A FIRST APPRAISAL OF THE LANDING AND MECHANISM OF THE SANTOS FISHERY

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CONTENTS

I — INTRODUCTION

In July 1958, a new programme of fisheries work was started in Santos, State of São Paulo, Brazil. As part of this programme a detailed collection of landing statistics was initiated. In this paper, the data collected during the first twelve months of the

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programme, July 1958 to June 1959, inclusive, are presented together with some preliminary observations.

As the whole programme was designed to give information on the size of the fishable stock in the area exploited off the southern coast of Brazil, such data as are presented in this paper will be published annually as basic data necessary for answering such problems as the following:

1) Areas of production of each species.
2) Areas of relative fishable density. (Landing per hour fishing).
3) Seasonal fluctuations in relative density within and between areas.
4) Relative efficiency of each type of fishing gear.
5) Annual variations in relative density.

As results are available for only one year at the moment, there is insufficient data to answer some of the above problems and others can only be answered in the most general terms. In addition, as this is the first year in which such a collection of data has been attempted, the data are not as accurate or as detailed as the authors would wish, but in the future it is hoped to improve these data.

The authors wish to thank Dr. Braga, of the "Serviço do Pescado, Departamento de Caça e Pesca, D.P.A., São Paulo", for making available to them the raw data and the preliminary extractions on which this paper is based. For a full description of the methods used in collecting and compiling the data, Dr. Braga's paper (in preparation) should be consulted.

A large number of named species are landed on the fish markets at Santos, but the major part of the landings are made up of less than ten species. A list of the common names together with the scientific name of each of these species is given in the appendix.

II — DATA

The data which were made available to the authors by Dr. Braga included the following:

1) Name of boat.
2) Type of fishing gear.
3) Size of boat (overall length).
4) Total quantity of fish landed by each boat.
5) Quantity of each species landed and quantity of small fish of various species landed and sold under the name of Mistura.

6) Position of fishing ground as reported by the captain of the boat.
7) Dates of leaving and returning to port.
8) Number of days actually spent fishing.
9) Number of hauls and total time the net was in the water.

These data are referred to in greater detail in Dr. Braga's paper.

In practice, it was not possible to collect information from all the boats landing in Santos and also for some of the boats the data are incomplete or had to be discarded for some reason. Therefore, although it should be remembered that the total weight of fish landed, as shown in the following tables, is an underestimate of the actual total landed in the port, the data represent the greater proportion of the total landing in Santos. Because of the incomplete information given by some of the boats, landings made by a certain boat may be included in one of the extractions given in this paper, but not in another extraction and therefore the totals as shown in one table may not always correspond to that shown in another.

An additional error arises when discussing the distribution of the fishing grounds as many of the boats are without navigational aids and therefore have difficulty in fixing their position accurately. However, this error has been reduced to a certain extent by the use of large statistical rectangles: one degree by one degree. It might have been preferable to use the size of rectangle suggested by Ripley (1956) of ten minutes by ten minutes, but, considering the errors in fixing the fishing grounds and also the additional ease of extraction, we thought that we were justified in using the larger rectangles to obtain the first general overall picture of the fishery presented in this paper. Any positions which were obviously false have been neglected.

In this paper we have restricted the discussion to fish actually landed at the fish markets in Santos. We are aware that this does not represent the total yield of fish from the sea in the area fished by the Santos boats.

In the more offshore waters fished by the Santos boats there is fishing by boats landing at other ports within and outside the State of São Paulo, and fish are also landed on the beaches. These landings are not considered in this paper.

