t)	Catch Per Day Fished (kg/day)	Catch Per Haul (kg/haul)	Catch Per Hour (kg/h)
1970	71	18.1	37.8	211.7	2 619	145	69.3	12.4
1971	68	18.3	38.8	211.3	2 541	139	65.5	12.0
1972	65	18.4	40.2	224.3	2 661	145	66.2	11.9
1973	102	22.3	56.7	290.6	3 468	156	61.2	11.9
1974	128	30.5	82.2	427.7	3 748	123	45.6	8.8
1975	123	25.2	61.1	291.8	2 337	93	38.2	8.0
1976	70	20.2	62.3	325.3	1 909	95	30.6	5.9
1977	67	19.0	61.0	294.9	1 790	94	29.3	6.1
1978	( in preparation )							

<sup>1/</sup> These data were derived from statistics made by Far Seas Fisheries Research Lab.  
Shrimp catch: Head-off weight.

Table 3.4.2 Catch and Effort of Japanese Flag Vessels in 1970-1977  
in the Shrimp Fishery Off Northeastern South America

Statistical Zone	Item	Y e a r			
		1970	1971	1972	1973
Total	Number of hauls	37 755	38 750	40 226	56 706
	Hours hauled	211 726	211 297	224 273	290 553
	Shrimp catch	2 620	2 543	2 663	3 469
69	Number of hauls				36
	Hours hauled				105
	Shrimp catch				2
70	Number of hauls	304	2 690	1 483	12 677
	Hours hauled	1 830	15 291	8 352	67 441
	Shrimp catch	22	205	82	856
71	Number of hauls	1 211	3 544	1 722	9 457
	Hours hauled	6 177	19 651	9 208	51 223
	Shrimp catch	80	258	87	605
72	Number of hauls	1 293	506	1 120	2 402
	Hours hauled	6 908	2 829	6 244	12 084
	Shrimp catch	97	32	57	130
73	Number of hauls	2 936	2 706	2 978	2 336
	Hours hauled	16 809	14 482	14 943	11 755
	Shrimp catch	194	172	181	114
74	Number of hauls	12 950	13 557	12 174	15 115
	Hours hauled	72 014	75 299	67 309	74 913
	Shrimp catch	877	890	786	925
75	Number of hauls	11 447	11 089	8 801	7 011
	Hours hauled	66 166	60 775	50 669	36 037
	Shrimp catch	734	684	615	359
76	Number of hauls	3 440	3 410	7 034	4 843
	Hours hauled	18 461	16 689	39 757	23 213
	Shrimp catch	286	225	504	308
77	Number of hauls	1 596	894	4 596	2 540
	Hours hauled	8 805	4 288	25 964	11 968
	Shrimp catch	122	54	326	157
78	Number of hauls	87	46	96	195
	Hours hauled	464	264	532	1 026
	Shrimp catch	6	3	7	9
79	Number of hauls	105	110	115	45
	Hours hauled	601	630	660	267
	Shrimp catch	8	6	9	2
80	Number of hauls	399	26	95	43
	Hours hauled	2 210	155	558	469
	Shrimp catch	27	1	8	3
81	Number of hauls	1 543	124	2	6
	Hours hauled	8 710	697	13	52
	Shrimp catch	129	8	0	0
0°- 1°N	Number of hauls	444	48	10	
	Hours hauled	2 571	247	64	
	Shrimp catch	37	4	1	

1/ These data were derived from statistics made by Far Seas Fisheries Research Lab.

Shrimp catch: head-off weight in tons.

Table 3.4.2 (continued)

Statistical Zone	Item	Y e a r				
		1974	1975	1976	1977	1978
Total	Number of hauls	82 175	61 110	62 265	60 952	
	Hours hauled	427 712	291 772	325 333	294 939	
	Shrimp catch	3 750	2 339	1 910	1 790	
69	Number of hauls	279	1 588	3 412	3 087	
	Hours hauled	1 604	6 845	18 497	15 018	
	Shrimp catch	12	67	106	87	
70	Number of hauls	21 113	17 778	10 576	13 499	( I n P r e P a r a t i o n )
	Hours hauled	111 397	75 894	55 902	66 906	
	Shrimp catch	984	644	329	342	
71	Number of hauls	10 967	4 443	2 838	2 478	( I n P r e P a r a t i o n )
	Hours hauled	60 138	21 832	15 204	11 923	
	Shrimp catch	478	160	77	54	
72	Number of hauls	3 902	2 240	4 179	2 067	( I n P r e P a r a t i o n )
	Hours hauled	21 326	10 752	22 291	10 031	
	Shrimp catch	168	74	108	44	
73	Number of hauls	5 482	2 812	2 191	5 385	( I n P r e P a r a t i o n )
	Hours hauled	29 896	14 003	11 427	26 435	
	Shrimp catch	217	87	66	113	
74	Number of hauls	18 109	9 293	2 685	2 775	( I n P r e P a r a t i o n )
	Hours hauled	89 017	48 066	14 659	13 686	
	Shrimp catch	893	405	74	60	
75	Number of hauls	9 690	6 780	6 270	4 527	( I n P r e P a r a t i o n )
	Hours hauled	51 042	34 599	34 031	22 536	
	Shrimp catch	413	268	200	133	
76	Number of hauls	7 722	9 314	16 474	9 984	( I n P r e P a r a t i o n )
	Hours hauled	38 559	46 543	86 703	49 723	
	Shrimp catch	333	366	521	342	
77	Number of hauls	4 767	6 740	13 624	17 150	( I n P r e P a r a t i o n )
	Hours hauled	23 960	32 614	66 521	78 681	
	Shrimp catch	243	258	429	614	
78	Number of hauls	109	92			( I n P r e P a r a t i o n )
	Hours hauled	570	522			
	Shrimp catch	5	7			
79	Number of hauls	12	4	16		( I n P r e P a r a t i o n )
	Hours hauled	73	22	98		
	Shrimp catch	0	0	0		
80	Number of hauls	23	20			( I n P r e P a r a t i o n )
	Hours hauled	130	80			
	Shrimp catch	4	1			
81	Number of hauls					( I n P r e P a r a t i o n )
	Hours hauled					
	Shrimp catch					
0°- 1°N	Number of hauls					( I n P r e P a r a t i o n )
	Hours hauled					
	Shrimp catch					



Table 3.4.3 Shrimp Catch of Japanese Flag Vessels in 1970-1977 in the Shrimp Fishery off Northeastern South America<sup>1/</sup>

Year	Unit: Head-off weight in tons											
	1970	1971	1972	1973	1974	1975	1976	1977	1978			
Total catch	2 619	2 541	2 661	3 468	3 748	2 337	1 909	1 790				
catch* by size category	251 389 482 400 602 270 160	277 387 477 370 657 244 144	310 447 534 396 650 223 157	142 267 486 479 809 521 656	231 408 606 594 876 438 540	167 286 322 406 641 294 404	207 236 246 299 408 265 268	116 258 202 305 366 270 418	( i n p r e p a r a t i o n )			
(Tails per pound)												
catch by species	903	535	659	760	748	464	280	393				
Brown**												
Pink-spotted (including small amounts of pink)	1 716	2 007	2 002	2 708	2 995	1 874	1 629	1 392				
Other shrimps	-	-	-	0	5	0	-	-				
January	193	234	202	195	336	299	188	172				
February	155	228	255	234	282	235	164	155				
March	221	219	278	250	368	267	182	160				
April	172	218	259	279	334	254	192	204				
May	263	215	263	319	334	203	202	162				
June	271	223	229	383	316	187	181	145				
July	234	242	207	306	316	167	164	134				
August	261	212	223	337	255	163	133	130				
September	176	217	178	314	289	130	132	135				
October	214	176	191	324	300	115	111	128				
November	205	182	174	255	303	151	126	137				
December	256	177	205	274	314	165	134	126				

1/ These data were derived from statistics made by Far Seas Fisheries Research Laboratory.  
 \* Data source is different from that of catch by species, catch by month and total catch  
 \*\* Penaeus subtilis, \*\*\* P. brasiliensis, \*\*\*\* P. notialis.

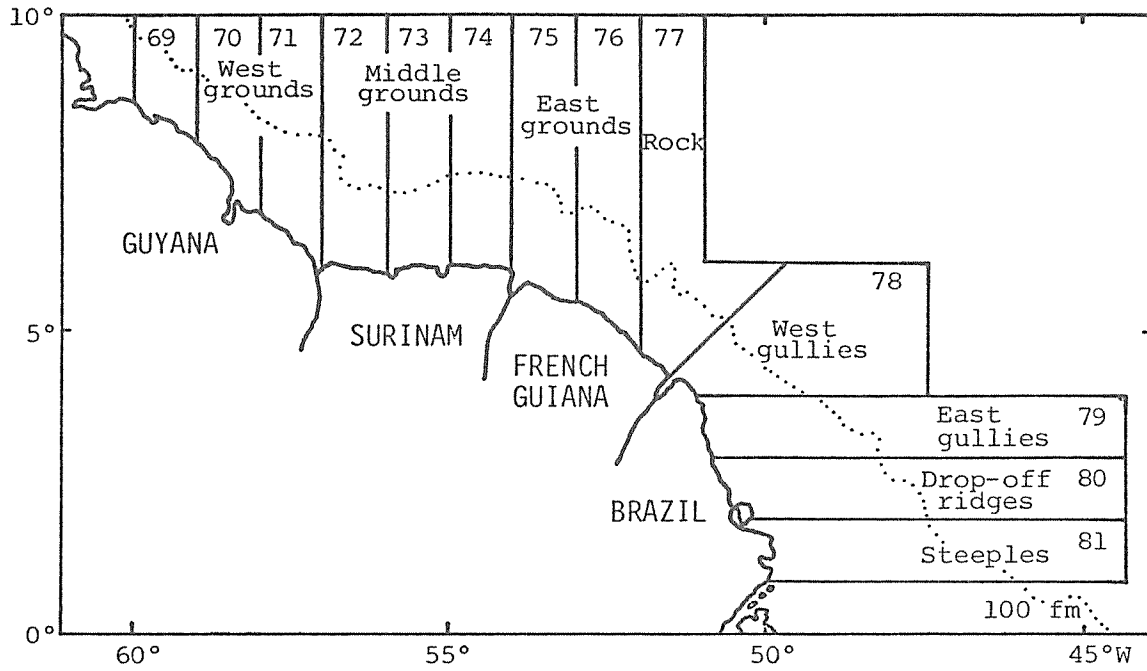


FIGURE 3.4.1. - THE GUYANA-BRAZIL SHRIMPING GROUND. The chart shows the statistical zones and their common names (from Jones et al., (1977)).

