The Present Status of the Exploitation and Evaluation of the Fishery Resources of Venezuela

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INTRODUCTION

The fishery resources of Venezuela and their exploitation were described by Simpson (1963) and Simpson and Griffiths (1967) at a time when comparatively little study had been made of them. Since December 1967, the Venezuelan Government and the Food and Agriculture Organization have been carrying through a Fisheries Research and Development Project, the FAO acting as executing agency for the United Nations Development Program and the Ministry of Agriculture of Venezuela acting as the cooperating government agency.

This project has been able to undertake a wide range of studies of the marine fishery resources and has been able to make a first evaluation of the major resources now under exploitation. Each species or species assemblage that is the object of an important commercial fishery has been classified in terms of total catch according to whether the fishery is in a developing phase, an accelerating growth phase, a decelerating growth phase (approaching but not attaining the maximum sustainable yield), the stabilized phase (at or near the level of maximum sustainable yield) or a state of over-fishing.

The total annual catch (marine and fresh water species combined) has increased steadily though slowly during the past 2 decades as Table 1 shows. Fresh water species occupy about 10% of the total.

For a number of species that were to a large degree the exclusive basis for a fishery, in contrast to trawl fishery species assemblages, some biological work was done, mostly on growth rates, the length-weight relationship, sexual maturity and sex ratios.

Although the majority of the references are in Spanish, they usually have an English summary, and some are printed in both English and Spanish.

STATUS OF THE RESOURCES

PELAGIC RESOURCES

Sardine

Sardinella anchovia is taken by beach seine in eastern Venezuela. The annual catch, most of which is canned, has oscillated around an average of approximately 40,000 tons since 1963 (Table 2). This stabilized catch is considered to be mainly due to the relatively limited accessibility of the resource to the method. The status of the resource until 1966 was described by Griffiths and Simpson (1967).

The relative percentage of the total sardine catch originating in the Gulf of Cariaco was, until about 1965, always greater than 80%, but from 1965 onwards

Table 1. Total annual landings and values in Bolivars of fish in Venezuela (1953-1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)	Year	Catch (tons x 10^3)	Value (B^s x 10^6)
1953	63.36	37.73	1963	97.40	56.47
1954	51.17	32.02	1964	110.41	63.66
1955	70.09	39.73	1965	119.26	69.10
1956	61.28	38.58	1966	116.79	73.86
1957	83.68	45.54	1967	113.22	71.60
1958	77.21	41.75	1968	126.18	64.25
1959	83.81	45.59	1969	134.11	102.59
1960	85.66	50.24	1970	126.33	113.15
1961	83.59	51.15	1971	139.94	130.79
1962	94.87	55.74			

this proportion declined to an average of 30-40% on an annual basis. The south-east coast of the island of Margarita, the north coast of the Peninsula of Araya and, to a lesser extent, the Carupano area on the north coast of Sucre have contributed significantly to the catch (Fig. 1). The cause of this is unknown. A long-term analysis of monthly catch and average sea-surface temperature records for the Gulf of Cariaco showed that up to about 1965 high monthly catches corresponded rather well with low average monthly temperatures. Thereafter, till about 1968, the high catches generally corresponded to months of high average sea temperature, and in recent years the earlier pattern has been partially reestablished (Martinez, ms). The long-term trend in the temperature (as well as sea-surface salinity) over the period 1954-1970 was significantly positive.

Sardine schools appeared to prefer cooler-than-average water. A strong correlation was found between the duration of the period in which the mean monthly temperature was below 24C and the annual catch in the Gulf of Cariaco. This temperature approximated the long-term average and was found to

Table 2. Total annual landings and values in Bolivars of sardines in Venezuela (1959-1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)	Year	Catch (tons x 10^3)	Value (B^s x 10^6)
1961	23.4	2.03	1967	40.0	3.91
1962	32.3	2.80	1968	36.8	4.12
1963	35.3	3.06	1969	35.9	3.17
1964	42.1	3.29	1970	40.7	3.15
1965	43.8	3.07	1971	43.3	3.24
1966	39.1	2.64			

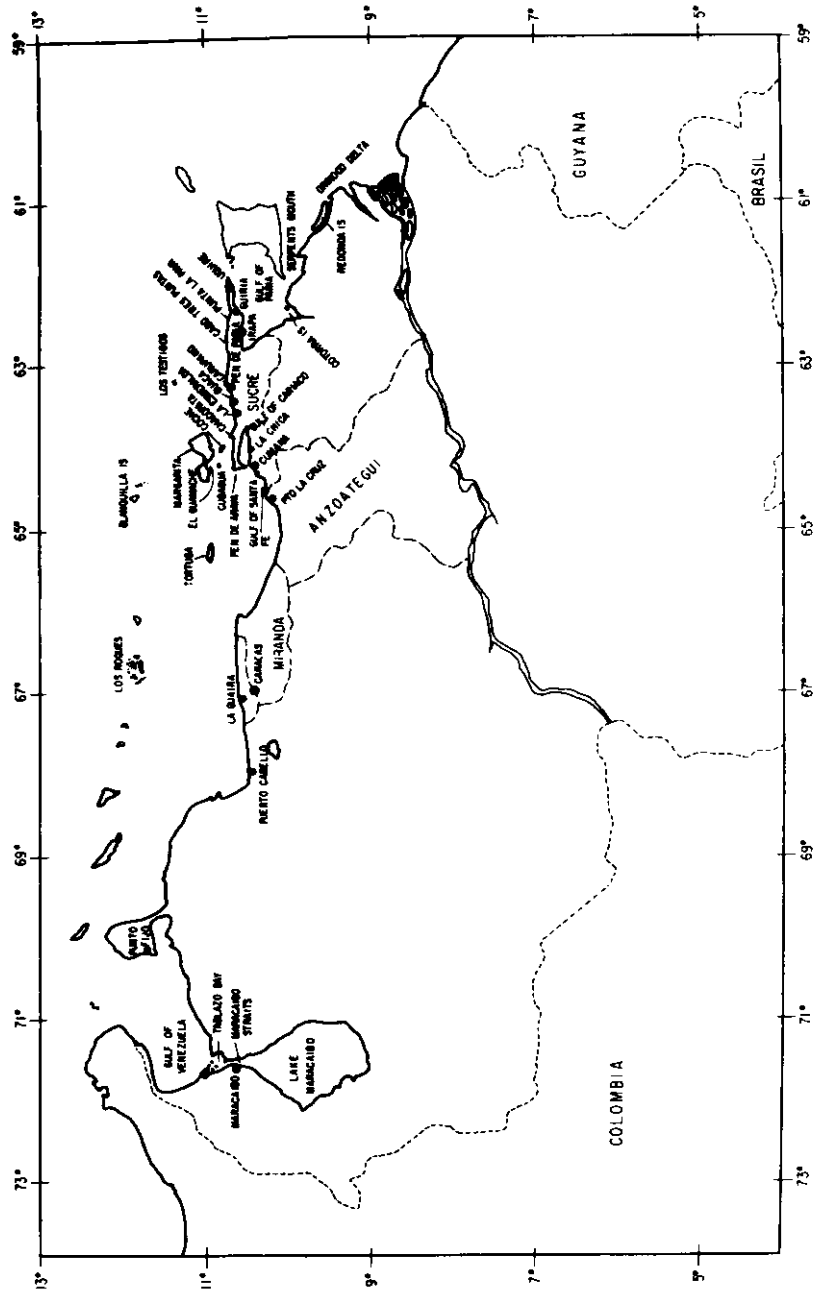

Fig. 1. Map of Venezuela showing fishing areas and geographic locations mentioned in the text.