By restricting this paper to the landings actually made at Santos fish markets we have to consider only four types of fishing gear: the Otter Trawl (Trawl de Portas), the Pareja (Parelha), a type of purse seine (the Traineira) and line fishing (Espinhel). The gears are described in detail in Anon. 1944, and

TABLE I — Weight of each species landed to nearest 1,000

Species	1958					
	July	August	September	October	November	December
Albacore Sps.	119.1	19.4	162.9	32.1	135.4	157.2
Sardine	202.0	221.6	26.1	299.6	37.4	88.8
Corvina	72.2	118.4	123.8	116.0	111.0	140.5
Pescada Foguete ..	352.4	231.1	162.2	184.3	164.4	234.9
Goete	40.0	34.4	26.7	71.7	113.3	211.1
Tainha	25.3	2.0	—	—	—	—
Cação	37.2	30.5	31.6	46.7	42.6	54.7
Mistura	158.2	160.3	137.9	175.0	123.2	159.0
Total	1,006.4	817.7	671.2	925.4	727.3	1,046.2
Other species	755.0	99.9	13.7	341.9	112.7	147.2
Total — fish ...	1,761.4	917.6	684.9	1,267.3	840.0	1,193.4
Shrimps:						
Camarão Legitimo .	—	—	0.9	4.5	1.8	1.0
Camarão 7 Barbas .	62.9	43.0	42.3	36.1	55.1	42.8
Camarão Rosa	109.5	70.4	59.0	70.8	60.4	65.5
Shrimp total — weight	172.4	113.4	102.2	111.4	117.3	109.3
Total shrimp-fish.	1,933.8	1,031.0	787.1	1,378.7	957.3	1,302.7

kilogrammes by months: July 1958-June 1959 (Santos)

1959						Annual total	% weight by species	Av. price per kilo	% value by species
January	February	March	April	May	June				
75.3	16.9	71.8	191.7	176.4	15.6	1,173.8	8.6%	Cr$ 50,00	13.3%
694.5	290.1	249.4	340.3	127.3	123.7	2,700.8	19.7%	Cr$ 20,00	12.3%
159.5	117.9	122.9	81.3	103.9	143.9	1,411.3	10.3%	Cr$ 40,00	12.8%
103.4	174.2	212.0	201.6	164.4	200.4	2,385.3	17.4%	Cr$ 50,00	27.1%
232.9	127.9	141.3	155.9	82.7	36.6	1,274.5	9.3%	Cr$ 30,00	8.7%
—	—	—	—	25.9	0.3	53.5	—	Cr$ 60,00	0.7%
37.8	28.0	33.2	51.4	32.3	51.2	477.2	3.5%	Cr$ 30,00	3.2%
148.7	139.7	151.6	200.6	149.7	211.3	1,915.2	14.0%	Cr$ 20,00	8.7%
1,452.1	894.7	982.2	1,222.8	862.6	783.0	11,391.6	83.1%	—	86.8%
159.5	115.8	21.0	141.8	284.3	128.1	2,320.9	16.9%	Cr$ 25,00	13.2%
1,611.6	1,010.5	1,003.2	1,364.6	1,146.9	911.1	13,712.5	91.7%	—	64.2%
0.7	1.1	4.7	11.9	11.7	12.7	51.0	4.1%	Cr$250,00	5.2%
42.9	9.4	32.3	44.6	57.0	67.1	535.5	43.2%	Cr$ 70,00	15.2%
48.3	43.8	47.6	41.3	24.4	11.0	652.0	52.7%	Cr$300,00	79.6%
91.9	54.3	84.6	97.8	93.1	90.8	1,238.5	8.3%	—	35.8%
1,703.5	1,064.8	1,087.8	1,462.4	1,240.0	1,001.9	14,951.0	—	—	—

referred to by Braga (in preparation). In Braga's paper, a description of the grouping of the boats into categories according to size is also given. We have adopted this system of classification in which the large boats are those of over 20 metres in length, the medium boats are from 10 metres to 20 metres in length, and the small boats are bellow 10 metres in length.

III — TOTAL QUANTITY AND RELATIVE IMPORTANCE OF EACH SPECIES LANDED IN SANTOS

In Table I, a summary of the total weight of marine fish and shrimp landed on the fish markets in Santos during the twelve months from July 1958 to June 1959 inclusive, is given. The figure of approximately 15,000 tons of marine fish and shrimp landed during the year is an underestimate the reason for which has already been given. The actual figure would not be more than 10% higher than this.

In Table I, the landings are broken down in order to show the relative importance both by weight and value of each species.