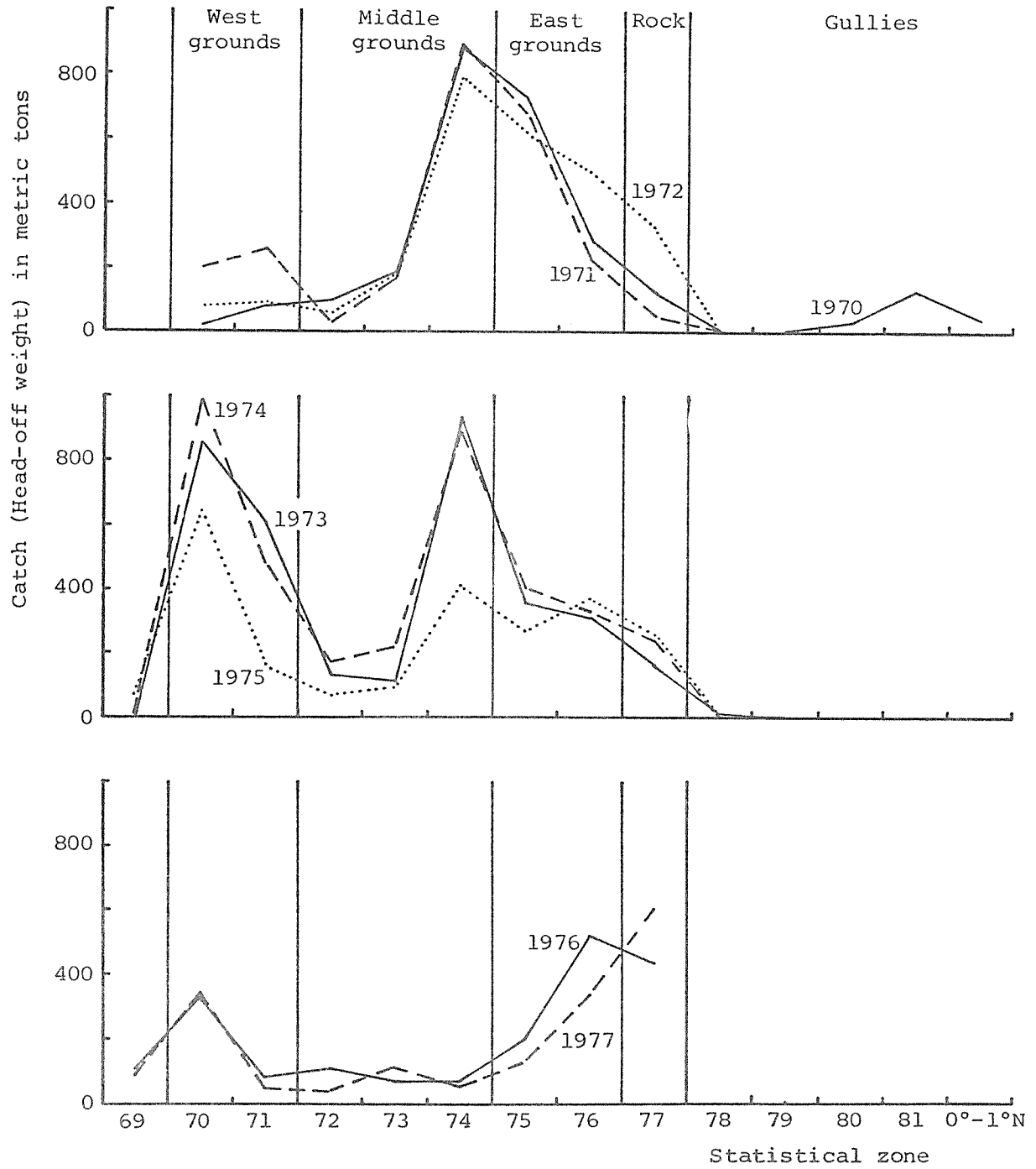


FIGURE 3.4.2.- GEOGRAPHICAL DISTRIBUTIONS OF SHRIMP CATCHES OF JAPANESE FLAG VESSELS

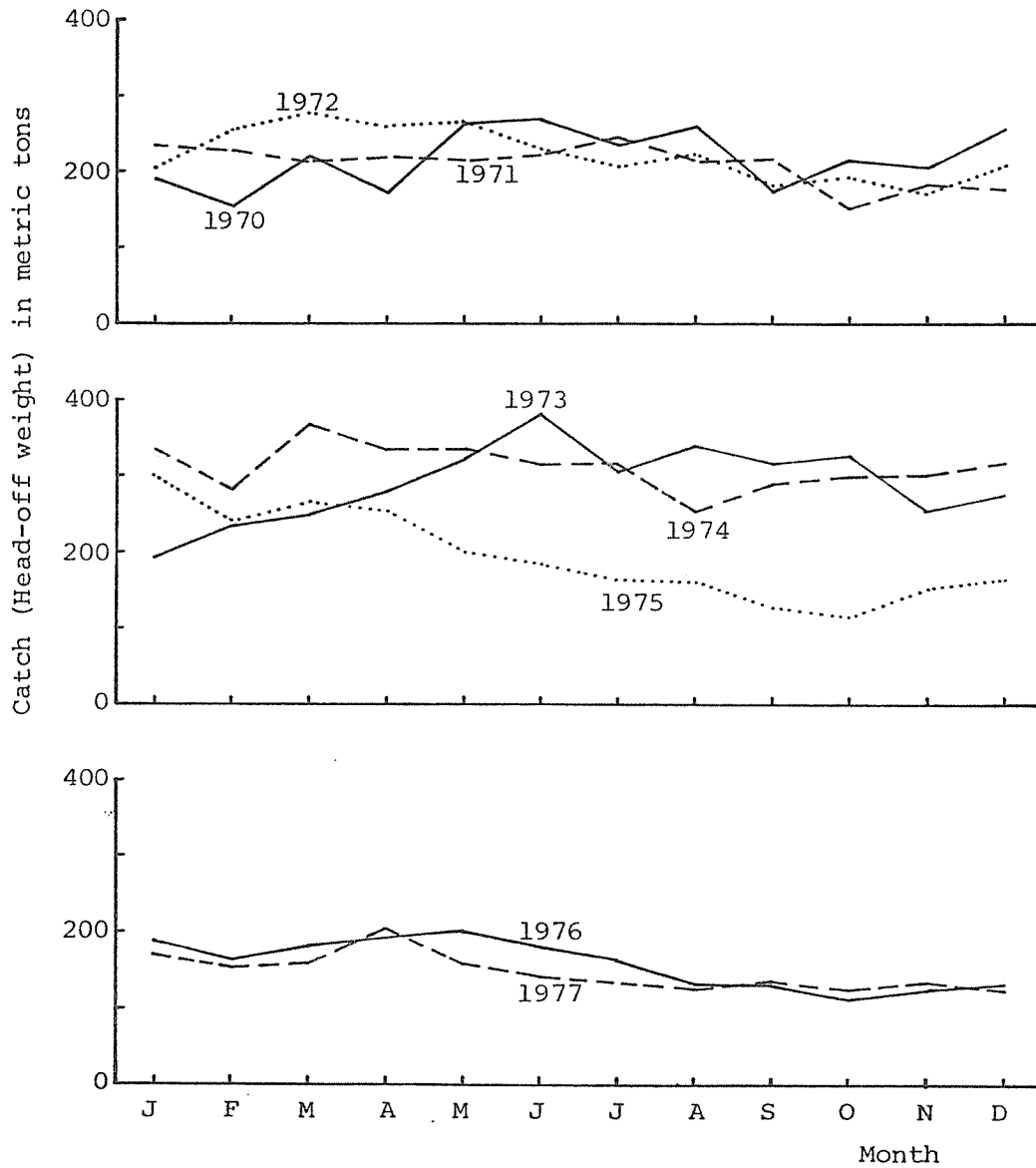


FIGURE 3.4.3. - MONTHLY CHANGES IN SHRIMP CATCHES OF JAPANESE FLAG VESSELS

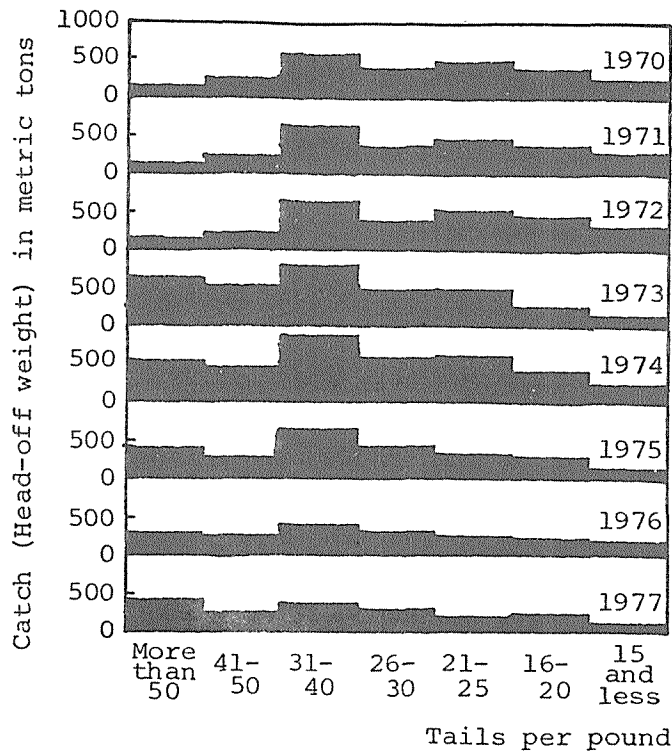


FIGURE 3.4.4.- SIZE CATEGORY COMPOSITIONS OF SHRIMP CATCHES OF JAPANESE FLAG VESSELS

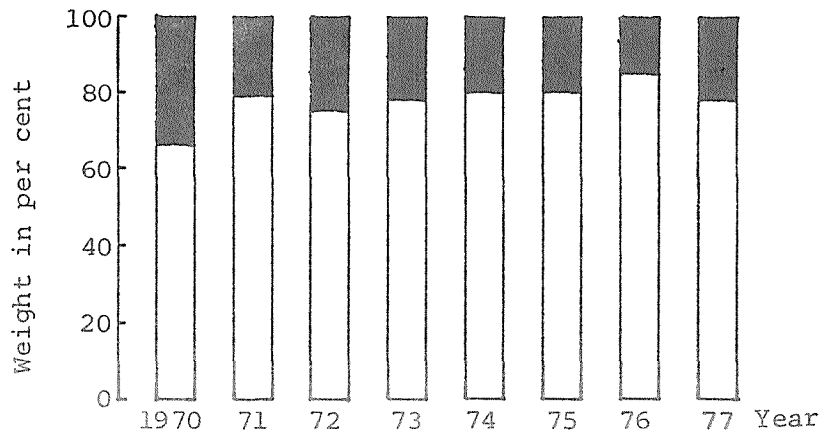

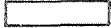


FIGURE 3.4.5.- SPECIES COMPOSITIONS OF SHRIMP CATCHES OF JAPANESE FLAG VESSELS

 Brown, *Penaeus subtilis*.  
 Pink-spotted, *P. brasiliensis* (including small amounts of Pink, *P. notialis*).

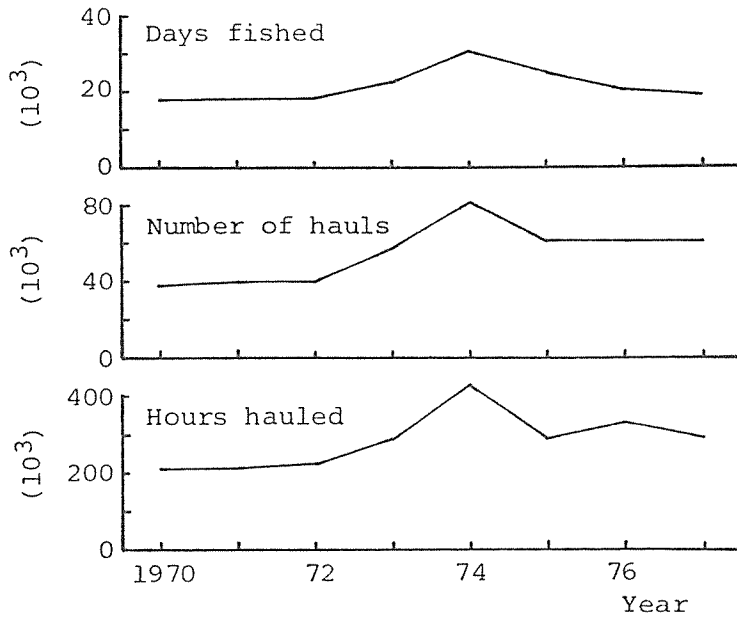


FIGURE 3.4.6.- TRENDS IN FISHING EFFORT OF JAPANESE FLAG VESSELS

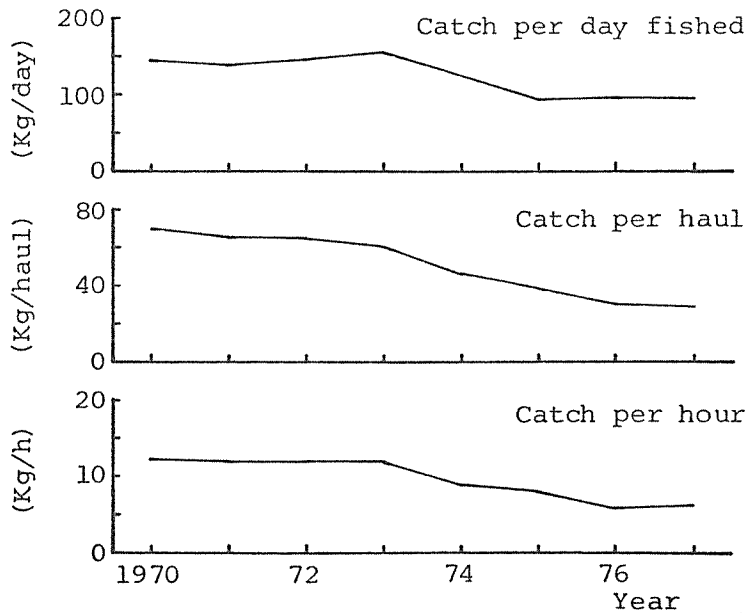


FIGURE 3.4.7.- TRENDS IN CPUE OF JAPANESE FLAG VESSELS

Catch: head-off weight

Review of Korean Fisheries and Research Activities  
on Shrimp of the Western Central Atlantic Ocean

by  
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1. History

The Korean shrimp trawl fishery in the Western Central Atlantic Ocean has been conducted since 1969, using five boats which belong to a company, Korea Marine Industry Development Corporation.

All of these boats were below 100 GT and based at Paramaribo in Suriname.

Since the fishery of the beginning year was an exploratory, as well as a training operation for fishermen, it could not be considered as a commercial fishing venture.

Therefore, the catch and the fleet power of that year were quite poor.

2. Recent Changes and Present Status of the Fisheries

The Korean shrimp trawl fishery in the Western Central Atlantic Ocean has gradually increased.

In proportion as the number of fishing boats is continuously increasing year after year, the catch is also on the increase (Fig. 3.5.1). Table 3.5.1 shows the number of Korean shrimp trawlers, the shrimp catch and the catch per unit of effort (CPUE) in the Western Central Atlantic Ocean, 1969-1977.

As Table 3.5.1 shows, the catch is increasing on the whole; 34 t in 1971, 871 t in 1974, 2 447 t in 1976, 2 799 t in 1977 (Fig. 3.5.1) and from now on this trend of the catch will be more or less dulled. Likewise, the number of operating boats is as follows: 5 vessels in 1971; 55 in 1974; 110 in 1976; 130 in 1977; 124 in 1978 and this level will be sustained.

Its CPUE also shows an increasing trend from 6.8 t/vessel in 1971 to 21.5 t/vessel in 1977 (Fig. 3.5.2).

3. Research Activities

Korean research activities on the shrimp of the Western Central Atlantic Ocean have been carried out since 1976 by the National Fisheries Research and Development Agency (NFRDA) in Pusan, Korea. From the previous year, based on the Governmental measures, the fishing information which should be submitted to NFRDA by firms and captains of the boats is being collected gradually.

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<sup>1/</sup> Senior Scientists

The coverage rates of the data on the shrimp of the Western Central Atlantic Ocean which were submitted to our Agency were as follows: 5.8 percent in 1976, 13.0 percent in 1977.

As the survey results of the data, the CPUE was summarized in Table 3.5.2. The CPUE is 8.78 kg/hour in 1976, 5.96 in 1977, 5.72 in 1978. In general the CPUE shows a decreasing trend.

The CPUE for 1977 is 68 percent of that for 1976, and that for 1978 is also decreasing slightly.



Table 3.5.1 Number of Korean Shrimp Trawlers, Shrimp Catch and CPUE in the Western Central Atlantic Ocean, 1969-1977.

Year	Number of Boats	Catch (t)	CPUE(t/vessel)
1969	5	*	*
1970	5	*	*
1971	5	34	6.8
1972	10	133	13.3
1973	21	278	13.2
1974	55	871	15.8
1975	82	1 126	13.7
1976	110	2 447	22.2
1977	130	2 799	21.5

- Remarks: 1. All of the boats are in the vicinity of 100 G/T
- 2\* In 1969 and 1970, the catch is unknown, because there was an exploratory and training fishery for the period.

Table 3.5.2 Catch, Effort and CPUE for Shrimp by Sample of Korean Trawlers in Western Central Atlantic Ocean, 1976-1978

Year	Catch (t)	Effort (hours)	Catch per Unit of Effort (kg/hour)	Coverage Rate (%)
1976	141	16 041	8.78	5.8
1977	364	61 065	5.96	13.0
1978	120	20 894	5.72	*

Remarks: In 1978, the data were only used for January to June.

Data source: National Fisheries Research and Development Agency.

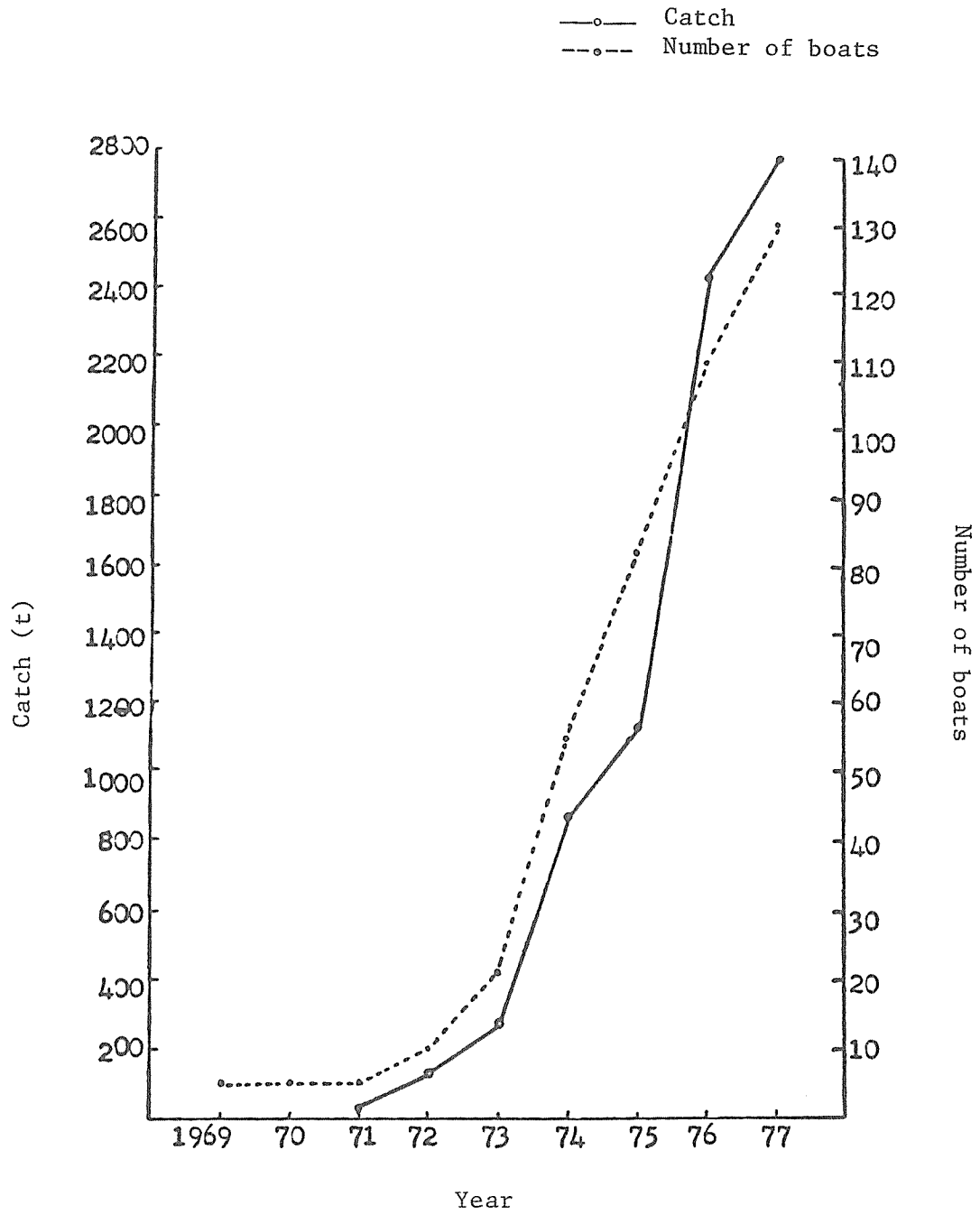


FIGURE 3.5.1. Changes of annual catch by Korean shrimp trawlers and number of boats in the western central Atlantic Ocean, 1969-1977