be a key temperature in work on the west African guilt sardine, *Sardinella aurita* (Boely, 1971).

A study of wind-induced upwelling in the Gulf and its relation to other biological variables (phytoplankton and zooplankton) showed this general short-term association to be so between late 1959 and late 1961 (Simpson and Griffiths, 1971).

The fishing method is known to take the whole school most of the time, more or less regardless of school size. The apparent abundance cannot therefore be safely measured by the catch per set until it has been determined whether or not average school size is dependent on the actual abundance.

The catch per set shows monthly variations with highest values generally occurring in the spring months (typically March) and the autumn months (typically September). These are periods of maximum phytoplankton standing crops, at least in the Gulf of Cariaco, and of highest frequencies of sexually mature sardines (though the spring maximum is by far the more important) (Simpson, 1965; Simpson and Griffiths, 1971). School size may therefore reflect feeding or spawning behavior rather than population abundance, or it may be determined by both.

The seine-month was chosen as a unit of effort not dependent on stock density as is the set. The relationship between the catch per seine-month and total number of seine-months indicated that an increase in the fishing effort above 800 seine-months, which was the level in 1970 and 1971, would only cause a small increase above the 44,000 tons caught in 1971.

According to the length-frequency data, the smallest annual mode normally enters the fishery in May at a total length of about 140 mm. This size is approximately that at which the first scale ring is formed, and corresponds to 1-year old fish (Heald and Griffiths, 1967). The sardine probably attains a maximum age of 5 years; most of the catch consists of fish older than 1 year and less than 3.

The sex-ratio does not differ significantly from unity (1:1). Sexually mature specimens of a total length less than 140 mm are rare. This fact, together with the time of entry (May or later) of fish of this size into the fishery, indicates that 1-year olds do not normally participate in the main annual spawning of this species (Simpson and Gonzalez, 1967).

The egg and larval surveys made in 1968 and 1969 showed that sardine spawning was most intense along the northeast and south coasts of Margarita, around the islands of Coche and Cubagua and between Cabo Tres Puntas and Guaca to about 15 miles offshore along the north coast of Sucre (Fig. 1). Spawning in the Gulf of Cariaco was low and confined to the north coast (Lopez, 1972). Spawning intensity was very low along the Santa Fe coast and around Los Testigos Islands and virtually absent in the Gulf of Paria and along the north coast of the Peninsula of Paria, east of Punta La Pava. Spawning intensity was highest in the early and late months of the year. Lopez (1972) confirmed the findings of Simpson and Gonzalez (1967), but in addition showed an expanded area of spawning. Also, the spawning observed in the Gulf of Cariaco was less intense than that observed by Simpson and Gonzalez (1967).

Although the commercial species of sardine is considered to be *Sardinella anchovia,* the closely related species *S. pinnula* and *S. brasiliensis* have been observed and may have been caught (Heald and Griffiths, 1967). However, the taxonomy of the genus in this area is in need of revision since the existing descriptions have been based on very few specimens.

Thread herring

Opisthonema oglinum is abundant along the Venezuelan coast; it is fished by beach seine, mainly in eastern Venezuela. The annual catch of roughly 600-800 tons increased about eight times between 1965 and 1967 (Table 3). Since then the catch has been variable.

Although no effort data are available, it appears that this fishery is still in the phase of accelerating growth. The catch is almost all converted to fish meal, though some is canned as "sardine."

The study of this species is comparatively recent. The analysis of length-frequency distributions and scale rings is being undertaken to determine age, growth and total mortality. Some morphometric work is also being done. Fish with up to six scale rings have been observed but about 50% of the catch has consisted of fish lacking a scale ring.

Other Clupeids

From time to time the "sardina canalera" (*Jenkinsia lamprotaenia*) is abundant in eastern Venezuela, but there is no commercial fishery for it; it may be less accessible to the beach seines than similar species.

Anchoveta

Although the annual catch (Table 4) of *Cetengraulis edentulus* is only about one-tenth of that of the sardine it is considered potentially important since it is known to be abundant. At present it is used almost exclusively for the production of fish meal.

The fishery is sporadic, markedly seasonal (mainly June-November) and isolated (mainly along the north coast of the Peninsula of Araya). It has therefore proven difficult to obtain an adequate sampling coverage.

Females are larger than males of the same age, at least throughout the range sampled (approximately 40-165 mm). The incoming size groups apparently originate between January and March, and again between September and November. The scales of the anchoveta showed growth rings, which were observed to form normally between January and March or between September and November.

The two annual size-classes indicate two main spawnings per year, though the predominant spawning season is considered to be June-November (Simpson, 1965). The spawning of anchoveta, as that of engraulids in general in eastern Venezuela, is widespread in both time and space. The egg and larval surveys confirmed that June to November is the predominant period and that the north coast of Sucre is the predominant area (Lopez, ms).

Table 3. Total annual landings and values in Bolivars of thread herring in Venezuela (1964-1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)	Year	Catch (tons x 10^3)	Value (B^s x 10^6)
1964	0.63	–	1968	6.50	623.4
1965	0.81	–	1969	3.85	320.1
1966	3.57	–	1970	6.58	375.8
1967	5.07	–	1971	9.13	518.2

Other Engraulids

Although relatively abundant, only one is of commercial interest at this time: the "camiguana" *(Anchoviella estauquae)*, which is sold fresh to a fairly restricted group of consumers. These engraulids are undoubtedly important ecologically. Occasional samples of camiguana have been obtained, but no systematic study has been undertaken except insofar as camiguana eggs and larvae are sampled in routine egg and larval surveys.