The total weight of shrimp (Camarão) landed is approximately 1,200 tons and is equivalent to 8.3% of the total weight (shrimp plus fish) landed. Two species of shrimp, Camarão Sete Barbas and Camarão Rosa, contribute together, in roughly equal proportions, 96% of the total landing of shrimp.

83% by weight of the fish landed is made up of seven species plus Mistura (a mixture of species which, because of their small size are sold together under the name of Mistura). The remaining 17% of the fish landed is made up of about 44 named species and grouped under the heading "other species" in Table I.

In order of importance by weight, the seven species are: Sardine 20%, Pescada Foguete 17%, Corvina 10%, Albacore (various species) 9%, Goete 9%, Cação 3.5% and Tainha. Mistura contributes 14% by weight of the total fish landings. This distribution is for the twelve months considered from July 1958 to June 1959 and examination of previous years will show that the distribution of species may differ considerably. This is discussed later in the paper.

In the Table I, we have also tried to estimate the relative value by species of the landings made in Santos. The price per kilogramme used in this estimate was the price at which fish were sold to the consumer by the Escola de Pesca in Santos during the period under consideration. These prices are some 60% higher than the price received by the fishermen on the fish market. Although the percentage by weight of shrimp in the landings is only 8.3%, shrimps represent 36% of the total value of marine

species landed in Santos and one species of shrimp, Camarão Rosa represents 80% of the total value of shrimp landed. The total value of fish landed is made up in the following way (expressed as a percentage of fish landings) :

Pescada Foguete, 27%

Albacore, etc., 13%

Corvina and Sardine, each, 12%

Goete and Mistura, each, 9%

Cação and Tainha, 1%

In this paper only the above mentioned species are considered in detail.

The data compiled by Ripley (1956) for landings made in Santos during the years 1951, 1952, 1953 are completely diffferent from those data collected in the period under consideration in this paper. Apart from the total weight landed being smaller, during Ripley's years, the composition of the landing with regard to the species is different. Then, a much higher weight of Sardine was landed, and Sardine represented a much higher proportion of the total weight. The weight of Corvina, Pescada, Goete, Albacore, Cação, and Shrimp was also considerably less than is landed at present. Mistura is the exception. Except for Mistura, the above mentioned species represented a much smaller percentage of the total weight. The landings were made up of a large number of species which in our analysis of 1958-59 contribute little to the total and are grouped under "other species".

The fishery has thus changed from one in which a large number of species contributed equally to the landings to one in which the fishery is based on a few species, the total weight of each being greater.

This is undoubtedly due to the fishery developing in the more off shore and more distant waters.

IV — DISTRIBUTION OF LANDING BY AREA

In Table II *A*, the weight of each species landed from each rectangle of 60 miles by 60 miles is shown. Each rectangle is identified by a number. This number is derived in the following manner: the latitude to the north of the rectangle and the longitude to the west of the rectangle, e.g.: rectangle 43-23 is enclosed