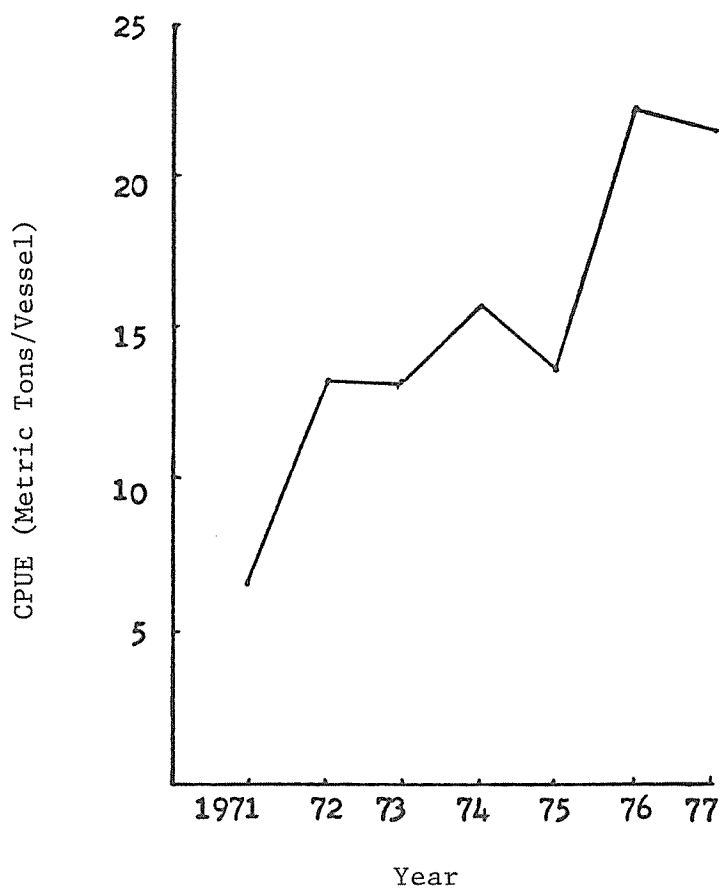


FIGURE 3.5.2.- Changes of annual CPUE (t/vessel) by Korean shrimp trawler in the western central Atlantic Ocean, 1971-1977

National Report 3.6

National Report - U.S.A.

by

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1. Introduction

This report is concerned with a brief historical review of U.S.A. shrimp fishery off Guianas and Brazil, the current status of this fishery (particularly with years 1975, 1976, 1977 and 1978), and with current research activities.

2. Historical Review

Numerous exploratory fishing operations and research cruises are associated with this fishery (Table 3.6.1). Whiteleather and Brown (1945) in 1943 and 1944 made a trawling survey of shallow waters off Guyana and Trinidad. The results of their survey were encouraging. They recommended the use of trawls by local fishermen. Whiteleather and Brown's explorations were followed by successful trawling off Trinidad by the ASSAULT in 1951 and 1952 (Richards, 1955) and many others. Surveys off Suriname by Higman in 1957 and off Guianas and Brazil by Bullis and Thompson in fall of 1957 and summer of 1958 were predecessors to the beginning of full-scale, commercial exploitation of shrimp resources of Guianas-Brazil fishery grounds.

The U.S.A. commercial shrimping activity off French Guiana out of Cayenne started in the late fifties. The first processing facilities were operated by a French owned interest. In 1960, ownership of this plant was transferred to a U.S. interest, and in 1976, went back to the French owner. In 1960, John Mann and Singleton started U.S.A trawling operations out of St. Laurent with 19 trawlers. Operation out of St. Laurent ended about 1975 or 1976.

U.S.A. shrimp trawling out of Georgetown began in April 1958, with 8-10 trawlers. These vessels landed their catch at the local B.G. Fishery Plant which was later bought by Georgetown Sea Food, a U.S.A. interest. In 1965, the present plant of Georgetown Sea Food Co. was built on the banks of the Demerara River. Booker Ltd., a locally-owned plant, was built in 1960 or 1961 in Georgetown. Local boats and some of the U.S.A. boats landed their catch at this plant.

Since 1975, the catch by other than U.S.A. boats has been landed at Guyana Food Processors Ltd., one of the most modern plants in the entire Caribbean region.

In 1956, Mr. Schweig, representing a New York company, built the first processing plant in Paramaribo to process sea bob shrimp. In 1969, this plant was sold to its present owner SAIL (Suriname-American Industries, Ltd.), a subsidiary plant of Castle and Cook, Inc.

The U.S.A. operation in Port of Spain started on 12 December 1965, with six U.S.A. flag trawlers owned and operated by the Ludwig Shrimp Co. The catches were unloaded and processed at a locally-owned plant of International Sea Foods, Inc. The first U.S.A. flag vessels fishing out of Port of Spain fished primarily off French Guiana and Brazil. The International Sea Foods plant was nationalized in 1977 and became National Fisheries Co., Ltd. The U.S.A. flag trawlers left Port of Spain in 1977.

On occasions one or two U.S.A. flag trawlers from Barbados fished the Guiana-Brazil shrimping grounds.

### 3. Current Status of Fisheries

The present strength of the U.S.A. fleet off the Guianas is 122 vessels. These boats operate out of Georgetown (72), Paramaribo (6) and Cayenne (44). During the period of the U.S.A.-Brazil Agreement, licensed U.S.A. vessels fished the Agreement Area of Brazil (153 boats for 1972, 193 for 1973, 214 for 1974, 92 for 1975, 99 for 1976 and 90 for 1977). The processing plants at which U.S.A. trawlers land and process their catches are Georgetown Seafood Co. in Georgetown, SAIL in Paramaribo and PIDEG in Cayenne. We also have information on fleets and processing plants owned by other than U.S.A. capital.

The present U.S.A. shrimp fleet is modern and fairly uniform in terms of the boat size and fishing gears. Jones and Dragovich (1973) presented a summary of boat characteristics of the U.S.A. fleet operating out of the Guianas including length of the boat, gross tonnage, horsepower, type and material used in construction and catch preservation methods (ice and freezing).

#### 3.1 Annual Landings

Based on annual summaries of all fleets combined, the landing records for 1960-68 exhibit a continuous upward trend (Fig. 3.6.1). The landings rose from 3.9 million lb in 1960 to 27.3 million lb in 1968. In 1969 and 1970, they declined slightly to 27.1 and 27.0 million lb, respectively. In 1971 and 1972, a sharp decline in catches to 22 million lbs was recorded. The year 1973 was marked by a peak catch of 27.3 million lb; from 1974 through 1978 a general declining trend in catches was noted. The portion of U.S.A. catch for the period 1972-78 represented, on the average, 36.4 percent of the total catch and varied from 27.3 percent in 1972 to 38.9 percent in 1974 (Fig. 3.6.2).

Parallel to the changes in quantities of shrimp landed over the last 19 years, the total number of vessels also changed (Fig. 3.6.1). The number of trawlers (as available) fishing out of Barbados, Trinidad, Venezuela,

Guyana, Cuba, Suriname, French Guiana and Brazil for the period 1961-1978 is presented in Table 3.6.2. In 1961, the fishery numbered 100 vessels. Thereafter, the number of vessels gradually increased and reached its maximum of 545 in 1975. From 1975 until the present, the number of vessels has been on the decline. For the years 1977 and 1978, the number of trawlers fishing out of Brazil, Cuba and Venezuela is not available to us. An updating of the number of vessels from 1973 onward will probably produce different total numbers of vessels for this fishery.

As long as the catches were good, the areas of fishing free of restrictions for all participating trawlers and the fuel prices low, the fishery was prospering. This state of prosperity was changed by a few recent events that occurred in this fishery. In 1971 Brazil was the first country in this fishery to declare a 200 mi territorial and economic zone. During 1972-77, Brazilian waters were restricted to all boats except domestic and those with special permits under bilateral agreements between Brazil and other nations. In 1978 and 1979, Brazilian shrimp grounds were available only to their own fleet. In 1977 French Guiana, Suriname and Guyana initiated a licensing system parallel to the establishment of their extended national offshore fishing jurisdiction. Another factor that affected the fishery was a steep rise in fuel prices from 12 cents to 48-50 cents per gallon in 1975. These events restricted the fleets to fishing locally (a complete exclusion of Brazilian waters from the fishery occurred in 1978 and 1979), to practise more efficient fishing with less fuel consumption, to relocate portions of their fleets, to sell entire fleets in some instances, to withdraw from the fishery in other instances, and to try to negotiate joint ventures with Brazilians. These are some of the known factors associated with the reduction in number of U.S.A. vessels and general decline in catch rates from 1973 onward. The mean catch of headless shrimp, expressed in pounds, per hour of fishing by U.S.A. fleet was 20.0, 24.7, 14.7, 14.2, 15.4 and 15.4 for 1972, 1973, 1974, 1975, 1976 and 1977 respectively.

### 3.2 Seasonal Fluctuations in Catches

A definite pattern was noted in seasonal distribution of catches, as reported by U.S.A. fishermen. For the years reported here (1975-77), the highest catches were at the beginning of the year (March-June period), with a gradual decline during the remaining months of the year (Fig. 3.6.3). Geographical distributions of catches has also exhibited a definite pattern with maximum catches in the Agreement Area (Fig. 3.6.4)

### 3.3 Size Composition of Landings

The majority of shrimp as reported in U.S.A. log reports during the 1975-77 period were in the size categories 23/25 and 26/30 counts per lb. We have also plotted the distribution of size categories from the landing records for the years 1975-77 (Fig. 3.6.5). Although there is some similarity between sizes from logbook data and the landings, the data from landings give a more precise picture on size distribution than records from captains logbooks which tend to report chiefly average sizes for

each day of fishing. The landing data on size distribution for 1975 show that the majority of shrimp were in size categories 21/25, 16/20 and 11/15; in 1976 21/25, 16/20 and >50; in 1977 most of the shrimp were in >50 size category followed by the 21/25 size category. The sizes of shrimp represented in landings may represent a true picture on size availability but may also in some instances reflect selective forms of fishing as influenced by marked price of shrimp, fuel prices, feasibility of operations, skill of the crew, condition of the boat and many other factors.

As in our previous study (Jones and Dragovich, 1977) to observe the temporal and spatial changes in size composition of shrimp catches as reported by U.S.A. captains, we calculated the mean size index for each statistical zone and each month for the 1975-77 period (Fig. 3.6.6). The mean size index system was used to simplify the indication of sizes. We had nine size categories (>50; 46/50; 41/45; 36/40; 31-35; 26-30; 21-25; 15-20; and <15 per lb). The index for smallest size category was assigned 1 and for the largest 9, with intermediate values representing the sizes between 1 and 9 using the following formula:

$$\frac{(Wt_A \times 1) + (Wt_B \times 2) + \dots + (Wt_I \times 1)}{Wt_A + Wt_B + \dots + Wt_I}$$

The smallest sizes occurred in March 1975 and 1976 and in April 1977. The largest sizes were in January 1975, 1976 and at the end of these years; intermediate sizes occurred during the summer months. In our previous study we noted somewhat similar monthly distribution for years 1972, 1973 and 1974. The spatial distribution of sizes for 1975-76 showed that the largest sizes occurred in the middle of the fishery, off Suriname and east of F. Guiana. The monthly data for each statistical zone tends to support this geographical distributional pattern of sizes. This apparent prevalence of small shrimp off Brazil, eastern F. Guiana and Guyana might be indicative, as in our previous studies, that these shrimp were probably recently recruited to the fishable stock. Smaller size of shrimp and higher catch rates off these two areas, as compared with the larger shrimp and lower catch rates off Suriname suggest that the young shrimp are being recruited principally to these areas. Furthermore, the monthly peak (March and April) of small shrimp might be indicative of seasonal recruitment periods.

#### 3.4 Species Composition

Our data on species composition is from captain's logbooks and our research surveys. The data for period 1975-77 showed brown and pink-spotted to constitute the bulk of the U.S.A. catch. Pink shrimp and white shrimp played a lesser role. Brown shrimp was predominant off Brazil and eastern French Guiana and pink-spotted off western French Guiana, Suriname and Guyana. Jones and Dragovich (1977) observed a similar geographic distribution of the two major species for the 1972-74 period.

#### 3.5 Discards of Small Shrimp

No information is available.



### 3.6 Fishing Effort

To present a picture of fishing effort for 1975-77, we have examined the variations in catch rates by year, hour of actual fishing, month, areas and depth. The average yearly U.S.A. catch per vessel was 44 200 lb for 1975, 58 600 for 1976 and 50 100 lb for 1977. We plotted the mean hourly catches for the years 1975-77 as reported by U.S.A. shrimp captains, according to two large subareas - one off Brazil and the other off all three Guianas combined. The hourly catches, as for the three previous years, were consistently higher off Brazil (zones 78-81) than off Guyana (zones 69-72) (Fig. 3.6.3). The plot of hourly catches for each zone and each month (Fig. 3.6.4) shows in more detail the same general distributional pattern of catch rates for 1976 and 1977 with highest catch rates off Brazilian and French Guiana's zones adjacent to the Brazilian grounds. During 1975, a poor shrimping year, the hourly catch rates were lower than usual throughout the year, but the catches off Brazil were still superior to those from Guyana. We also examined fishing effort in relation to depth and fishing zones (Fig. 3.6.7). For all three years (1975-77), most of the fishing was between 21 and 35 fathoms, the depth of which brown, pink-spotted and pink shrimp are primarily found. Fishing effort was minimal in waters less than 10 fathoms where white shrimp are generally found.

### 3.7 Days at Sea

The number of days a vessel spends at sea may be determined from accurate records on each vessel's activity. In the absence of such information, we must be satisfied with estimates. The owners of shrimp companies try to keep the boats fishing five days for every two days in port, not counting breakdowns and variety of other unpredictable occurrences. Thus U.S.A. trawlers spend, on the average, about 250 days per year at sea. Since the declaration of the 200 mi zone, the travelling time between the home port and the fishing grounds has been reduced to about 10 percent. The time spent in trawling equals about 18-20 hours per day per boat. The U.S.A. fleet spent most of its fishing hours during 1975-77 off Brazil and Guyana (Fig. 3.6.8).