Yellowfin tuna

The tuna longline fishery for *Thunnus albacares* was started in the late fifties and is now a well established sector of the Venezuelan fisheries; it exploits the tuna stocks in the Atlantic Ocean and the Caribbean Sea in common with many other nations (Griffiths and Simpson, 1967). The landings of tuna for the last 10 years have fluctuated around 2,500 metric tons per year, representing a value of about 5 million Bolivars (Bs) to the fishermen (Table 5). Yellowfin occupy about 70% of the tuna landings and about 60% of the total landings of this fishery. Seventy percent of the catch is landed in ports on the northeastern coast

Table 4. Total annual landings and values in Bolivars of anchovies in Venezuela (1959-1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)	Year	Catch (tons x 10^3)	Value (B^s x 10^6)
1959	1.47	38.09	1966	2.08	63.19
1960	2.12	55.49	1967	0.86	58.50*
1961	4.51	126.09	1968	5.42	366.03
1962	4.35	126.17	1969	4.85	288.09
1963	4.54	136.24	1970	3.92	237.31
1964	1.29	38.60	1971	3.41	196.78
1965	4.79	154.20			

*Estimate

Table 5. Total annual landings and values in Bolivars of tuna in Venezuela (1961 - 1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)
1961	2.01	2.25
1962	3.54	4.22
1963	3.09	4.59
1964	1.94	3.28
1965	1.83	3.73
1966	3.14	4.57
1967	2.06	4.13
1968	1.98	4.01
1969	2.72	5.60
1970	2.20	4.84
1971	2.35	5.41

Table 6. Total annual landings and values in Bolivars of Spanish and King mackerels (1961-1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)
1961	3.41	5.05
1962	3.07	4.54
1963	2.99	4.41
1964	3.90	5.61
1965	3.23	4.95
1966	3.46	5.59
1967	3.03	10.15
1968	2.66	4.74
1969	2.86	5.42
1970	2.45	4.91
1971	3.52	7.29

and sold to the canneries, the remaining 30% is landed in La Guaira for fresh consumption in Caracas.

The data from this fishery show that catch rates for tuna have declined steadily but these have leveled off at about 1.50 fish/100 hooks in recent years (Griffiths and Nemoto, 1967; Hooft and Ramos, 1972). The data indicate that the resource is probably now being overfished.

In mid-1972, several foreign purse-seine vessels fished successfully off the northeastern coasts of Venezuela and one vessel, accompanied by two chummer boats, was given permission by the National Fisheries Office to conduct fishing by this method on an exploratory basis, and in two trips caught 463 tons of yellowfin and 120 tons of skipjack (Mihara, Medina and Griffiths, 1972).

There are some indications that the stock in the Caribbean Sea is to some degree separate from the one in the Atlantic Ocean, within the areas fished by the Venezuelan fleet (Hooft and Ramos, 1972). In the length-frequency distributions, the principal modes of one area are somewhat displaced with respect to those of the other at the same time of the year, and certain modes are observed in one but not in the other area in a given quarter. Little or no fishing is done in the area of the common boundary between the two regions. There are some minor morphometric differences between specimens from the two areas.

There appear to be five or six modal sizes in the catch but it is not known whether these are year classes or whether, like the Pacific yellowfin, there are two age groups per year about 6 months apart. Little is known of yellowfin spawning in this region but gonad samples obtained in 1970 showed that sexually mature tuna were common in October and November. Because the fish is gutted at capture such information is difficult to obtain from the Venezuelan fleet.

A few samples of viscera have been obtained and show that crustaceans are probably the predominant element of the tuna diet.

Other Tunas

Albacore occupy at most 20-30% of the tuna catch, and bigeye tuna no more than 5%. The remainder of the catch, apart from yellowfin, consists of sailfishes, spearfishes and sharks. The annual catches of spear and sail fishes have increased slowly during the past decade to a level of 400-500 tons per year. The data for these species do not justify drawing firm conclusions about the state of the stocks. Blackfin and bluefin tuna are only occasionally caught.

Skipjack of 3-5 kg in weight are seasonally (October-February) abundant off the central Venezuelan coast and there is an incipient, though rather primitive, fishery for them by hook and line, with or without fishing poles (Hilders, 1972). Chum is used. This fish is entirely new to the market so that its development is very much dependent on the development of the market, though the general shortage of bait in the central region is a significant factor.

Spanish and King mackerels

There are extensive though modest fisheries for *Scomberomorus maculatus* and *S. cavalla*, the Spanish mackerel being generally predominant. The primary fishing gear is the gillnet; the secondary is trolled lines. The main fishing area is eastern Venezuela, though these mackerels are abundant at times in central and western Venezuela. These fish are mainly sold fresh for direct consumption, with local surpluses being salted.

Peak catches are observed in February and September. The annual catch of each species is usually a little less than 1,500 metric tons, though the 1971 catch of Spanish mackerel was nearly 1,900 tons. Total landings of these mackerels are given in Table 6.

Gillnets used in the fishery have mesh sizes of 3-½, 4 and 4-½ inches (stretched mesh); and catch rates, though highly variable, are between 0.3 and 1.3 fish per 1,000 m^2 per hour per gillnet set.

Sexually mature specimens are apparently not found in the Gulf of Paria, indicating that these mackerels do not spawn there.

Catch records of numerous small boats are being obtained and analyzed and some morphometric measurements have been taken. The highly dispersed nature of this artesanal fishery and the large size and relatively high value of the fish make sampling difficult.

Chub mackerel

This species (*Scomber japonicus*) is another abundant but underexploited resource with a poorly developed market. The fishery is artesanal, the mackerel being taken by handline (sometimes multiple-hook) and, incidentally, by beach seines and gillnets. The catch is extremely variable (Table 7).

This fish is sold mainly for fresh consumption, but the production of canned mackerel is increasing. No effort data are available, but morphometric measurements and some length-frequency data have been taken.

Other Scombrids

There are sparsely developed seasonal fisheries for Atlantic bonito and frigate mackerel (*Sarda sarda* and *Auxis thazard* respectively). They are usually taken

Table 7. Total annual landings and values in Bolivars of chub mackerel (1967-1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)
1967	0.37	81.4*
1968	1.55	346.2
1969	4.05	677.2
1970	0.35	252.2
1971	1.18	710.7

*Estimated

Table 8. Total annual landings and values in Bolivars of white and grey mullets (1967-1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)
1967	3.43	3.77*
1968	3.90	4.03
1969	3.53	4.00
1970	3.51	3.95
1971	3.49	3.88

*Estimated

by trolling. Approximately 300 tons of each species are taken annually. There are insufficient biological or fishery data to permit any analysis of this resource.

Mullets

Two species of mullet are taken by dispersed coastal fisheries with beach seines and gillnets. The annual catches (Table 8) have remained rather steady at just over 2,000 tons for white mullet (*Mugil curema*) and 600 tons for blueback (*M. liza*). Small quantities of a third species (*M. incilis*) are also taken in certain areas (e.g. Gulf of Paria). The main fishing season is November to February. Mullet are sold fresh, with local surpluses being salted.