TABLE II-A — Total weight landed per year in tons per rectangle

	FISH						SHRIMP		
RECTANGLES	P.FOGUETE	CORVINA	GOETE	MISTURA	SARDINHA	TAINHA	7 BARBAS	ROSA	LEGITIMO
43-23	–	–	–	0.8	29.1	–	–	0.6	–
44-23	9.5	10.0	13.3	23.4	491.6	0.3	0.6	56.4	0
45-23	57.9	31.9	43.6	81.0	1,816.1	0.3	1.3	14.6	1.3
45-24	153.7	126.3	167.3	344.8	319.5	20.1	91.5	206.4	5.3
46-23	18.3	14.6	17.7	40.2	0.4	–	28.4	–	0.6
46-24	330.0	166.5	589.0	720.9	44.1	4.3	410.0	164.8	14.8
47-24	72.7	46.8	22.1	64.8	–	3.0	1.3	1.0	5.1
47-25	503.4	142.0	272.2	422.0	–	–	1.9	13.8	21.1
47-28	0.1	0.5	–	3.0	–	–	–	2.0	–
48-25	5.6	3.1	0.9	5.2	–	11.5	0.5	2.9	0
48-26	53.2	70.8	18.8	35.6	–	14.0	–	13.0	1.2
48-27	87.4	95.1	33.9	137.9	–	–	–	169.0	0.8
48-28	9.4	47.3	2.5	8.7	–	–	–	3.6	0.8
48-29	10.0	7.5	2.5	0.5	–	–	–	–	–
49-28	49.7	46.6	2.5	1.0	–	–	–	0.3	–
49-29	479.3	212.7	48.4	18.2	–	–	–	2.3	–
49-30	86.7	54.0	13.8	0.6	–	–	–	0.6	–
50-30	371.4	218.8	21.7	2.3	–	–	–	0.3	–
50-31	26.0	14.1	2.1	0.1	–	–	–	–	–
51-31	28.7	28.7	0.3	–	–	–	–	–	–
51-32	18.8	15.5	0.9	3.2	–	–	–	0.4	–
52-32	13.5	58.5	1.0	1.0	–	–	–	–	–
TOTAL	2.385.3	1.411.3	1.274.5	1.915.2	2.700.8	53.5	535.5	652.0	51.0

by longitudes 43° west and 44° west, and latitude 23° south and 24° south. It should be remembered that the fishery is not necessarily distributed evenly throughout the rectangle, and is usually concentrated nearer to the coastal side.

The landings of Sardines in Santos are made from three or four rectangles (see Fig. 1 *d*) to the north east of Santos. The landings of Tainha also show a restricted distribution (Fig. 1 *h*), but this is somewhat misleading as we have considered only the Tainha landed on the fish market in Santos, and therefore that which has been caught by purse seine. We have not included Tainha caught in traps or by other fishing gears along the beaches and mouths of the rivers.

Corvina, Pescada Foguete, and Goete (Fig. 1 *a*, *c*, *b*) are landed from rectangles distributed over a wide area. Generally two centres of high production can be seen: one off Santos, and one off the coast of Santa Catarina at about 30° south.

Mistura (Fig. 1 *i*), shows a similar wide distribution of landings, but the highest concentration of landings is in the rectangles close to Santos. To some extent this may be an artifact caused by the boats fishing farther to the south rejecting Mistura because of the small commercial value and the length of the voyage.

In Table II *B*, and Fig. 1 *j*, the landing per rectangle made at Santos of Albacore during twelve months is shown. The Albacore landed at Santos is caught over a much wider area than any of the other species. The Santos boats fish as far north as the Equator, and as far as 30° south. From Fig. 1 *j* it appears that the total annual production per rectangle is of roughly the same order to the south and to the north without any clearly defined centre of production.

Landings of over 100 tons per rectangle are made from the south as well as from the north but there are more rectangles in the north landing over 25 tons per annum than in the south. This fishery, which is conducted by long line, is farther off shore than the other fisheries previously discussed. Under the heading of Albacore is included more than one species (see Appendix).

The fishery for Cação, Table II *B* and Fig. 1 *k*, is also distributed over a wide area but not to the extent of the Albacore and Tuna fishery. There is a high center of annual landing from an area to the south of the State of São Paulo and the area fished extends along the coast to the south of São Paulo until the State of Rio Grande do Sul. The fishery is generally a more inshore fishery than that for Albacore.

TABLE II-B — Total weight landed per rectangle per year (in tons)