## 4. Fishery Monitoring - Catch and Effort Statistics

The National Marine Fisheries Services (NMFS) established a system for collecting information on catch and effort as part of its responsibility under the U.S.A.-Brazil Agreement, which was signed in May 1972. The agreement required that vessel skippers keep records of their fishing activity. A logbook form was designed after consultation with fleet operators, plant processors and representatives of the Brazilian Department of Fisheries. Information on fishing time, area and catch for each trip was recorded by vessel captains on these logbook forms. To aid the skipper in describing his fishing area, the logbook form includes a chart of the fishing grounds marked with grid zone number and depth. Fishing time is recorded as number of drags made and number of hours fished each day and separate entries are made for fishing during the day and at night. Catch is given as total pounds (heads-off weight) caught each day, and the fisherman is asked to indicate the species and the predominant size category.

The Agreement required that logbook records be kept for fishing in the area of agreement off Brazil. However, the U.S.A. industry provided us with information on the entire area of the fishery. In addition to the logbook reports, we receive a report from each processing plant on the size composition of each vessel's landings. The collection of raw data is the most important part of any fishery statistics system and represents a significant input of time and effort by industry members (vessel captains and fleet managers) toward providing the basic information necessary to understanding and manage this fishery.

The last of the series of U.S.A.-Brazil Fishery Agreements expired on 31 December 1977. This date officially marked the end of this system for collection of information.

During 1978 and 1979, the collection of the information on catch and landing statistics has continued on a voluntary basis, mostly owing to the excellent cooperation of the U.S.A. industry and key members of foreign companies.

The collection of port sampling shrimp data from the landings was carried on during 1976, 1977 and 1978 under a separate contract between NMFS and local parties in Georgetown, Guyana; Cayenne, French Guiana; Paramaribo, Suriname and Port of Spain, Trinidad. This sampling programme will be described in another report.

#### 4.1 Research Surveys

In addition to the collection of catch and effort statistics NMFS, in collaboration with the scientists from the three Guianas, Brazil and Trinidad, has conducted six research cruises (1972-1977). The findings of these surveys may be found in Cruise Reports which were distributed to all interested parties and in a special paper on five cruises combined by Dragovich, Jones and Boucher (1980).

#### 4.2 Reports

Numerous reports with the interpretation of the data on this fishery were issued and distributed to members of the Guiana-Brazil shrimp industry, the members of the scientific community and other interested parties.

As a part of collaboration between the scientists of U.S.A. and Brazil, two scientific meetings were held, one in Belem, Brazil in January 1976 and the other in Miami, Florida in April 1977.

### 5. Shrimp Research Programmes

Our research programme on the shrimp fishery off the Guianas and Brazil is aimed at providing guidelines for proper management of the fishery. The programme consists of the collection of catch and effort

statistics from U.S.A flag vessels primarily, and from other sources, secondarily, and the analysis of these data by standard methods. Additional data on the fishery are collected on research surveys conducted by U.S.A. research vessels. Data from these surveys are more specific in regard to accuracy of information on biological and ecological aspects of the fishery grounds and their biota. We also collect information, from our port sampling of shrimp landings, on species composition of landings, on sex and sizes and on maturity stages of females.

By combining information and interpretation of data collected from catch and effort statistics, oceanic surveys and port sampling, we were able to answer a number of questions on this fishery. For example, at present, we have fairly accurate information on the geographic and depth distribution of species within the entire fishery on the productivity aspects of the area in terms of area and time of the year, on the occurrence of different shrimp sizes, on the existence of a link between the monthly distribution of rainfall and the production of shrimp, and on ecological factors (salinity, temperature and bottom type). Among the numerous areas where knowledge is lacking, perhaps two deserve immediate attention:

- (1) the migration patterns of each species within the fishery and ecological factors influencing these migrations. Perhaps a tagging experiment would be a good start in answering the question on seasonal migrations;
- (2) the questions on stock identification need to be addressed. Up to the present, we have treated all species in this fishery as a single stock. Are there genetic differences between the same species collected off the mouth of the Amazon and off the mouth of the Moroni River? Perhaps we should consider in our plans promoting studies concerned with genetic identifications of stocks by means of electrophoresis.

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- Jones, A.C. and A. Dragovich, Investigations and management of the Guianas  
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Fish.Inst. 25:26-33.

Table 3.6.1 Exploratory Fishing Operations and Research Cruises on Living Marine Resources Off Northeast Coast of South America, 1943-1976.

Vessel	Period	Area	Authority	
No. 305	1943-1944	Trinidad - Guyana	Whiteleather & Brown	1945
ARTHUR ROGERS	1949	Guyana	Mitchell & McConnell	1960
ASSAULT	1951-1952	Trinidad	Richards	1955
VD - 3	1955	Suriname	Smith	1959
COQUETTE	1957	Suriname	Higman	1959
ORSTOM II	1954	French Guiana	Durand	1959
OREGON	1959	Guianas	Bullis & Thompson	1959
CAPE ST. MARY	1957-1959	Guyana	Mitchell & McConnell	1960
OREGON	1963	Guyana-French Guiana	U.S. Fish & Wildlife Service	1963
OBRAZTSOVO	1963	Central Venezuela	Sal'nikov	1965
SRTR-9075	1964	Central Venezuela	Sal'nikov	1965
NEREID	1964	Orinoco Delta	Cervigon	1965
AMBITION	1965	Venezuela-Guyana	Unpublished	-
LA SALLE	1967	Venezuela-Suriname	Gines & Cervigon	1968
COQUETTE	1962-1965	Suriname	Rathjen, Yesaki and Hsu	1969
CALAMAR	1967-1968	Venezuela-French Guiana	Rathjen, Yesaki and Hsu	1969
THALASSA	1971	French Guiana	Abbes Istpm	1972
OREGON II	1972-1976	Guianas-Northern Brazil	Dragovich, Jones and Boucher	1979
C-5	1974-1975	Guyana	Coyula y Carrillo	In press
DEANAT	1978	French Guiana	Paulmier	1978

Table 3.6.2 The Average Number of Shrimp Trawlers Fishing Each Year in the Guianas-Brazil Shrimp Fishery, 1961-78.

Year	Barbados	Trinidad	Venezuela	Guyana	Cuba	Suriname	French Guiana	Brazil	Total
1961	-	-	-	60	-	40	-	-	100
1962	-	-	-	72	-	24	-	-	96
1963	-	-	-	89	-	25	33	-	147
1964	30	-	-	81	-	25	51	-	187
1965	24	-	-	96	-	25	58	-	203
1966	32	43	-	105	-	34	67	-	281
1967	32	58	-	113	-	50	89	-	342
1968	35	48	-	134	-	55	90	-	362
1969	36	63	-	142	-	51	110	1	403
1970	25	78	-	162	-	55	83	18	421
1971	-	60	-	160	-	45	60	21	346
1972	-	55	-	175	-	55	60	25	370
1973	6	42	40	200	-	63	68	24	443
1974	21	39	40	202	11	106	62	30	511
1975	20	50	40	209	11	140	45	30 <sup>2/</sup>	545
1976	0	66	40	190	5	165	31	30 <sup>2/</sup>	527
1977	0	77	-	157	-	192	42	-	-
1978	0	-	-	148	-	165	83	-	-

Number of U.S.A. Vessels with UB Numbers

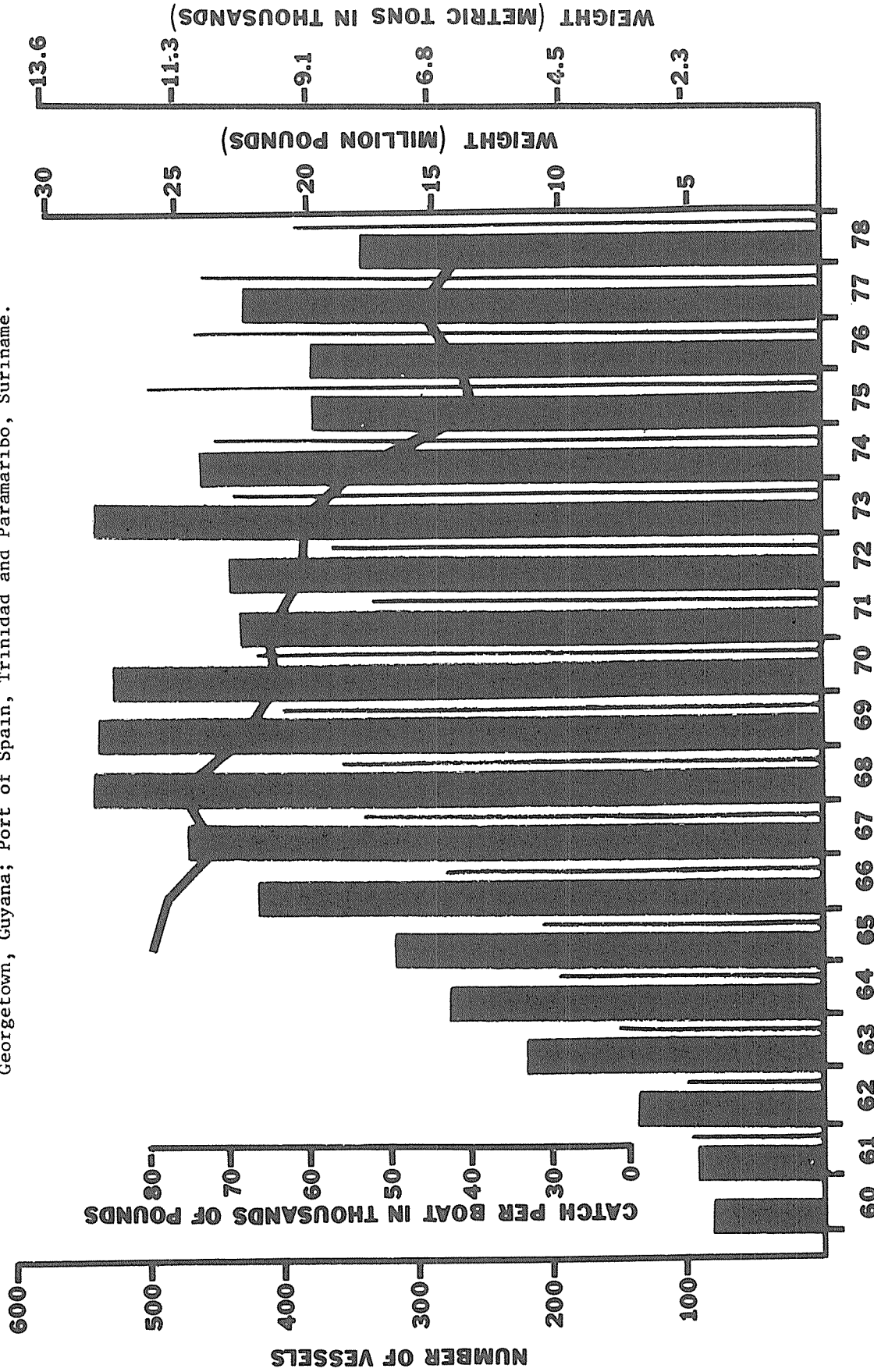
1972	=	153 boats
1973	=	193 boats
1974	=	214 boats
1975	=	92 boats
1976	=	98 + 1 boats
1977	=	90 boats - the last Agreement was terminated on 31 December 1977.

1/ The number of vessels has been verified through 1972. From 1973 to 1978, the data need to be updated from Venezuela, Cuba, French Guiana (only 1978) and Brazil.

2/ In 1975 and 1976 these vessels fished south of Equator, outside the Agreement Area.

FIGURE 3.6.1.-

Total annual landings of shrimp (head-off) for the Guianas-Brazil fishery, the number of vessels operating each year and the average catch per boat. Solid bars represent the landings; vertical lines represent the number of vessels; horizontal line indicates mean catch per boat. The data for 1960-74 period are from Jones and Dragovich (1977)<sup>1/</sup>, the data for 1975-78 period are from Cayenne, French Guiana; Georgetown, Guyana; Port of Spain, Trinidad and Paramaribo, Suriname.



<sup>1/</sup> Jones, A.C. and A. Dragovich, The United States Shrimp Fishery off Northeastern South America 1977 (1972-74). Fish.Bull 75: 703-16

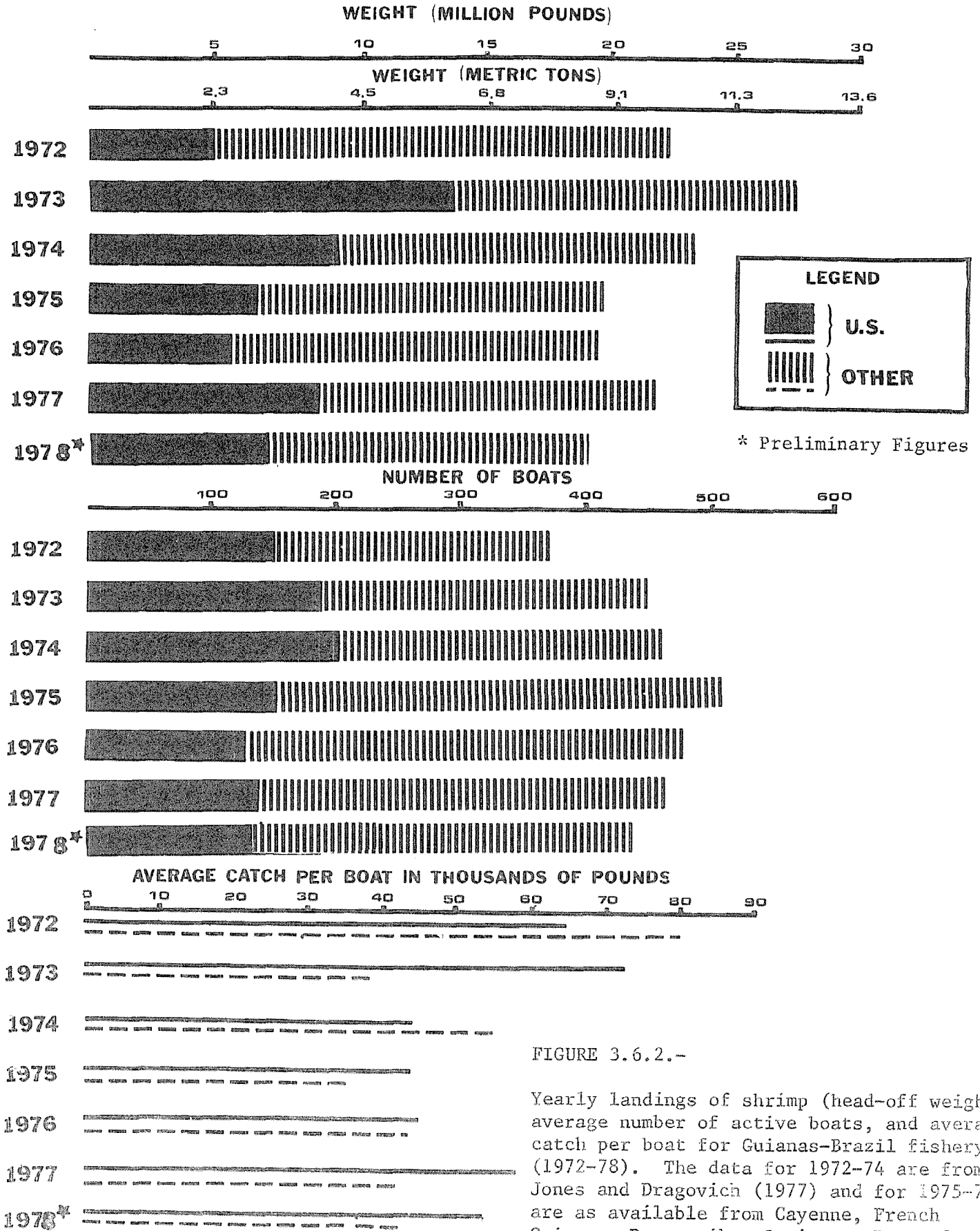


FIGURE 3.6.2.-

Yearly landings of shrimp (head-off weight), average number of active boats, and average catch per boat for Guianas-Brazil fishery (1972-78). The data for 1972-74 are from Jones and Dragovich (1977) and for 1975-78 are as available from Cayenne, French Guiana ; Paramaribo, Suriname; Port of Spain, Trinidad and Georgetown, Guyana.