Again, the dispersed nature of this artesanal fishery makes it difficult to obtain catch-effort data, but biological sampling in fish markets and certain landing places, particularly in western Venezuela, has been relatively good.

Bigeye scad and Rough scad

These scads are taken mainly by beach seine, gillnet and troll. Bigeye scad (*Selar crumenophthalmus*) is predominant, and rough scad (*Trachurus lathami*)

Table 9. Total annual landings and values in Bolivars of bigeye and rough scads (1967-1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)
1967	2.50	1.21*
1968	2.05	1.00
1969	2.26	1.09
1970	1.74	1.04
1971	2.10	1.39

*Estimated

Table 10. Total annual landings and values in Bolivars of crevalle in Venezuela (1967-1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)
1967	1.23	–
1968	1.79	1.85
1969	1.99	2.18
1970	1.58	2.00
1971	1.94	2.39

is not identified in the catch statistics. The annual catch (Table 9) of bigeye scad is between 1,000 and 1,500 tons in eastern Venezuela and between 200 and 400 tons in the central area; catches elsewhere are negligible.

Scads are known to be abundant, and the fishery could be developed substantially, especially in the central zone (Hilders, 1972). Biological samples of both species have been obtained somewhat irregularly and await analysis.

Other Carangids

The crevalle jack, *Caranx hippos*, is taken seasonally along the Venezuelan coast, principally by beach seine and trolling. The annual catch is between 1,500 and 2,000 tons (Table 10). About two-thirds of the catch is made in eastern Venezuela, one-third in western Venezuela and a small amount in the central zone. As with the scad, there is ample scope for increasing the catch in the central zone. Jack is popular locally as a food fish, mostly being sold fresh. The rather sporadic and seasonal fluctuations in abundance impede development of the fishery. For similar reasons, few biological samples or fishery statistics have been obtained for this species.

The Atlantic moonfish, *Vomer setapinnis*, is taken by trawls, beach seines and gillnets. The main fishing area is in the eastern zone; the second is in the western zone; negligible quantities are taken in the central region. Annual catches are shown in Table 11. Some biological and fishery statistics data have been obtained.

Other Perciforms

There is a seasonal coastal fishery (by beach seine and gillnet) for bluefish, *Pomatomus saltatrix*, mainly off the north coast of the State of Sucre. The annual catch is between 700 and 1,000 tons. The main fishing season is from May to August. Occasional biological samples have been taken.

Between 300 and 500 tons of sable-fish, *Trichiurus lepturus*, are taken each year by bottom and, to a lesser extent, by floating longlines and handlines, mainly in eastern Venezuela. This species is sold fresh locally. It is a consistent though minor component of the tuna longliners' catches. Fishery statistics and biological sampling have not been developed.

DEMERSAL RESOURCES–FISH

The demersal fish program began in 1968 in western Venezuela, and in early 1970 operations were initiated in the eastern region.

One hundred and twelve species of fish have been identified from the commercial catches taken in Lake Maracaibo and the Gulf of Venezuela. Although Lake Maracaibo is essentially a body of freshwater, it is connected to the Gulf of Venezuela. Because of the faunal interchange between the two areas, the Lake's resources have been included, for convenience, in the marine sector. Apart from shrimps, three species of fish predominate in the Lake fishery.

Lake curvina

Twenty-three per cent (approximately 6,000 metric tons) of all Lake Maracaibo catches (Table 12) consist of *Cynoscion maracaiboensis*. Both beach seines and handlines are used in the fishery.

Table 11. Total annual landings and values in Bolivars of Atlantic moonfish in Venezuela (1967-1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)	Year	Catch (tons x 10^3)	Value (B^s x 10^6)
1967	1.07	–	1970	1.37	1.23
1968	1.94	1.38	1971	1.19	1.11
1969	1.82	1.46			

The curvina spawns throughout the year in the Bay of Tablazo and Straits of Maracaibo and enters the fishery at the end of the first year at a total length of 40 cm (Espinosa, 1972).

Manamana

Anodus laticeps, a characid, is the second most important commercial species in Lake Maracaibo after curvina, comprising about 20% (5,000 met. tons) of the Lake catches (Table 13). No significant quantities of manamana are taken outside the Lake.

The fishery is by surround net, mainly in the southern part of the Lake. This fish migrates up rivers from the Lake. There is no major river fishery, but the fishermen take advantage of the migrations into and out of the rivers. Some aspects of the biology of this species have been described (Espinosa and Gimenez, ms).

Bocachico

Prochilodus reticulatus reticulatus is a characid fish similar to the manamana and is the third most important commercial species in the Lake, accounting for about 15% (3,800 tons) of the Lake catches (Table 14).

Gulf of Venezuela trawl fishery

Two fleets operate in the Gulf of Venezuela: the Punto Fijo fleet and the Maracaibo fleet. The number of trawlers in the Punto Fijo fleet has increased

Table 12. Total annual landings and values in Bolivars of Lake curvina (1961-1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)	Year	Catch (tons x 10^3)	Value (B x 10^6)
1961	4.36	3.28	1967	6.50	4.90
1962	4.80	3.50	1968	6.74	5.64
1963	5.37	3.96	1969	7.09	6.41
1964	5.41	4.15	1970	5.86	5.24
1965	6.14	5.07	1971	9.00	8.48
1966	7.39	5.62			

Table 13. Total annual landings and values in Bolivars of manamana in Lake Maracaibo (1967-1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)
1967	5.12	1.84
1968	6.29	2.21
1969	9.55	3.54
1970	6.56	2.56
1971	5.03	2.06

Table 14. Total annual landings and values in Bolivars of bocachico in Lake Maracaibo (1967-1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)
1967	1.78	0.73*
1968	3.62	1.46
1969	4.62	1.95
1970	1.94	0.96
1971	3.84	1.73

*Estimated

from 11 in 1956 to 130 in 1971. The total landings during the same period increased from 4,000 to 11,000 tons. The Maracaibo fleet started in 1962 with three vessels, increasing to 49 in 1971. Apart from trash fish, nearly all the catch of the Maracaibo fleet consists of white shrimp complemented by grooved shrimps when abundant. The Punto Fijo fleet lands a variety of species: grooved shrimps (*Penaeus aztecus, P. duorarum* and *P. brasiliensis*), white shrimp (*P. schmitti),* grunt *(Orthopristis ruber),* curvinata *(Macrodon ancyclodon),* croaker *(Micropogon furnieri),* squid *(Doriteutis plei),* curvinas *(Cynoscion* spp.), snappers *(Lutjanus* spp.), southern sennet *(Sphyraena picudilla),* Atlantic moonfish *(Vomer setapinnis),* sharks (mainly *Rhizoprionodon porosus)* and octopus.
don porosus) and octopus.