Rectangle	Albacore	Sps.	Cação	Rectangle	Albacore	Sps.	Cação
18 — 01	165.8	4.2		38 — 04	6.5	—	
23 — 03	172.5	2.7		39 — 01	6.5	—	
24 — 01	10.7	—		39 — 02	6.5	—	
24 — 05	5.9	—		39 — 24	1.4	0.6	
25 — 00	11.6	—		40 — 23	1.2	1.3	
25 — 01	5.2	—		40 — 24	25.7	25.4	
26 — 05	3.7	—		41 — 24	4.8	10.1	
27 — 05	2.8	—		41 — 27	1.3	—	
27 — 09	19.9	—		42 — 25	2.6	1.7	
28 — 03	21.7	7.6		42 — 27	6.1	5.9	
28 — 04	5.5	—		43 — 27	5.4	—	
28 — 08	6.7	—		43 — 28	1.0	—	
28 — 09	58.9	7.6		44 — 23	—	4.6	
29 — 02	6.3	—		44 — 24	4.1	0.1	
29 — 03	28.0	—		44 — 25	116.5	9.2	
29 — 08	6.6	1.4		44 — 26	58.7	3.4	
29 — 09	46.5	—		44 — 28	2.3	—	
30 — 02	23.8	—		45 — 23	—	12.1	
30 — 07	2.8	—		45 — 24	—	59.7	
30 — 08	0.9	—		45 — 26	21.7	0.4	
30 — 09	2.2	—		45 — 27	6.5	—	
30 — 12	1.1	—		45 — 28	1.7	—	
31 — 07	3.9	—		46 — 23	—	4.5	
31 — 08	2.4	—		46 — 24	—	108.4	
31 — 10	1.8	—		46 — 28	2.4	—	
31 — 11	1.6	—		46 — 30	1.5	—	
32 — 10	4.3	—		47 — 24	—	9.5	
32 — 18	59.2	4.1		47 — 25	—	52.5	
33 — 10	0.9	—		47 — 29	2.5	—	
34 — 20	4.2	—		47 — 30	3.5	4.9	
35 — 03	0.1	—		48 — 25	—	2.0	
35 — 20	3.7	7.6		48 — 26	—	11.3	
35 — 21	9.1	3.8		48 — 27	—	37.0	
36 — 00	37.2	—		48 — 28	—	7.0	
36 — 03	3.5	—		49 — 28	—	8.9	
36 — 16	4.9	—		49 — 29	—	13.5	
36 — 21	—	15.9		49 — 30	—	3.1	
37 — 00	30.9	—		50 — 30	—	11.4	
37 — 02	33.0	—		50 — 31	—	6.1	
37 — 03	3.6	—		51 — 31	—	2.3	
37 — 04	31.9	2.4		51 — 32	—	1.5	
38 — 02	24.9	—		52 — 32	—	1.5	
38 — 03	19.7	—					

V — DISTRIBUTION OF FISHING TIME WITHIN THE FISHED AREA BY EACH TYPE OF BOAT AND GEAR

Table IV *A-G* gives the number of hours fishing of the Santos boats during the twelve months in each rectangle. We define the number of hours fishing as the number of hours the net was actually in the water and we obtained this figure by multiplying the number of hauls made during the voyage of a boat (information supplied by the master of the boat) by the average length of the hauls during that trip. The total number of fishing hours referred to in this paper does not include steaming time, searching time, or any other time spent by the boat without the net in the water. In the case of the Albacore and Cação long line fishing, we have the total fishing time but no indication of the length of the line or the number of hooks and, as these two vary considerably, we are unable to arrive at a reliable index of effort.

The number of hours fishing during the twelve months period has been calculated separately for the medium and large trawlers, the medium and large Parejas, the small trawlers, and the small Parejas, as shown in Table IV and Fig. 2 for each rectangle in which fishing took place.

It can be seen that the small Parejas fish in the rectangles near to the coast and within a short distance of Santos and have approximately the same distribution as the small trawlers, but a larger number of fishing hours. The large and medium Parejas fish farther off shore and to the south of Santos making trips of some length. The medium and large trawlers and the large and medium Parejas generally show a similar area distribution, but fishing by the larger trawlers is concentrated closer to Santos although more off shore than the small trawlers and Parejas.

The fishing time of the traineiras has been given in an earlier paper on Sardines (Richardson *et al.*, 1959).

VI — DISTRIBUTION OF WEIGHT LANDED ACCORDING TO TYPE OF FISHING GEAR

In Table III, the weight of each of the more important species landed in Santos during the twelve month period under consideration is shown according to the type of fishing gear used and the size of the boat used to give that landing. The landing per hour fishing is also shown in the Table. The relative importance of each gear in terms of weight of each species landed, irrespective of the area fished, can be assessed from these data.