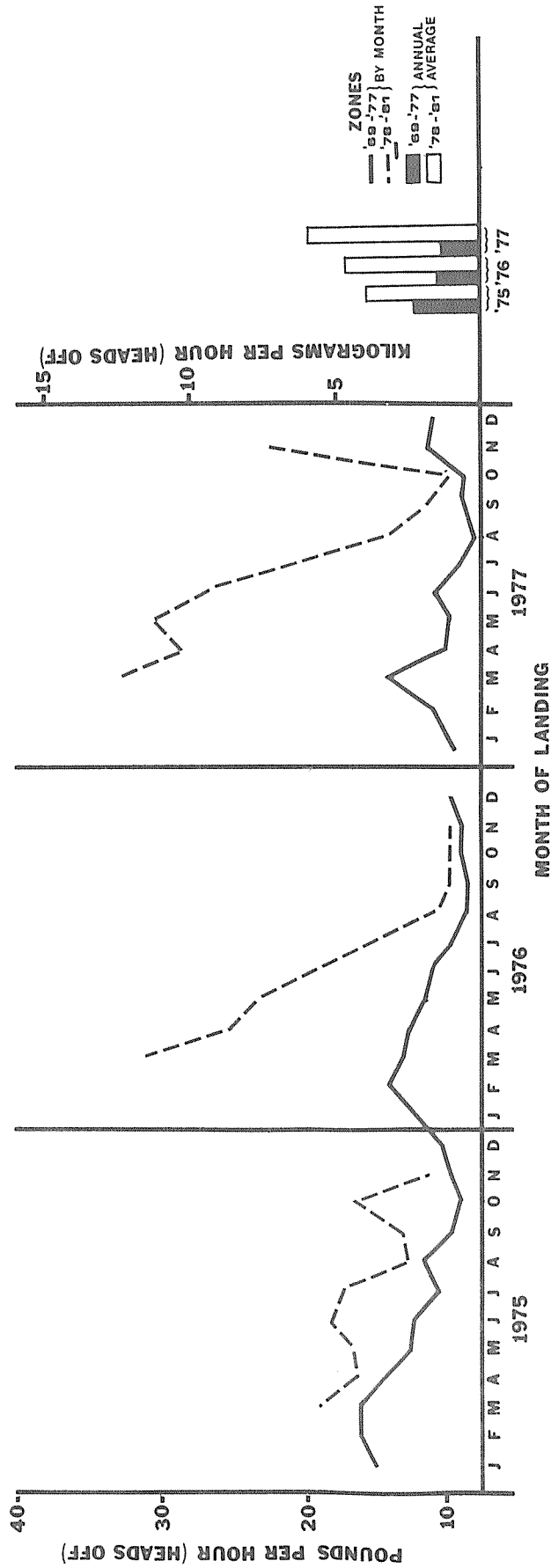


FIGURE 3.6.3.- Distribution by month of the mean catch rate of shrimp for U.S.A. Vessels fishing off the Guianas (Zones 69-77) and Brazil (Zones 78-81) for 1975-77 period. Catch rates expressed in pounds and kilogrammes of shrimp (head-off weight) per hour of fishing.





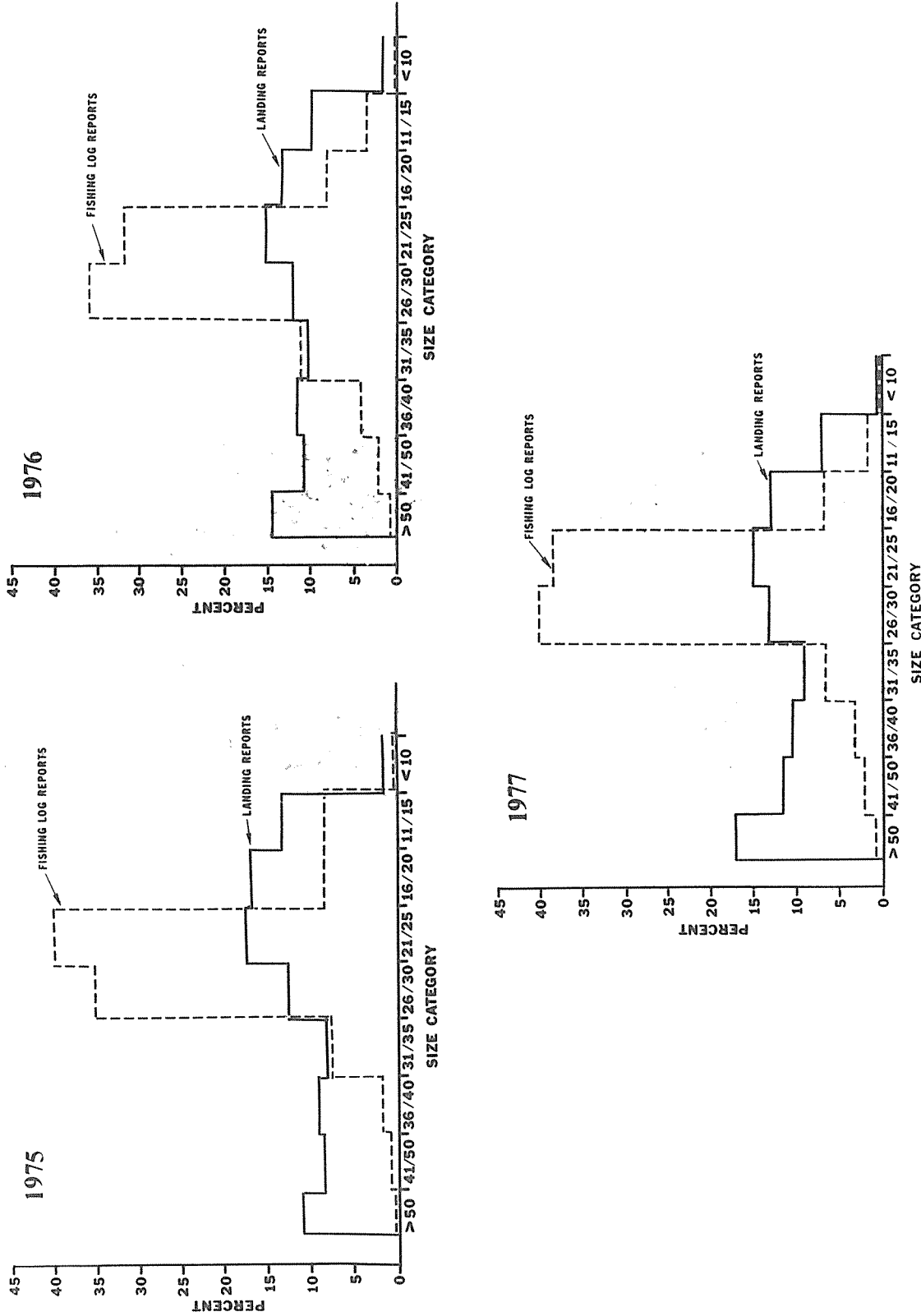


FIGURE 3.6.5.- Size composition of the shrimp catches of U.S. vessels is reported in landing records and fishing log reports for the period 1975-77. The size categories are the number of head-off shrimp per pound. In pounds for 1975 landing records = 9 432 558 and logbook records = 1 898 191; for 1976 landing records = 10 701 896 and logbook records = 1 511 397; for 1977 landing records = 12 013 528 and logbook records = 1 058 757.

FIGURE 3.6.6.- Distribution by fishing zone and month of the mean size index of shrimp calculated from fishing log reports of U.S.A. vessels. The size index was calculated as described in text. Data cover 1975-77 period.

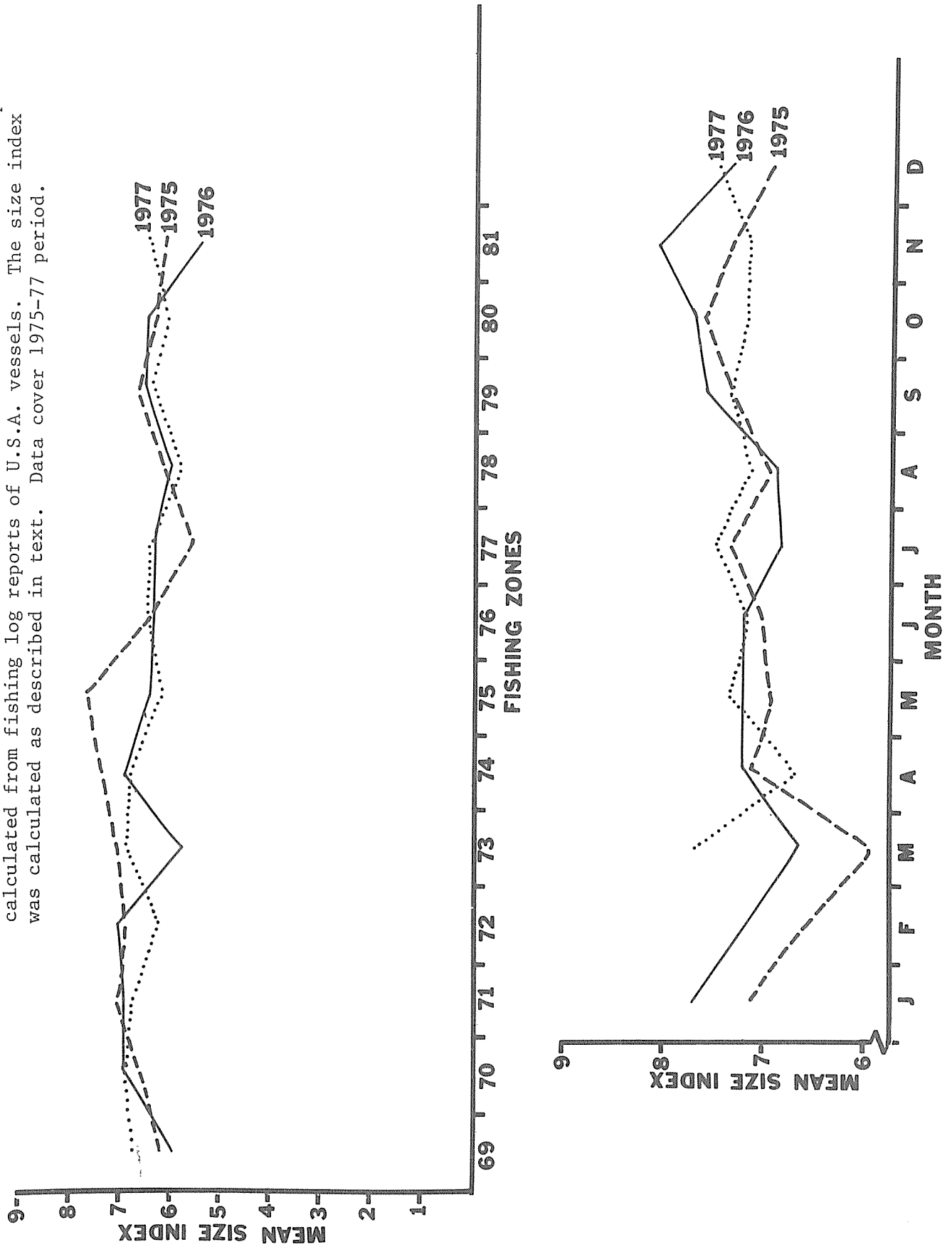


FIGURE 3.6.7.- Frequency distribution of reported effort (hours fished) at each depth for all zones combined for 1975-77.  
1975 = 335 436 h  
1976 = 256 000 h  
1977 = 228 740 h