A first stock assessment has been made of this assemblage of species using commercial statistics and data from the monitoring of fishing operations (Racca and Griffiths, 1972). Biological studies of individual species have not been developed as was done for the Lake species.

The trash fish, which are returned to the sea, may constitute as much as 75% of the total catch of a given haul.

The relationship between catch per unit effort and effort is good if 3 years (1965, 1967 and 1970), known to be years of extraordinary shrimp catches (Cadima *et al,* 1972), are ignored or if the shrimp catches for each year are subtracted from catch totals. The level of effort corresponding to the maximum sustainable yield was estimated at about 20,500 days' absence from port of the Punto Fijo fleet. This value decreases to about 18,500 days' absence if the years 1965, 1967 and 1970 are not considered. If the shrimp catches are discounted, the level is at about 16,500 days' absence. The catch-effort relationship for shrimp is discussed later. The present level of trawl fishing effort in the Gulf of Venezuela is at about 27,000 days' absence from port.

Apparently not all the commercial fish species are equally affected by the fishing effort; about half (sharks, curvinas, snappers, southern sennet and Atlantic moonfish) do not individually show a definite response to the fishing effort; grunt, curvinata, croaker and squid do. The shrimps are a special case in which a response is observed but with wide variations (Cadima *et al,* 1972).

The relative percentages of grunt and shrimps in the catches have increased as the fishery developed, whereas the percentage of the remaining species has remained constant or declined slightly. The grunt resource is being fished somewhat above its level of maximum sustainable yield, though the catch-effort curve has only a very broad maximum, such that even at the prevailing high effort levels, the present annual yield is close to a maximum sustainable yield.

In the western demersal fishery, the catch-effort relationships of individual species are greatly variable. The relationship between catch per unit effort and effort for "unclassified" catch is a well-defined concave descending curve however.

Eastern Venezuela trawl fishery

The trawl fishery in Eastern Venezuela (Novoa and Cadima, 1972; Novoa, Cadima and Racca, 1972), which began in 1960, was carried out by two to three vessels until 1966. The landings consisted almost entirely of demersal fishes. The number of vessels increased rapidly after 1967 and totaled 60 in 1971. Shrimps, squids, octopus and other molluscs (especially scallops) were taken in negligible quantities prior to 1968 but increased from 15 to 37% of the total landings in the period 1969-1971, and it is probable that this percentage will increase further. There are two main base ports: Cumana and Puerto La Cruz. The Cumana fleet fishes preferentially in the area of Isla Margarita, whereas the Puerto La Cruz fleet fishes preferentially along the coasts of Anzoategui and Miranda States.

Total landings have increased from 340 tons in 1960 to 5,400 tons in 1971 but the catch per boat-month decreased from 18 tons per boat-month in 1969 to 12 tons per boat-month in 1971. It is concluded that this fishery, taking all species together, has entered the phase of decelerating growth. However individual commercial species or groups, such as Atlantic moonfish (*Vomer setapinnis*), sharks (principally *Rhizoprionodon porosus*), snook (*Centropomus ensiferus*), southern sennet (*Sphyraena picudilla*), squids (*Doriteuthis plei* and *Loligo palei*), octopus (*Octopus vulgaris*) and shrimps, are still in the development phase; corocoro *(Orthopristis ruber)* appears to have entered the stabilization phase. It should be emphasized however that the data are not yet adequate to properly define the catch-effort relationships.

Moderate increases in the fishing effort probably would produce higher total yields but would further decrease the catch per boat.

All the invertebrates (shrimp, octopus and squid) show increasing catch rates together with sennets and curvinas and curvinatas (these last two taken together). The catch rates for nearly all the fish species are declining, though often in an irregular manner.

Fisheries in other areas

There is a small amount of trawling in the central region (Hilders, 1972) and in the Gulf of Paria (Ewald, Diaz and Cadima, 1971). The principal commercial species are shrimps. In the Gulf of Paria croaker (*Micropogon furnieri*), curvina, curvinata and mojarra (*Eugerres plumieri*) are the predominant fish species taken. The catches show strong seasonal variation with croaker, curvinas and

Table 15. Total annual landings and values in Bolivars of grunt in Venezuela (1967-1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)
1967	2.94	–
1968	3.75	2.44
1969	4.10	2.85
1970	3.13	2.70
1971	3.70	3.28

Table 16. Total annual landings and values in Bolivars of croaker in Venezuela (1967-1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)
1967	1.06	–
1968	1.29	0.85
1969	1.49	1.19
1970	1.18	1.10
1971	1.31	1.19

mojarras most abundant between August and November and shrimp usually most abundant in the remaining months.

Some of the species taken by the trawl fleets, such as grunt, croaker, snapper and snook, and to a certain extent dogfish and catfish (both of which are taken by bottom lines, beach seines, gillnets and other gears), have annual catches in excess of 1,000 metric tons, as do the groupers, which are not commonly taken by the trawlers.

Grunt

This species (*Orthopristis ruber*) appears to have a particularly close association with shrimp catches. The annual landings are shown in Table 15.

Croaker

Micropogon furnieri is an important component of the trawl catches. The annual landings are given in Table 16.

Snook

Centropomus ensiferus is also an important component of the trawl catches; the majority of the catches of this species are made by the eastern trawl fishery

Table 17. Total annual landings and values in Bolivars of snook in Venezuela (1967-1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)
1967	1.42	–
1968	1.55	1.39
1969	1.59	1.53
1970	1.25	1.32
1971	1.40	1.37

Table 18. Total annual landings and values in Bolivars of sharks in Venezuela (1967-1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)
1967	1.94	–
1968	2.11	1.85
1969	2.41	1.83
1970	2.18	1.77
1971	2.25	1.96

Table 19. Total annual landings and values in Bolivars of marine catfish in Venezuela (1967-1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)	Year	Catch (tons x 10^3)	Value (B^s x 10^6)
1967	4.44	–	1970	6.38	2.45
1968	5.19	1.08	1971	4.33	2.10
1969	3.53	2.52			

off the coast of Anzoategui. It is also taken by beach seines, often in coastal lagoons. The annual landings are given in Table 17.

Sharks and Dogfishes

Three species are distinguished in the official statistics: shark (*Carcharhinus springeri, C. acronotus* and *C. limbatus*) that are usually taken by longlines; tiger shark (*Galeocerdo cuvieri*), usually taken by bottom longlines; and a dogfish (*Mustelus higmani*), which is also taken with bottom longlines but may be caught by trawlers. Other species may be included in the total catches (Table 18).