TABLE III — Annual weight landed (July 1958-June 1959) by especies,

Gear	Albacore Sps.		Corvina		Pescada Foguete		Sardine		Tainha	
	Total	Av. landing p/hour fishing	Total	Av. landing p/hour fishing	Total	Av. landing p/hour fishing	Total	Av. landing p/hour fishing	Total	Av. landing p/hour fishing
Otter trawl Medium and large	—	—	297,645	3.9	228,504	3.0	—	—	—	—
Small otter trawl (Baleeira)	—	—	3,235	0.3	1,807	0.2	—	—	—	—
Pareja (Trawl de pare-lha) Medium and large	—	—	961,297	19.0	1,895,213	37.5	—	—	—	—
Pareja (Trawl de pare-lha) Small	—	—	142,067	4.2	259,749	7.7	—	—	—	—
Purse seine (Traineira)	—	—	—	—	—	—	2,700,760	1,718.0	53,500	34.0
Long line (Linha-espinhel)	1,173,799	485.8	6,807	1.0	—	—	—	—	—	—

and landing per hour fishing, for each gear (kilogrammes) (Santos)

Mistura		Cação		Goete		Shrimps					
						Camarão Rosa		Camarão Sete Barbas		Camarão Legitimo	
Total	Av. landing p/hour fishing	Total	Av. landing p/hour fishing	Total	Av. landing p/hour fishing	Total	Av. landing p/hour fishing	Total	Av. landing p/hour fishing	Total	Av. landing p/hour fishing
422,991	5.5	94,746	1.2	48,758	0.6	632,855	8.3	6,435	0.1	1,729	0
10,841	1.1	5,295	0.6	1,298	0.1	1,200	0.1	173,555	18.3	282	0
916,743	18.2	119,467	2.4	681,229	13.5	15,023	0.3	5,403	0.1	39,201	0.8
563,854	16.7	39,354	1.2	543,017	16.1	2,850	0.1	350,052	10.4	9,817	0.3
—	—	—	—	—	—	—	—	—	—	—	—
770	0.1	Jap. boat: 131,694 Braz. boat: 86,611	545.1 13.1	100	0	—	—	—	—	—	—

Shrimp is landed mainly by the trawlers; 816 tons out of the total of 1,238 tons. The Parejas land half of the weight landed by the trawlers. Within the category of trawlers, the medium and large trawlers landed 640 tons and the small trawlers, 176 tons. In the case of the Parejas, it is the small Parejas which land a larger quantity than the medium and large boats.

From Table III, the landing of each species can be examined from the point of view of the gear used to make that landing, and also comparisons can be made between gears for any species in terms of landing per hour fishing. Camarão Rosa is landed almost entirely by the large and medium trawlers: 632 tons out of a total landing of 652 tons. Landing per hour fishing by these medium and large trawlers is also considerably higher than for the same species landed by any other type of gear or size of boat, and from Fig. 1 *e* it will be seen that the distribution of the fishery for this species is confined to the rectangles close to Santos.

Camarão Sete Barbas is landed almost exclusively by the small trawlers and the small Parejas both of which have a very much greater landing per hour fishing than the large boats. The small trawlers land approximately 18 kilos per hour of fishing; the small Parejas have a lower landing of approximately 10 kilos per hour. In this respect, it should be remembered that the figures given in Table III are estimates of landing per fishing unit per hours of fishing and therefore, as the Pareja unit consists of two boats, the landing per hour of fishing must be divided by two if landing per hour *per boat* is required. In the above case, for instance, although the ratio of trawler landing per hour fishing compared with Pareja is given as 18/10, the ratio of landing per hour per boat would be 18/5 giving the smaller trawler a much higher production per fishing boat time than the Pareja. In practice, the small trawler is primarily landing Camarão Sete Barbas.

Camarão Legítimo is landed mainly by the Parejas. The quantity landed by medium and large Parejas being four times that of the small Parejas, but landing per hour fishing is in the order of only two to one.