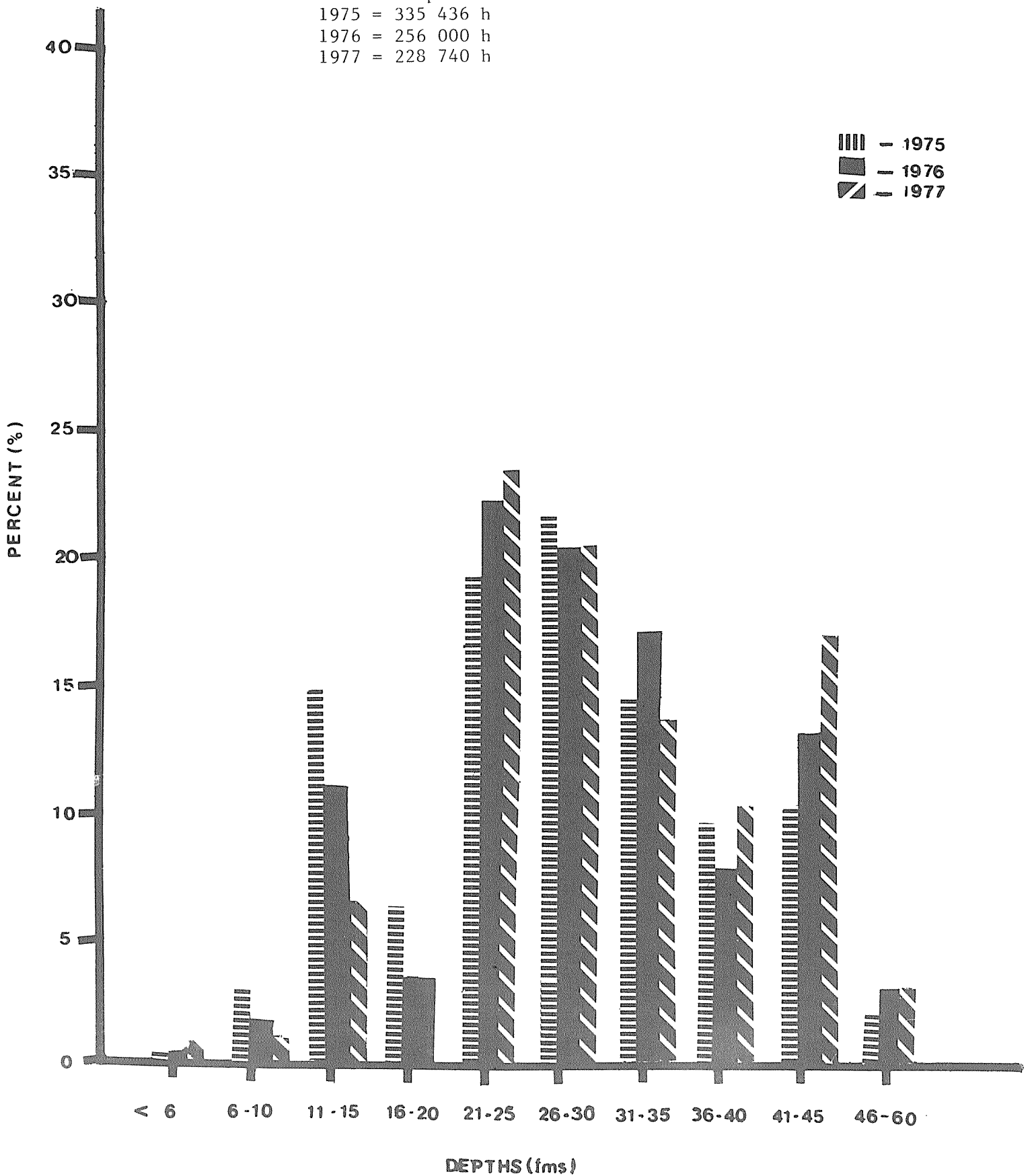
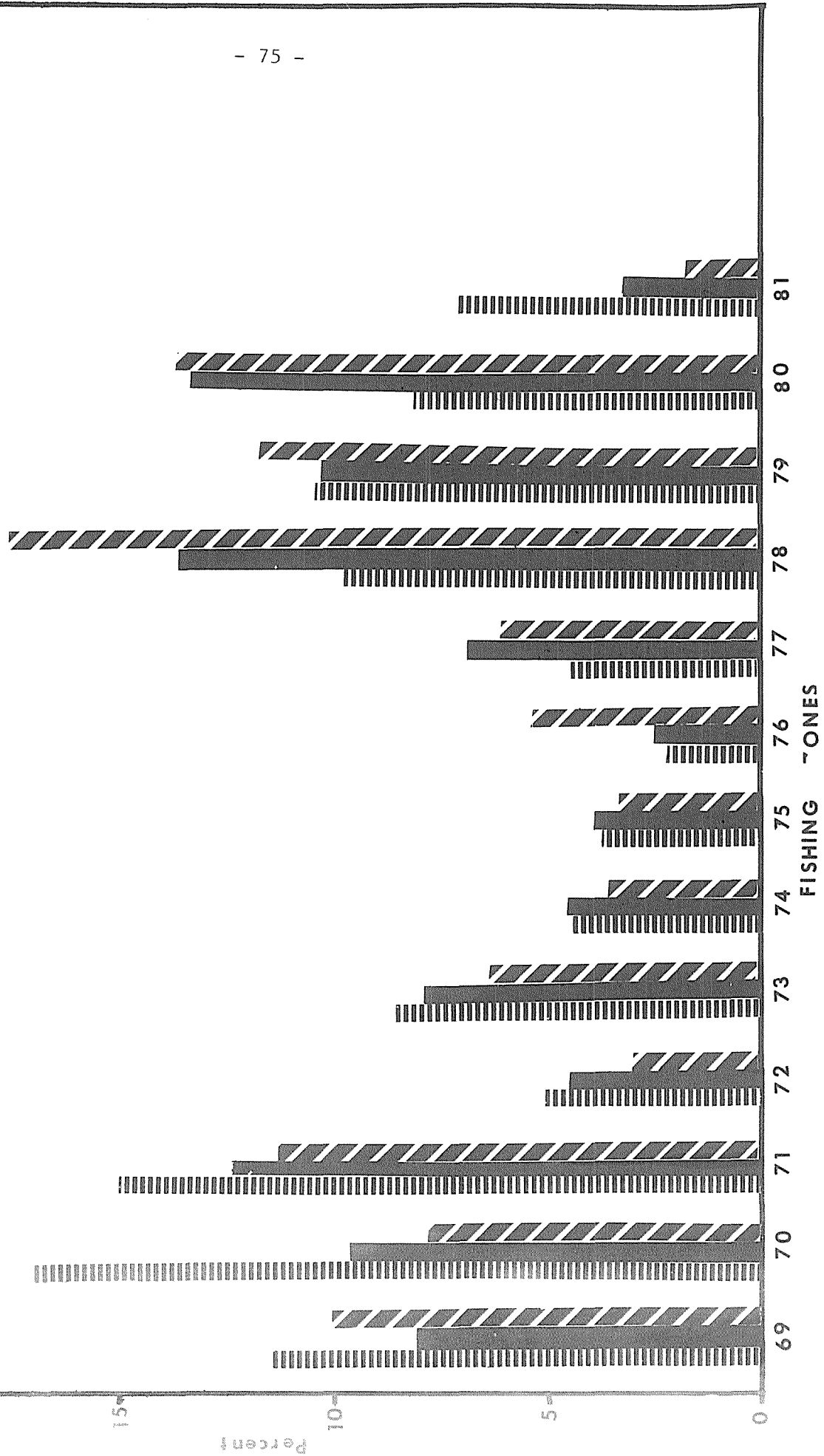


FIGURE 3.6.8.- Distribution of reported effort in hours for each fishing zone, all depths combined, 1975-77.

1975 = 335 436 h  
1976 = 256 060 h  
1977 = 228 740 h

▨ -1975  
■ -1976  
▩ -1977



Esquema de la Pesquería Venezolana de Camarón

por

H.J. Montesinos y L.R. Marcano

1. General

1.1 Flota Nacional

Está formada por barcos arrastreros del tipo florida convencional sin red de prueba. Las esloras oscilan entre 20 y 30 m con un tonelaje de registro bruto entre 80 y 180 t y una potencia del motor entre 100 y 900 hp. La tripulación la componen siete hombres y las campañas tienen una duración de 10 a 20 días.

La mayor parte de los barcos tienen casco de metal, aunque algunos son de fibra de vidrio. La capacidad de "cava" (bodega) en general es de 6 a 40 t, utilizándose como sistema de conservación el hielo molido o en escarcha. Muchos barcos tienen sistema de refrigeración. Las operaciones se realizan desde dos puertos diferentes, uno situado en el Golfo de Paria (Puerto Pesquero Internacional de Güiria) y otro, más distante, situado en la ciudad de Cumaná (Tablas 3.7.1 y 3.7.2 y 3.7.5).

1.2 Procesamiento

El camarón es descargado principalmente con cabeza, para ser descabezado y clasificado por tallas en plantas procesadoras situadas en Güiria y Cumaná donde se empaca en cajas de 5 lb y se congela. Una parte va directamente en fresco al mercado nacional.

1.3 Estadísticas

Las salidas de los barcos del puerto son registradas por la Capitanía correspondiente. Mensualmente cada barco declara su producción al Gobierno.

1.4 Programas de Investigación

Existe un Centro de Investigaciones Pesqueras en Cumaná, dependiente del Gobierno.

A nivel de las plantas procesadoras se recogen los datos precisos de desembarque por talla y por área. Desde el Centro se realizan campañas a bordo de barcos comerciales y se ha mantenido un programa de libro de pesca que lleva el Jefe de Operaciones del barco. También se hacen muestreos en los muelles de desembarque.

## 2. Revisión Histórica de la Pesquería

(a) Fecha de Comienzo: 1973. Por migración masiva de barcos del occidente de Venezuela hacia el oriente debido a colapso en la pesca de camarones del Golfo de Venezuela.

(b) Flota Nacional:

(1) Tendencia en tamaño de las flotas

En las Tablas 3.7.1 y 3.7.2 se presenta la evolución de cada flota durante el período 1973-1978.

De 1974 a 1977 subió el número de barcos operando en el área de 66 a 129 unidades. En 1978 se observó un descenso a 58 barcos.

(2) Tendencia en el modo de operación

- Flota con base en Cumaná

La duración de los viajes ha bajado de 12,85 días en 1975 a 11,58 en 1978. El número de viajes por barco al mes pasó de 1,46 a 1,42 (Tabla 3.7.3, Fig. 3.7.1).

- Flota con base en Güiría

Duración de los viajes: de 10,03 días en 1976 a 9,37 en 1978 aumentando el número de viajes/barco/mes de 1,58 a 1,72 en el mismo período 1976-1978 (Fig. 3.7.2).

(3) Tendencia en los desembarques anuales

En las Tablas 3.7.4 y 3.7.5 se presentan las capturas realizadas por cada flota durante el período 1973-1978.

La tendencia a aumentar a medida que el esfuerzo de pesca aumenta, ha pasado de 46 t en 1974 a 2 080 t en 1977, habiéndose registrado un descenso en 1978 a 818 t (Tabla 3.7.6, Fig. 3.7.3).

## 3. Estado Actual de la Pesquería Venezolana en Guayana

(a) Número de Barcos

Se presenta en la Tabla 3.7.6. Se observa que ascendió al máximo en 1977 con 129 barcos operando. A partir de ese año el número ha descendido debido principalmente a presiones nacionales de tipo conservacionista y político.

No se conocen los datos de las flotas extranjeras que pescan sobre la plataforma de Guayana en aguas nacionales venezolanas, pues esas operaciones no cuentan con los permisos de la ley. Sólo está autorizada la pesca realizada por una flota semi-industrial de pequeños arrastreros trinitarios que operan principalmente en los caños de la propia desembocadura del Río Orinoco. Sin embargo, de estas operaciones tampoco existen datos estadísticos.

(b) Desembarques

También se presentan en la Tabla 3.7.6. (En las Tablas 3.7.4 y 3.7.5 están clasificados por flota.) Se observa un máximo de 2 080 t alcanzado en el año 1977. En la Fig. 3.7.4 se observa la tendencia en función del esfuerzo total.

(c) Areas de Pesca

En un principio las operaciones de algunos barcos con base en Güiria se realizaban hasta frente a Paramaribo. Ultimamente se han restringido a la Guayana Venezolana desde Punta Bombeador, al sur del Golfo de Pará hasta las fronteras con Guyana, en fondos no más allá de las 30-40 brazas de profundidad (Fig. 3.7.5).

(d) Estacionalidad de las Capturas

Se notan fuertes oscilaciones entre 75 y 350 t mensuales. La tendencia general es que el segundo trimestre sea el mejor (Fig. 3.7.6).

(e) Composición por Especies de los Desembarques

Principalmente camarón marrón (P. aztecus), P. duorarum y P. brasiliensis en porcentajes desconocidos. Aproximadamente un 40 por ciento del total de camarón capturado corresponde a camarón blanco (P. schmitti), el cual se encuentra en las aguas más llanas (cercanas a la costa venezolana).

(f) Esfuerzo de Pesca (en días de ausencia de puerto)

Para cada flota, de las dos que operan en el área de Guayana, el esfuerzo se presenta en las Tablas 3.7.1 y 3.7.2, expresado en barcos-año, barcos-mes, viajes y días de ausencia.

(g) Captura por Unidad de Esfuerzo

Expresada en kilogramos de camarón entero, por día de ausencia de puerto, se presenta en las Tablas 3.7.4 y 3.7.5 para cada flota y en la Tabla 3.7.6 para el total nacional. Las variaciones mensuales de este indicador de abundancia poblacional se han graficado (Fig. 3.7.7) observándose un patrón similar al encontrado en el caso de los desembarques.

También se presentan las variaciones anuales del índice CPUE en función del esfuerzo de pesca total ejercido en el área por los barcos venezolanos (Fig. 3.7.8). La tendencia a mejorar los rendimientos por día a medida que el esfuerzo ha aumentado hasta el presente es muy clara.



Tabla 3.7.1 Esfuerzo de Pesca Ejercido en el Area de Guayana por la Flota Camaronera con Base en el Puerto de Cumaná. Período 1973-1978

Año	Barcos-Año	Barcos-Mes	Viajes	Días de Ausencia
1973	45	140	245	2 570
1974	49	194	285	3 422
1975	43	235	364	4 362
1976	42	227	332	4 267
1977	60	304	472	5 767
1978	33	117	166	1 923

Tabla 3.7.2 Esfuerzo de Pesca Ejercido en el Area de Guayana por la Flota Camaronera con Base en el Puerto de Güiría. Período 1973-1978.

Año	Barcos-Año	Barcos-Mes	Viajes	Días de Ausencia
1973	62	207	211	4 656
1974	17	64	93	1 130
1975	45	176	430	3 350
1976	48	190	300	3 008
1977	69	208	338	3 189
1978	25	145	249	2 333

Tabla 3.7.3 Modo de Operación (Días/Viaje y Viajes/Barco-Mes) de la Flota Camaronera Venezolana que Opera en el Area de Guayana. Período 1973-1978.

Años	F L O T A			
	C U M A N A		G U I R I A	
	Días/Viaje	Viajes/Barco-Mes	Días/Viaje	Viajes/Barco-Mes
1973	10,49	1,75	22,07	1,02
1974	12,01	1,47	12,15	1,45
1975	11,98	1,55	7,79	2,44
1976	12,85	1,46	10,03	1,58
1977	12,14	1,55	9,43	1,63
1978	11,58	1,42	9,37	1,72

Tabla 3.7.4 Capturas Anuales de Camarón y Esfuerzo de Pesca Ejercido en el Area de Guayana por la Flota Camaronera con Base en el Puerto de Cumaná. Período 1973-1978

Años	Días de Ausencia	Capturas (t con cabeza)	C.P.U.E. (kg/día)
1973	2 570	583	227
1974	3 422	529	154
1975	4 362	868	199
1976	4 267	863	202
1977	5 767	1 390	241
1978	1 923	338	176

Tabla 3.7.5 Capturas Anuales de Camarón y Esfuerzo de Pesca Ejercido en el Area de Guayana por la Flota Camaronera con Base en el Puerto de Güiria. Período 1973-1978

Años	Días de Ausencia	Capturas (t con cabeza)	C.P.U.E. (kg/día)
1973	4 656	791	170
1974	1 130	217	192
1975	3 350	683	204
1976	3 008	587	195
1977	3 189	690	217
1978	2 333	480	206

Tabla 3.7.6 Capturas Anuales de Camarón y Esfuerzo de Pesca Ejercidos en el Area de Guayana por la Flota Camaronera Venezolana, con Base en los Puertos de Güiria y Cumaná. Período 1973-1978

Años	Barcos-Año	Días de Ausencia	Capturas (t)	C.P.U.E. (kg/día)
1973	107	7 226	1 374	190
1974	66	4 552	746	164
1975	88	7 712	1 551	201
1976	90	7 275	1 449	199
1977	129	8 956	2 080	232
1978	58	4 256	818	192

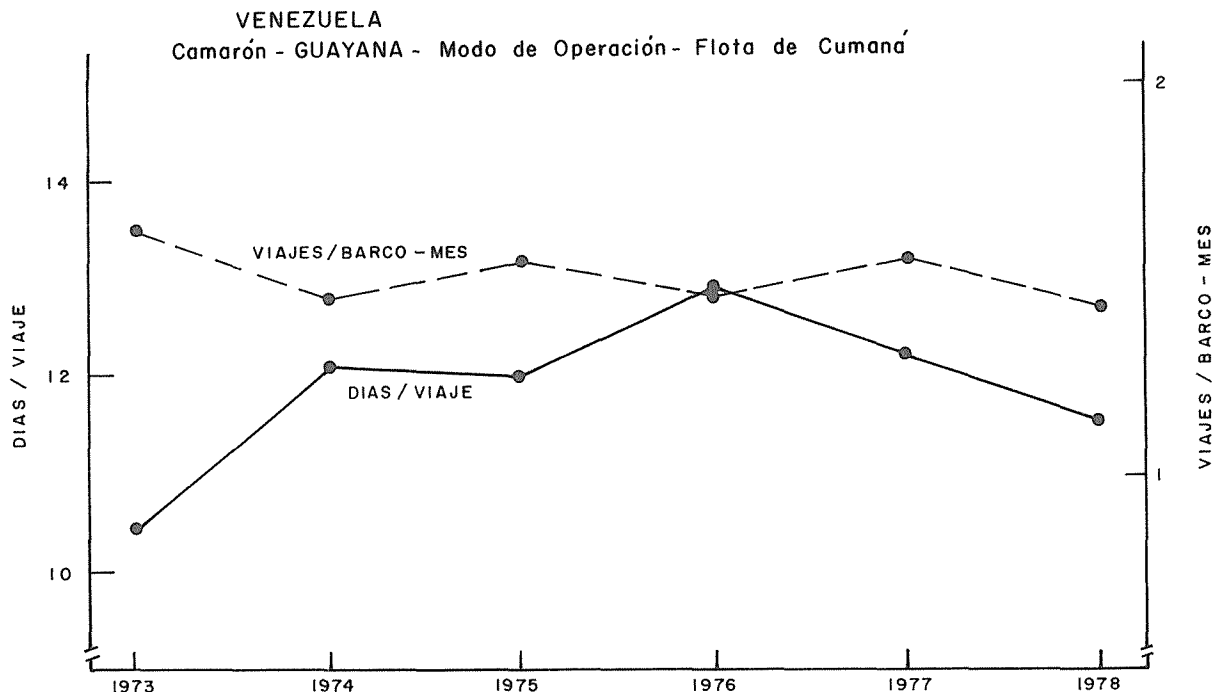


FIGURA 3.7.1. MODO DE OPERACION EN GUAYANA, (DIAS/VIAJES Y VIAJES/ BARCOS - MES) DE LA FLOTA VENEZOLANA CON BASE EN EL PUERTO DE CUMANA. PERIODO 1973 - 1978