Marine catfishes

The predominant species is *Arius spixii*, which is taken usually by beach seine, mainly in northeastern Venezuela. Another species, *Bagre marinus*, is more commonly taken by bottom longline though in smaller quantities. Most of the catch from the beach-seine fishery is used for fish meal.

Table 20. Total annual landings and values in Bolivars of snappers in Venezuela (1961-1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)
1961	3.84	7.27
1962	3.34	6.53
1963	2.86	5.62
1964	2.85	5.83
1965	2.69	5.72
1966	2.80	6.21
1967	2.39	5.58
1968	2.59	6.00
1969	3.01	7.21
1970	2.62	7.03
1971	2.61	7.80

Table 21. Total annual landings and values in Bolivars of groupers in Venezuela (1961-1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)
1961	1.48	2.53
1962	1.46	2.56
1963	1.40	2.55
1964	1.43	2.74
1965	1.82	3.06
1966	1.34	3.02
1967	1.53	3.63
1968	1.44	3.60
1969	1.31	3.59
1970	1.11	3.28
1971	1.19	3.68

Snappers

Several species of snapper are taken by small-boat coastal fisheries using handlines and bottom longlines; trawlers also catch modest quantities. These snappers are a preferred species in the fresh fish market. The disperse nature of the fishery however has made study difficult. Table 20 shows the trend of the catches during the last decade.

The predominant species distinguished in the official statistics is the red snapper (*Lutjanus aya*), followed by mutton snapper (*L. analis*) and gray snapper (*L. griseus*). However one of the significant fish of the unclassified species is the lane snapper (*L. synagris*), an important component of the trawl fishery.

Groupers

Like the snappers, these fish are taken by the small-boat coastal fishery but are far less common in the trawl catches. They are also a preferred fresh fish variety. There are several species, but the only one classified in the official statistics is the snowy grouper (*Epinephelus niveatus*), though it only comprises 10-15% of the total catch of groupers. The catches and values for the last decade are shown in Table 21.

DEMERSAL RESOURCES–INVERTEBRATES

Shrimps

Shrimps are the most valuable living marine resource in Venezuela and the most important element in the trawl catches. Preliminary evaluations have been made by Cadima *et al* (1972), Novoa and Cadima (1972) and Racca and Griffiths (1972). The total annual catches are given in Table 22.

In western Venezuela, the white shrimp (*P. schmitti*) apparently forms one stock only, with the juveniles in Lake Maracaibo and the adults in the Gulf of

Table 22. Total annual landings and values in Bolivars of shrimps in Venezuela (1961-1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)
1961	2.49	3.94
1962	3.80	6.08
1963	3.90	6.21
1964	4.33	7.84
1965	7.98	14.25
1966	3.40	12.77
1967	5.06	20.42
1968	4.60	17.89
1969	5.37	25.24
1970	8.67	44.72
1971	9.37	48.08

Table 23. Total annual landings and values in Bolivars of ark shell in Venezuela (1961-1971)

Year	Catch (tons x 10^3)	Value (B^s x 10^6)
1961	2.09	0.16
1962	2.12	0.17
1963	0.69	0.05
1964	2.30	0.18
1965	3.96	0.26
1966	4.29	0.32
1967	2.30	0.16
1968	3.88	0.30
1969	4.51	0.34
1970	5.37	0.38
1971	4.13	0.34

Venezuela. The amount of fishing and the total catch have both increased during the period 1965-1971. The catch per unit effort has decreased from about 420 to 160 kg per day over the same period. The relationship between total effort and total catch shows that the current level of effort (in terms of days' absence from port of the Maracaibo fleet) is probably still slightly below that required to obtain the maximum sustainable yield. Any increase in effort, however, would cause only minor increases, or perhaps even a decrease, in the total catch, and the catch per boat would decrease further. The considerable variation in catch (in the years 1965, 1970 and 1971 in this case) are thought to be due to strong annual variations in recruitment, but other possible causes need to be examined.

The beach seine fishery in Lake Maracaibo, which exploits mainly juvenile (5-16 cm total length) white shrimp, has reached the phase of decelerating growth. The catches from the Lake constitute about 15% of the total shrimp catches of western Venezuela. The relation between the Lake stock and the Gulf stock of white shrimp has not yet been elucidated. Although recruitment is continuous, both stocks receive two main recruitments per year, one from February to June and the other from August to October, though with appreciable inter-annual variation and some phase differences between the Lake recruitments and the Gulf recruitments, which is not unexpected in a migratory species such as white shrimp.

The grooved shrimp stocks (*P. aztecus, P. duorarum* and *P. brasiliensis*) are largely confined to the Gulf of Venezuela and are exploited mainly by the Punto Fijo fleet. The catch rates of the grooved shrimp have also declined, from about 170 to 130 kg per days' absence for the Punto Fijo fleet, during the period 1962-1971. The fishery seems to be approaching the maximum sustainable yield, and a further increase in the number of vessels would cause only a minor increase in, or might even decrease, the total catch. Again, there are wide variations in the years 1965, 1970 and 1971. The grooved shrimp fishery, though in a phase of decelerating growth, has only one rather prolonged, ill-defined recruitment maximum.

In eastern Venezuela, the fishery for white and grooved shrimps is in the developing phase. The increase in exploitation from 1967 to 1971 has produced higher catches per boat-month (from about 1,800 to nearly 3,000 kg per boat-month) as well as higher total catches (from about 81 tons to about 1,200 tons in 1971). The level of exploitation is certainly below that required to obtain the maximum sustainable yield, and an increase in the present level of fishing effort will most probably increase the total catches, though it is not possible to determine the magnitude of this expansion. At the moment, 60 vessels are fishing in the area.

The catch rates show two annual maxima, one from March to May, the other from September to November.

White shrimp predominate in the catches of the small-trawler fishery of the Gulf of Paria (Ewald, Diaz and Cadima, 1971), occupying more than 50% during most months of the year except August through November. The total annual landings of this small fishery were about 184 tons in 1969 and 149 tons in 1970.

The Gulf of Paria and the Orinoco delta provide special conditions that have determined an uncertain development for this fishery so far. In view of the

considerable shallow inshore areas where shrimp are thought to be abundant, rather specialized fishing boats, gears and methods may be required to take full advantage of the resource.

The sea-bob (*Xiphopenaeus kroyeri*) appears in great quantities, together with white shrimp, in the trawl catches in western and eastern Venezuela, but it is discarded at sea. The main reason for this seems to be its lack of commercial value in Venezuela, though in some Central American, Brazilian and Guyanian fisheries the sea-bob is an important species that is exported to the U.S. The Pacific coast fisheries of Colombia are now landing and processing this species for export.

Scattered information indicates that the sea-bob is very abundant in the catches, and preliminary estimates give a proportion of 5 or more tons of sea-bob per ton of white shrimp. It is probable that most of the sea-bob at present discarded at sea does not survive. If so, the fishing could be affecting the stocks, but the almost complete lack of information on the catches makes it impossible to estimate this influence as well as the potential yields of this resource.

Small amounts of freshwater shrimps of the genus *Macrobrachium* are taken in the Lake Maracaibo area and elsewhere.

Lobster

A preliminary evaluation (Cobo de Barany, Ewald and Cadima, 1972) of the lobster fishery (*Panulirus argus*) of Los Roques shows that total catches have decreased by 25% from 140 tons in the 1962-1963 fishing season to about 100 tons in the 1969-1970 season. Over the same period, the catch per trap has decreased from 17 to 9 kg.

The level of fishing effort that will produce the maximum sustainable yield seems to be about 50-60% of the present total effort of 13,300 traps.

Crabs

The trap fishery for crabs (*Callinectes sapidus* and *C. bocourti*) in the Lake Maracaibo area started in 1969 and is increasing rapidly (Griffiths, Cadima and Rincon, 1972). *Callinectes sapidus* is the predominant species.

The two principal fishing areas are the southwest and the southeast coasts of the Straits of Maracaibo. Some crab fishing is also done in the southern part of Tablazo Bay.

The fishing effort, catch and catch per unit effort have increased steadily since 1969. The season of highest catches per unit of effort (kg per trap-day) is the second half of the year. The present average catch rate is about 2 kg per trap-day. The catch in 1970 was 276 metric tons and in 1971 463 metric tons. In the first quarter of 1972, the catch reached 408 tons.

The catches are composed predominately of males (90%) because the distribution of the two sexes is different; the females prefer salt water except when they enter brackish or fresh water to mate with the male crabs.

Recruitment of young crabs to the fishery apparently occurs mainly in July and November. These months correspond to periods of greater abundance of egg-bearing females, July being predominant in this respect. It may be inferred that recruits to the fishery are at least 1 year old.

The possibilities for the expansion of this fishery are considerable. Further biological studies and stock assessment work are required however.

Mussel

This mussel (*Perna perna*) is abundant in Venezuelan waters; it is similar to the common mussel, *Mytilus edulis*. The fishery is based on natural beds and on culture rafts (Salaya *et al*, ms). The mussel beds, numbering about 30, are found along the north coast of Sucre. Limited accessibility has rendered exploitation of most of these beds difficult. Nevertheless the more accessible beds west of Carupano are so heavily fished, since efforts at cultivation started in the early 1960s, that the yield of seed mussels from these beds has been reduced to critical levels within the space of a few years.

Historically, the mussel beds have been exploited by manual removal of the mussels from the rocks. The mussels are found between the intertidal zone and 10-m depth. The catch is destined for fresh consumption and canning. At present two companies are engaged in mussel cultivation; one operates six rafts in La Chica, Gulf of Cariaco and the other operates two in El Guamache Bay, Margarita. There are a few other private and experimental rafts in operation. The rafts produce 20 to 40 tons of commercial grade mussels per raft per year (Salaya *et al*, ms).

Since 1960 the yield has been variable, ranging from 141 tons (including shell) to 312 tons in 1968. Production decreased in 1971 to 138 tons from the natural beds and 93 tons from the rafts.

This mussel grows approximately 10 cm during its first year, which is considerably more than the growth rates observed in Europe for *Mytilus edulis*, a similar species.

The period of most intense spawning is December-April. January and February are the months of maximum abundance of larvae, and February, March and April the months of maximum fixation of seed mussels.

The prospects for cultivation are favorable, given the high growth rate, the high biological productivity of eastern Venezuela coastal seas, the absence of environmental extremes and the large number of protected yet productive bays. Nevertheless, several technical and economical difficulties in the design and construction of the rafts have yet to be overcome before successful myticulture can be achieved.

Pepitona

Until 1957, the catch of this bivalve (*Arca zebra*) was low, not exceeding 600 tons (unshucked). Since 1957, the fishery has grown steadily and the annual catch (Table 23) is now about 4,500 tons (Salaya, 1971). Therefore, in terms of weight, this is the second most important invertebrate resource after shrimps. Venezuela is the number one producer of ark-shell in the world (FAO Fisheries Statistical Yearbook 1971). The fishery is by dredge and the most important beds are along the northeastern, eastern and southeastern coasts of the island of Margarita and the northeastern coast of the island of Cubagua. Although there are ark-shell beds in western Venezuela, they are not at present exploited. The catch rate may reach 1,500 kg per hour of dredging (i.e. not counting lowering

and raising time), although 1,000 kg is more usual. The yield of meat is about 20% of total weight. The catch is mostly canned for national consumption.

The catch-effort data are not adequate for determining the present status of the fishery, but annual catches, though variable, have been increasing. However, the catch is 1971 was only 4,150 tons, decreasing from a mixiumum value of 5,400 tons in 1970.

Pearl oyster and Mangrove oyster

The pearl oyster (*Pinctada imbricata*) resource reached a stage of over-exploitation years ago, possibly as early as 1946, and only three banks are now producing commercial quantities of pearls of inferior quality (Salaya and Salazar, 1972).

The catch in 1969 was only 149 tons (compared with 6,816 in 1953) producing only 495 carats of pearls. Some efforts at oyster culture have been made together with mussel culture, and there appear to be prospects for this.

Fishing by diving disappeared over a decade ago, and only drags are used now. The fishery is now completely overshadowed by that for pepitona which has occupied areas once dominated by the oyster.

Oyster meat has been canned in moderate quantities since 1941, and the economic yield of this product has exceeded that of the pearls.

The mangrove oyster (*Crassostrea rhizophorae*) is exploited locally, mainly for fresh consumption, but this is hardly more than a subsistence fishery.

Scallop

Pecten papyraceus recently became prominent in the trawl catches of eastern Venezuela, off the east coast of Isla Margarita, and the production has been mostly exported to the U.S. as frozen scallop mussel. There is a limited local consumption of fresh scallops, which are sold unshucked.

The catch in the first half of 1972 amounted to about 300 metric tons; the price paid to the fisherman was Bs 1.00/kg.

Three trawlers are fishing specifically for this species. As an incipient fishery, the prospects for expansion seem favorable. Fishery statistics are now being obtained to quantify this development.

RELATED WORK

FISHERIES OCEANOGRAPHY

Some studies of the marine environment were made to determine, as far as possible, the main features that could be related to fish distribution and abundance. These studies were made mainly in conjunction with egg and larval surveys and acoustical surveys. Some data collected several years ago were also analyzed. These data consisted of observations of sea temperature, salinity and dissolved oxygen content, zooplankton and phytoplankton standing crops, and wind conditions in the Gulf of Cariaco from 1959 to 1961 (Simpson and Griffiths, 1971; Griffiths and Simpson, ms).