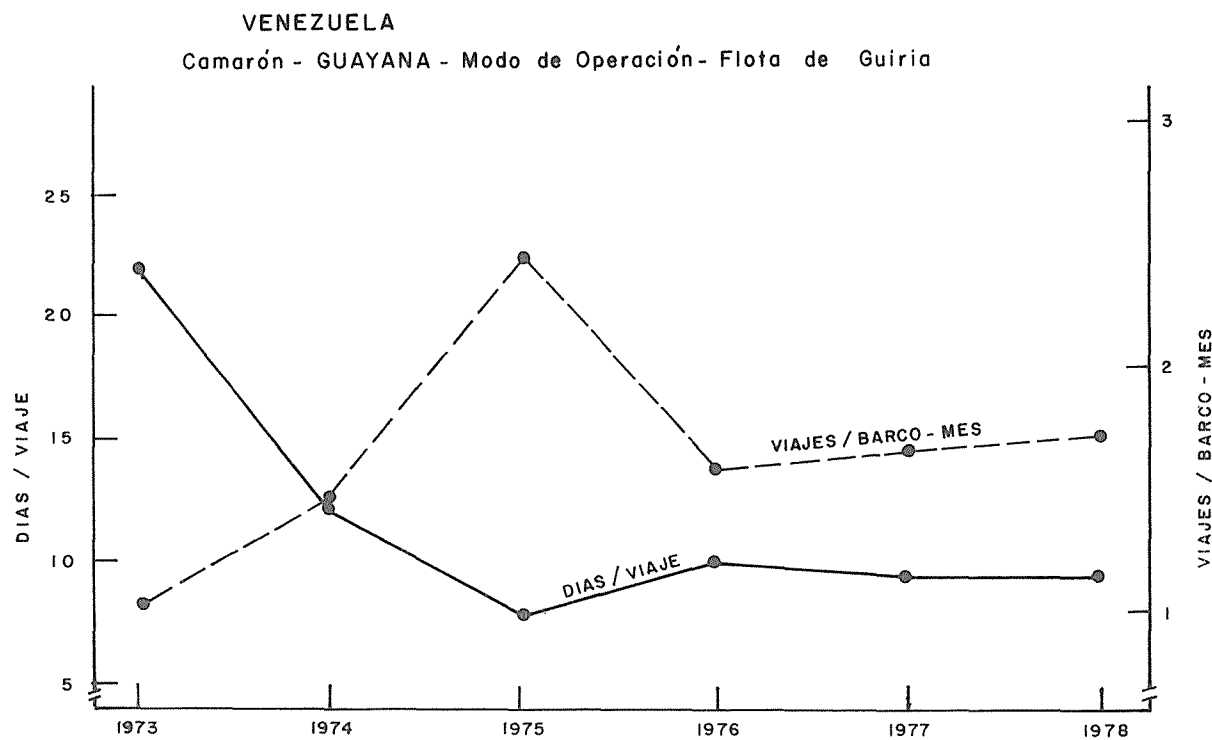


FIGURA 3.7.2. MODO DE OPERACION (DIAS/VIAJES Y VIAJES/BARCO - MESES) DE LA FLOTA CAMARONERA CON BASE EN EL PUERTO DE GUIRIA Y QUE OPERA EN LA GUAYANA. PERIODO 1973 - 1978

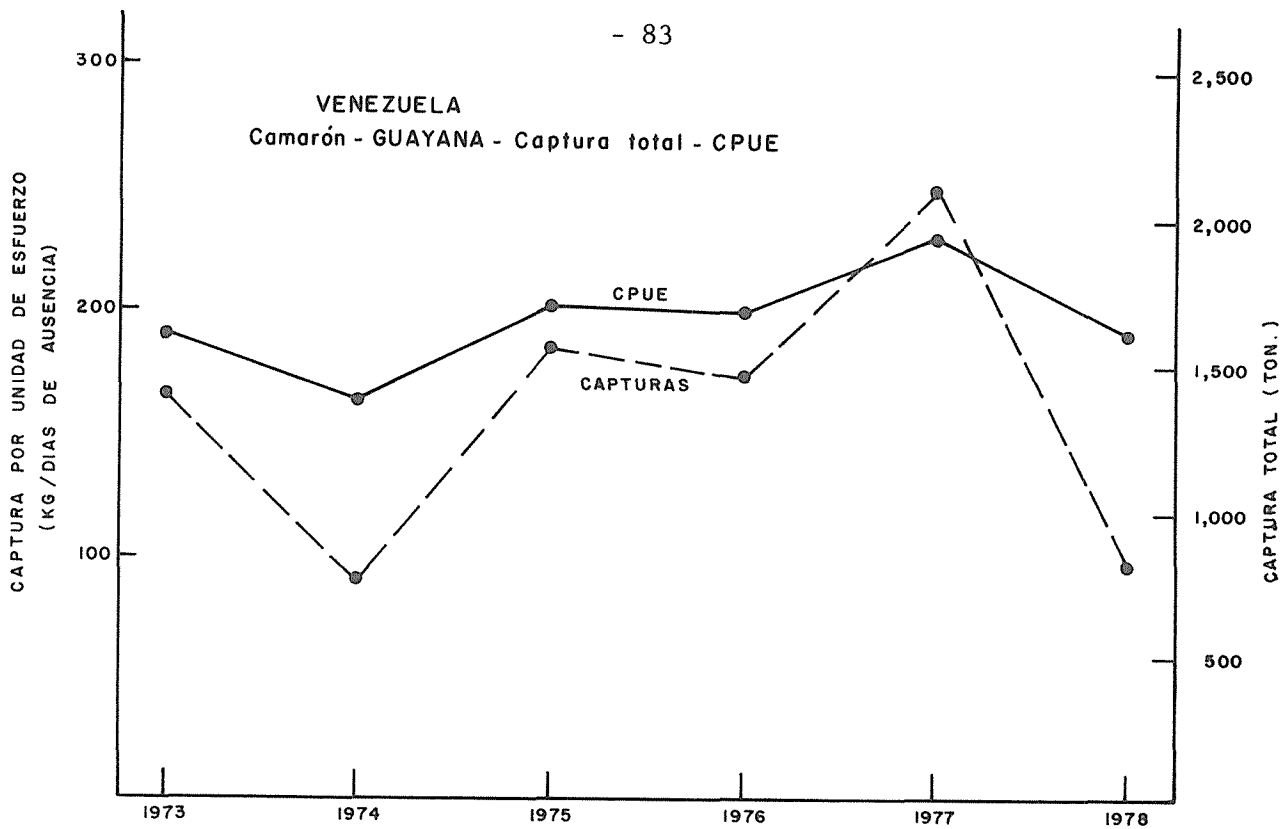


FIGURA 3.7.3. CAPTURAS ANUALES DE CAMARONES, TOTALES Y POR DIAS DE AUSENCIA, REALIZADAS EN LA GUAYANA POR LA FLOTA VENEZOLANA CON BASE EN LOS PUERTOS DE GUIRIA Y CUMANA. PERIODO 1973 - 1978

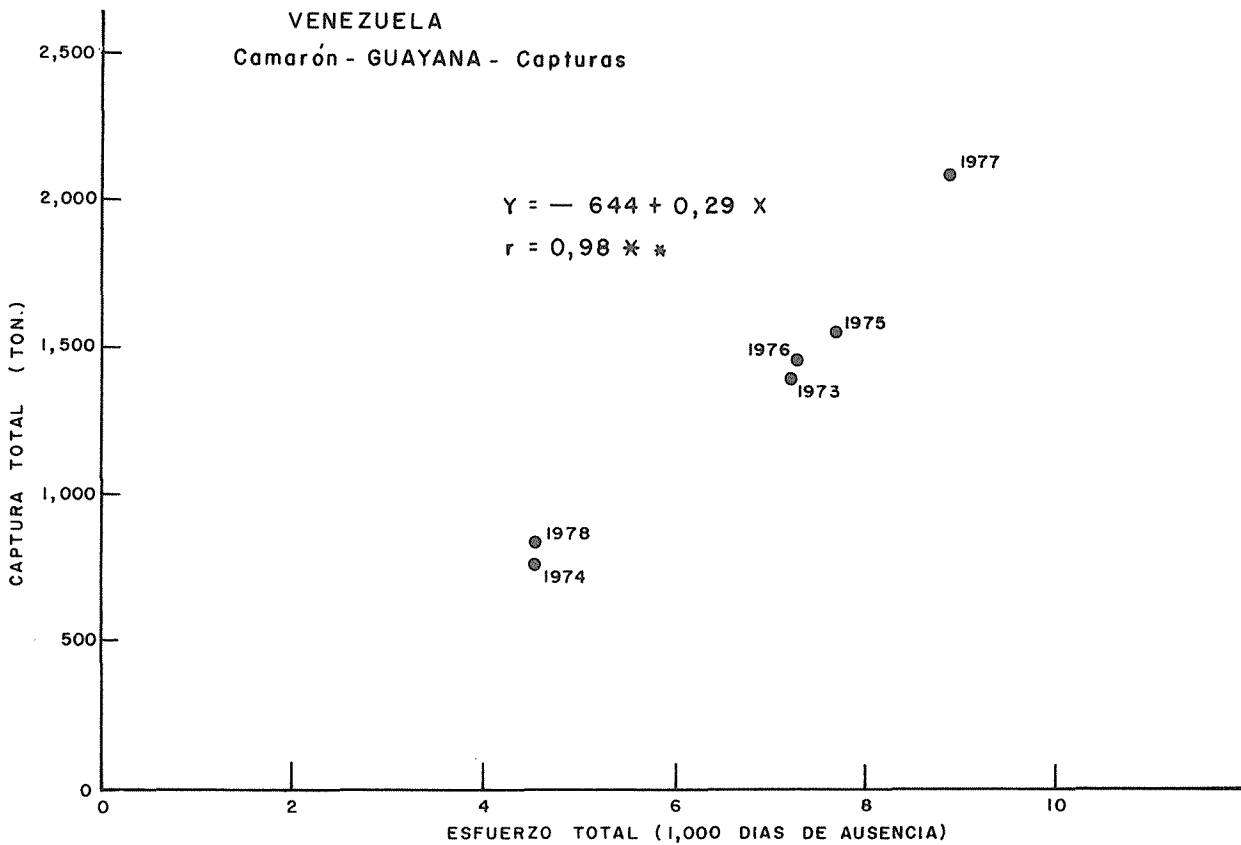


FIGURA 3.7.4. CAPTURAS ANUALES DE CAMARONES EN EL AREA DE GUAYANA POR LA FLOTA VENEZOLANA CON BASE EN LOS PUERTOS DE CUMANA Y GUIRIA. PERIODO 1973 - 1978

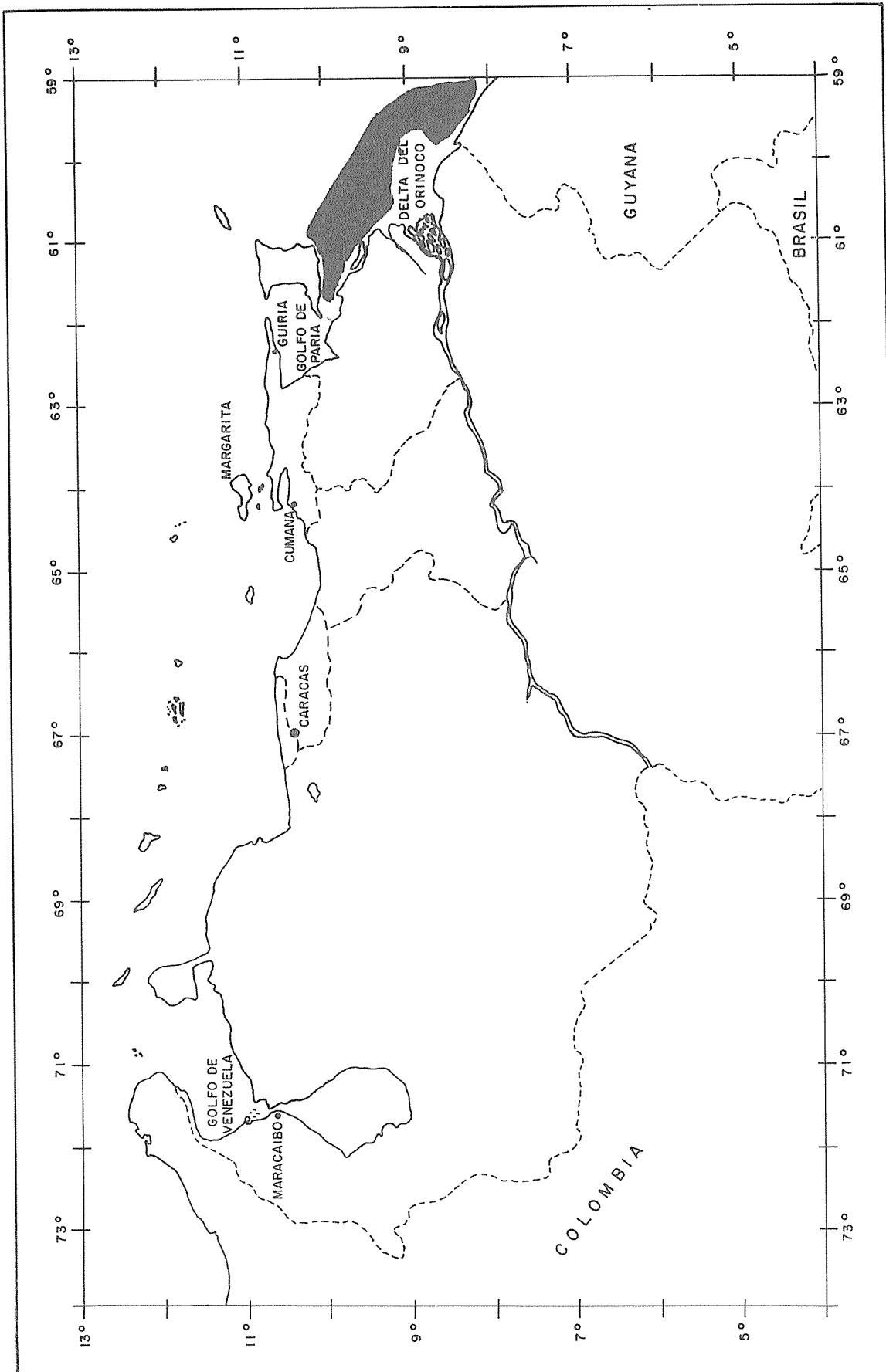


FIGURA 3.7.5.- AREA DE OPERACION DE LA FLOTA VENEZOLANA Y LOCALIZACION DE LOS PUERTOS DE DESMBARQUE  
(CUMANA Y GUIRIA)