Relatively well defined seasons were found to occur. Between January and April, northeasterly winds were predominant, causing upwelling and low sea-

surface temperatures, subsequently resulting in high standing crops of zooplankton and phytoplankton. Generally speaking, large sardine catches also occurred in this period. Later in the year, the northeasterly winds were largely replaced by weaker northwesterlies and maximum temperatures occurred in the late summer and autumn months (August to October). The period of peak northwesterly winds (August-October) produced a secondary maximum in the phytoplankton standing crop in September.

These seasonal extremes in the first and third quarters of the year play an important role in the biological cycles of the various species and the fisheries covered in this report.

The seasonal nature of the influence of the Orinoco, and possibly the Amazon river, on the coastal waters of northeastern Venezuela has been confirmed by recent data. The same studies show the occurrence of upwelling in the Gulf of Cariaco, the waters along the north coasts of the Peninsulas of Araya and Paria and waters off the west coast of Araya and the south and east coasts of Margarita. All these areas are centers of fishery activity.

The relationship between long-term temperature records and sardine catches was described earlier. In the Maracaibo area, salinity and temperature data were collected regularly for about 2 years (1970 and 1971) and are now being analyzed.

PELAGIC EXPLORATORY FISHING

In spite of the lack of a fisheries research vessel, some pelagic exploratory fishing has been carried out with a small drum seiner. Besides sardine, the drum-seiner frequently caught small amounts of half-beak, flying fish, sennet, rough scad, porgy, pompano, bumper, tenpounder, anchoveta and camiguana. Except for rough scad, sennet, anchoveta and camiguana, these species are not normally caught by the coastal fishermen. As mentioned earlier, the first experimental purse-seining for tuna in Venezuelan coastal waters was carried out by a Spanish purse-seiner, accompanied by two chummer boats, under a special license issued by the National Fisheries Office from May 10 to July 9, 1972, off La Blanquilla and La Tortuga islands (Mihara, Medina and Griffiths, 1972).

DEMERSAL EXPLORATORY FISHING

The trawler *Carmelina* was chartered for fishing the inner Gulf of Venezuela and the Lake of Maracaibo. Six exploratory trips were made (Ewald *et al*, 1971). One hundred and twelve species of fish and eight species of shrimp were caught.

In Lake Maracaibo, the most commonly caught commercial fish were mojarra (*Eugerres plumieri*), Lake curvina (*Cynoscion maracaiboensis*) and catfish (*Arius* sp.).

Shrimp catches as high as 21 kg per hour were obtained in the deeper areas. These are not exploited by the local beach-seine fishery. The catches consisted of a large percentage of juvenile brown shrimp (*P. aztecus*), whereas the beach seine fishery in the Lake exploits juvenile white shrimp (*P. schmitti*) stocks; the brown shrimp were not thought to be present in the Lake prior to this exploratory fishing. Large commercial quantities of the blue crab (*C. sapidus*) and the clam (*Polimesada*) were taken.

Large catches of pepitona (*Arca zebra*) were obtained with a small try net in 20-fathom depths just west of Punto Fijo in the Gulf of Venezuela.

Non-commercial species usually predominated in the catches in both zones, however.

It was not possible to carry out deep water trawling as no appropriate vessel was available. However, two Spanish trawlers were given a special license to conduct exploratory trawling along the Venezuelan coast between Puerto Cabello and Isla Margarita. They fished at a depth of 200-400 fathoms, as well as at shallower depths, between December 1971 and April 1972. In the central region (Puerto Cabello to Isla Tortuga), the predominant species in the catch were hake (*Merluccius albidus*) and red shrimp (probably *Plesiopenaeus edwardsianus*) at the depths trawled. These were followed by a type of Norwegian lobster (*Nephrops*) and spiny crab (*Maia*).

The catches from north of Isla Margarita were those usual for that area as mentioned earlier: white shrimp, snapper, grouper, panchito (*Pristipomoides macrophthalmus*), cunaro (*Rhomboplites aurorubens*), a dogfish (*Mustelus higmani*) and chub mackerel (*Scomber japonicus*).

Some exploratory fishing was done in the inshore area of the Gulf of Paria. Three main areas of relatively good fishing have been discovered: one between Guiria and Irapa, another north of Cotorra Island in the southern part of the Gulf and a third in the southern entrance to the Gulf (Serpent's Mouth).

HYDROACOUSTIC SURVEYS

Nineteen surveys were made in 1971 (Ødegaard, Abad Carpio and Malave, 1971a; 1971b). The main vessel used for this work was a converted Florida shrimp trawler. It is equipped with a Simrad EH2E sounder and a Simrad Skipper sounder. The drum-seiner mentioned earlier was also used occasionally. It carried an Ekolite RS2 sounder and a Wesmar SS300.

The area surveyed comprises the Gulf of Cariaco, the Santa Fe coast, the north and west coasts of the peninsula of Araya, the coastal waters of the Islands of Margarita, Cubagua and Coche and the north coast of the Peninsula of Paria over a period of 8 months, which is too short a time to draw any firm conclusions on fish stock abundance and distribution. The areas of highest apparent abundance were found to be the central part of the Gulf of Cariaco, the southeast coast of the Island of Margarita and the area between the island and the Peninsula of Araya.

EXPERIMENTAL FISHING

Several new and modified gears have been built and tested. Many of these are described by Mihara *et al* (1971a). The gears are: multiple-hook handline, one piece longline, monofilament gillnets, three-beam lift net, trammel nets, beam trawl, special beach seines (Mihara *et al*, 1971b), fish and octopus traps and various other types of small gear.

DISCUSSION AND CONCLUSIONS

Considerable progress was made during the last 5 years in investigations on the marine fishery resources of Venezuela. Although stock assessments based on

the analysis of the catch and effort data are preliminary, they provide the best knowledge available on the status of the resources and show which fisheries can be safely expanded (mostly the inshore, small-boat fisheries), those that can be cautiously expanded (e.g. shrimp, especially in eastern Venezuela) and those that offer no prospects of a higher yield with increasing fishing effort (e.g. yellowfin tuna, certain demersal species and lobster). With improved data over a longer term, more precise evaluations would be possible, but these are unlikely to alter substantially the preliminary estimates.

Certain resources are thought to exist but firm evidence is not yet available. These are the shrimp and related demersal resources of the Gulf of Paria and the demersal resources of the Gulf of Paria and the Orinoco delta area.

Several artesanal fishing gears have been developed. These could appreciably increase the productivity of the inshore fisheries, but a rapid increase in production is subject to market development.

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