VENEZUELA  
Camaron - GUAYANA - Captura mensual

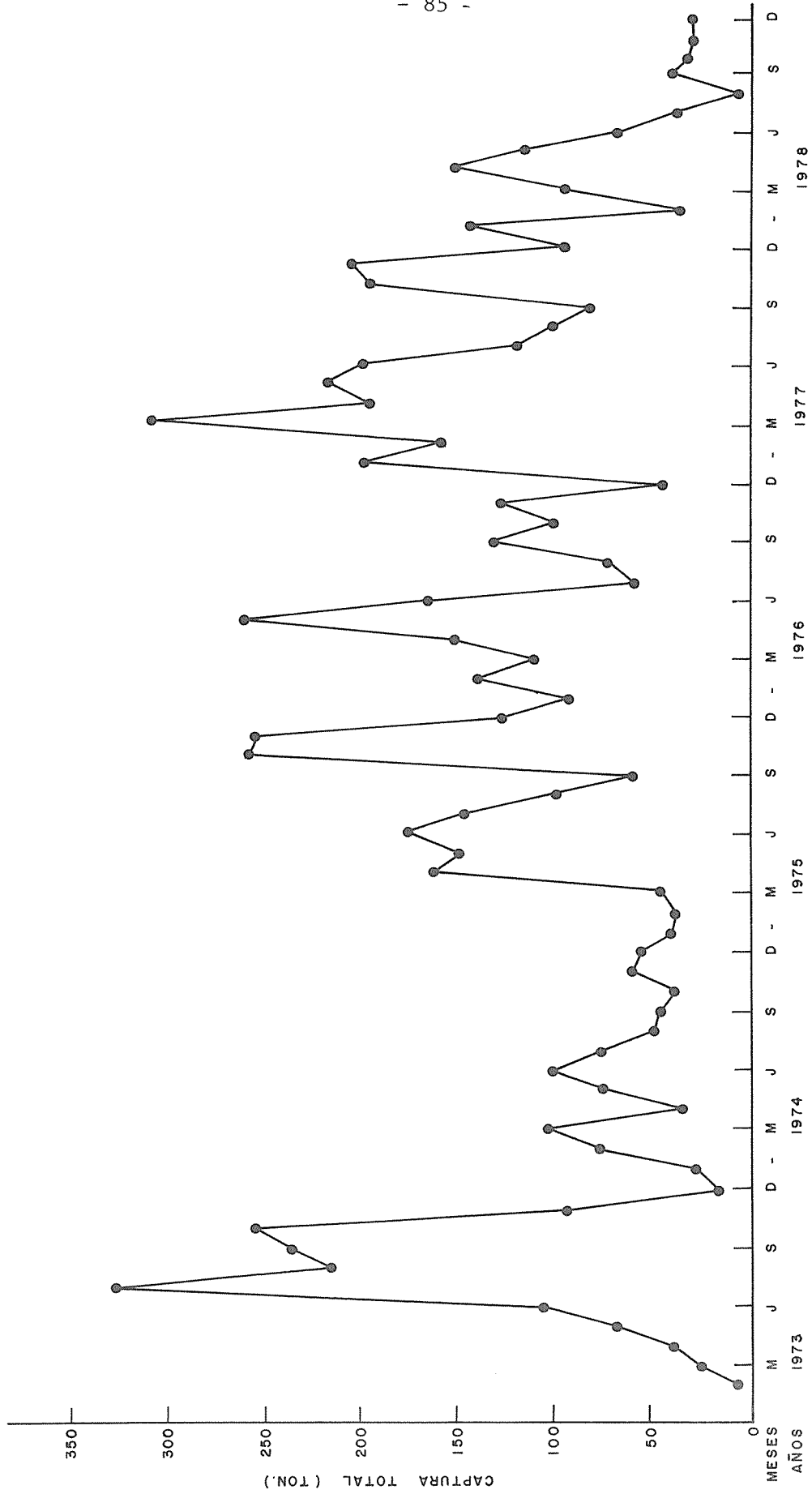


FIGURA 3.7.6. CAPTURA MENSUAL DE CAMARONES EN EL AREA DE GUAYANA, POR LA FLOTA VENEZOLANA CON BASE EN LOS PUERTOS DE CUMANA Y GUIRIA. PERIODO FEBRERO 1973 - DICIEMBRE 1978

VENEZUELA  
Camarón - GUAYANA - CPUE mensual

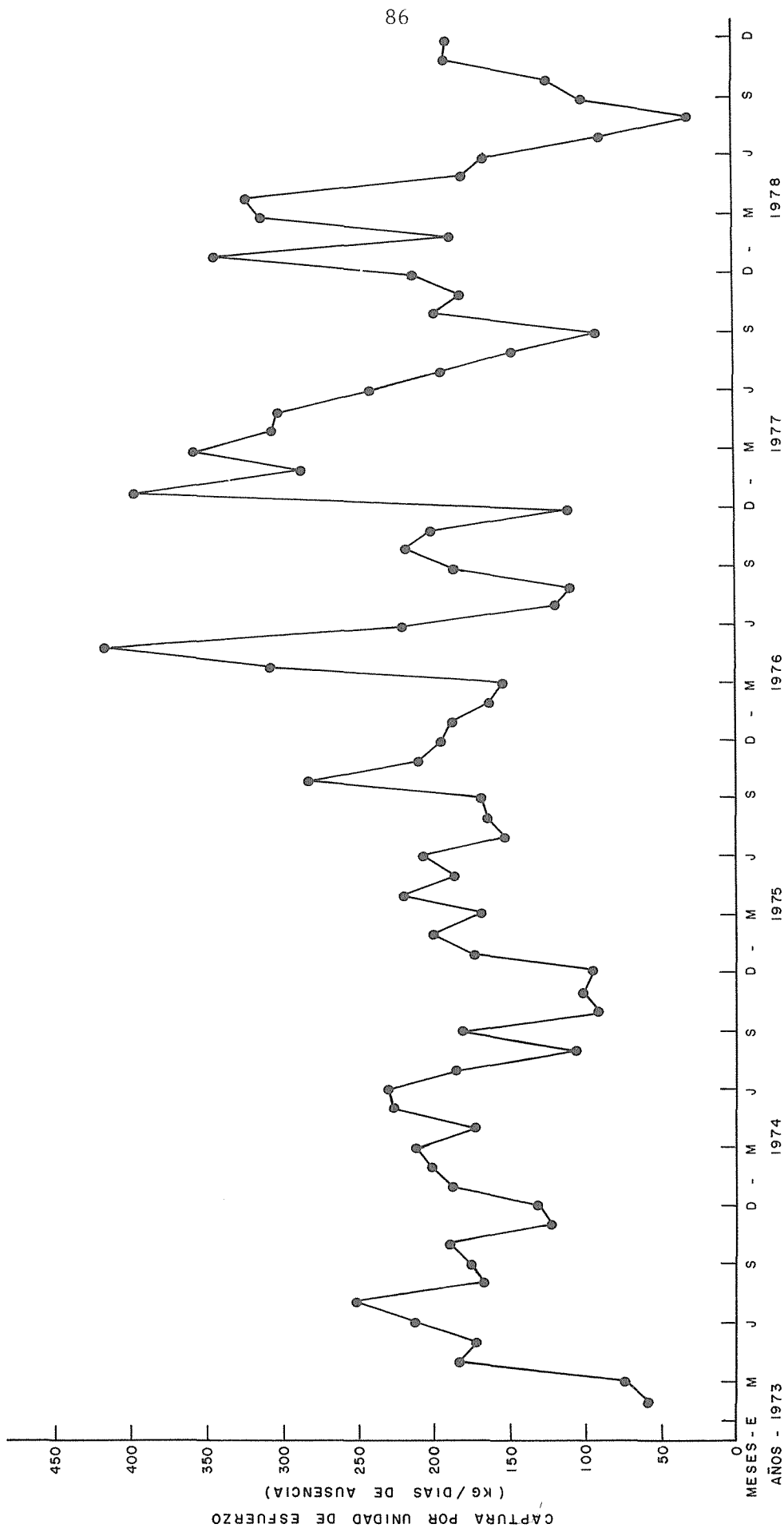


FIGURA 3.7.7. CAPTURA MENSUAL DE CAMARONES EN EL AREA DE GUAYANA, POR DIAS DE AUSENCIA DE PUERTOS DE LA FLOTA VENEZOLANA CON BASE EN CUMANA Y GUIRIA. PERIODO FEBRERO 1973 - DICIEMBRE 1978



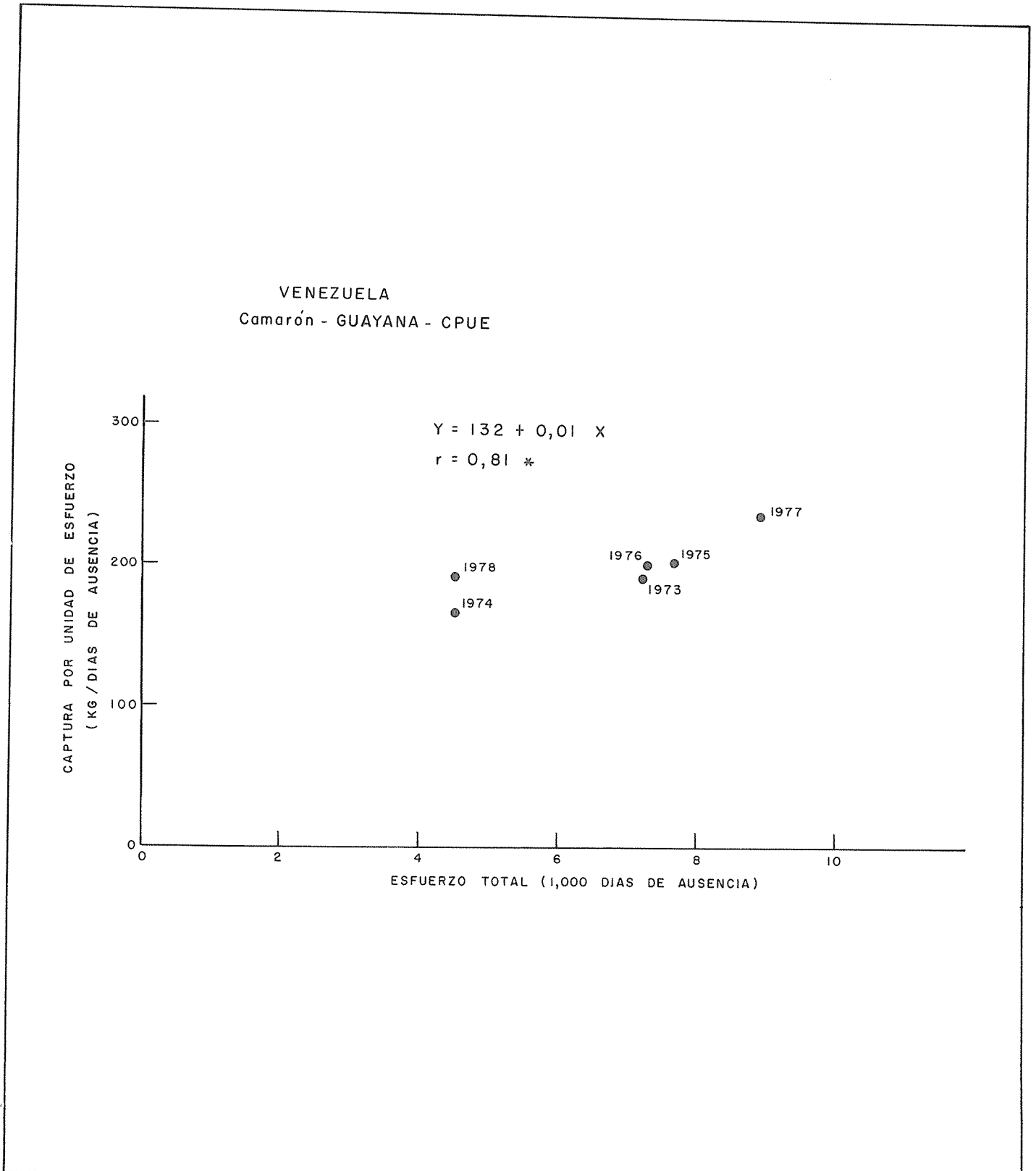


FIGURA 3.7.8. CAPTURA ANUAL DE CAMARONES EN EL AREA DE GUAYANA, POR DIAS DE AUSENCIA DE LA FLOTA VENEZOLANA CON BASE EN LOS PUERTOS DE CUMANA Y GUIRIA. PERIODO 1973-1978

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2. Review of Status of Fishery Statistics and Fishery Research Capabilities in the WECAF Project Area by L. Villegas. November 1978.
3. Shark Fishing in the Western Central Atlantic by S. Springer. March 1979.
4. Report of the First Session of the Executive Committee of the WECAF Project, 18-20 May 1978.
5. Aspectos Técnicos de la Pesca Artesanal en la República Dominicana y Recomendaciones para su Mejoramiento y Desarrollo por M. Giudicelli. Junio 1979.
6. Report on Fish Handling, Processing and Quality Control in Jamaica by C.A.M. Lima dos Santos. July 1979.
7. Programme of Fisheries Development and Diversification in Jamaica by M. Giudicelli. July 1979.
8. La Pesca Artesanal Marítima en la Costa Caribeña de Colombia: Su Situación, sus Posibilidades y sus Necesidades para el Desarrollo por M. Giudicelli. Agosto 1979.
9. Report on Mission to Suriname to Evaluate a Fishermen's Training Proposal by E. Oswald. June 1978.
10. Report on Mission to Antigua, Barbados, Dominica and St. Lucia by R. Kreuzer and E. Oswald. June 1978.
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12. Informe de la Misión a Nicaragua para Prestar Asistencia en las Operaciones de Pesca Parguera Exploratoria y Experimental por M. Giudicelli. Agosto 1978.
13. Bahamian Fisheries Development Mission, Findings and Recommendations by M. Giudicelli. June 1978.
14. Investigación Preliminar sobre las Condiciones Higiénico-Sanitarias y Tecnológicas del Manipuleo, Procesamiento, Comercialización y Control de Calidad de Productos Pesqueros en Nicaragua por C.A.M. Lima dos Santos. Agosto 1978.
15. Purse Seining Demonstration and Training in Montserrat and Study of Adequate Technologies for Fisheries Development in the Country by M. Giudicelli. September 1978.
16. Informe sobre el Tratamiento de Pescado en República Dominicana Incluyendo Sugerencias Referentes a Programas de Extensión por W. Brownell. Octubre 1978.

17. Asistencia a INDERENA en su Programa de Introducción de Redes de Arrastre para la Producción de Pescado en Colombia por M. Giudicelli. Octubre 1978.
18. Marine Artisanal Fisheries in Northeast Brazil and Some Suggestions for the Improvement of the Extension Programmes by W. Brownell. October 1978.
19. Extension Training of Artisanal Fishermen and Other Fisheries Personnel in the WECAF Region by W. Brownell. October 1978.
20. Granadian Fisheries Development Mission, Findings and Recommendations by M. Giudicelli. November 1978
21. Report on the Demonstration and Training in Fishing for Red Snapper in Belize and Identification of Fisheries Development Opportunities by M. Giudicelli. January 1979.
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23. Programa para la Investigación y Evaluación Comercial de los Principales Potenciales Pesqueros Marítimos de Honduras por M. Giudicelli. Mayo 1979.
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25. Programa Preliminar para el Desarrollo de la Pesca Artesanal en la Región de San Andrés y Providencia, Colombia por M. Giudicelli. Agosto 1979.
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