For one species of shrimp it has been shown that one gear may land more weight than any other gear, but for another species the greatest weight is landed by a different gear. Whether this is due to differences in the efficiency of each type of gear or category of boat, or is due to differences in the areas fished or actual differences in stock density, cannot be seen from this Table and will be examined later. The weight of fish landed (consider-

ing only the more important species) is divided according to gear in the following manner: the Parejas land the largest weight, 6,122 tons followed by the traineiras landing 2,753 tons of pelagic fish, the long liners landing 1,406 tons and the trawlers landing 1,075 tons.

Sardine is taken exclusively by Seine (Traineira) and the Tainha landed from the open sea is also landed exclusively by Seine (Traineira).

The Corvina and Pescada Foguete landings are made chiefly by the large and medium Parejas. The small Parejas and the medium and large trawlers land a considerably smaller quantity of these species and in about equal amount. The landing per unit fishing time by the medium and large Parejas is very much higher than for any of the other categories. The landing per unit by the medium and large trawlers is the same as that of the small Pareja (two boats) for Covina, but is much lower for Pescada Foguete.

Goete is landed mainly by Parejas, the small boats landing almost as much as the medium and large boats and the landing per unit fishing time is higher for the small Parejas than for the medium and large boats.

About half the total landing of Mistura is made by the medium and large Parejas and the other half of the landing is divided equally between the small Parejas and the medium and large trawlers. The landing per hour fishing by all types of Parejas is considerably higher than the figure for the medium and large trawlers.

Most of the weight of Cação landed is made by long liners but both trawlers and Parejas of each size also land Cação. The landing per hour *per boat* is the same for the medium trawlers and the medium Parejas. The small trawlers and the small Parejas also land the same amount per hour of fishing per boat and this is exactly half of the landing per hour made by the larger boats. The landing per hour by the trawlers of Cação may not be a reliable figure because, included in the total, is the weight of fish caught by hand line while the boat is not trawling. The Japanese long line boats land a larger weight of Cação than the Brazilian boats and the landing per hour of fishing is considerably higher. However, this may be due to the different length of line and the number of hooks used by each nationality.

Albacore and Tune are caught exclusively by long line. The catch per hour is not reliable because the length of line and number of hooks is variable between boats and is unknown.

VII — DISTRIBUTION OF LANDING PER HOUR FISHING BY SPECIES, GEAR AND AREA, AS AN INDEX OF RELATIVE DENSITY AND EFFICIENCY

In Table IV *A-G*, the landing per hour fishing for each species and for each gear per rectangle is shown.

If we assume that the landing per hour of fishing gives an index of the density of the fishable stock as sampled by a particular gear, we have an index of the relative density of the fishable stock in each rectangle shown in Table IV and we can compare the relative density of any area with that found in another area.

We can also make comparisons of the relative fishing power or efficiency between gears by directly comparing the landing per unit fishing time of each gear. In order to do this, it must be assumed that the fishing time by each type of gear to be compared is distributed both spatially and with respect to time in a similar manner for each of the categories under comparison. In practice, this assumption may not be valid because the rectangles which have been taken in the present analysis are large. There is, therefore, a possibility of a different distribution of small and medium boats in a gived rectangle with the smaller boats concentrated towards the inshore part of the rectangle.

Certain further assumptions must be made until more detailed information is available. For instance, such comparisons between gears and areas as are suggested above are only valid if there is no change in the size and rigging of the fishing gear or in the mesh between one area and another or between one period of the year and another, or change in fish behaviour. According to the fishermen, there is no change in the fishing gear of a particular boat which remains the same irrespective of the area in which it is fished or whatever the season of the fishing. For lack of more detailed information, we have accepted this.

We have also assumed that the fish landed reflects the catch. This is certainly not a valid assumption as there is always a selection of the fish at sea on the ship which takes the form of small fish of all species either being discarded at sea or brought back to the fish market as Mistura. From data collected on commercial boats and on the fish market it appears that the weight of each species discussed in this paper which is landed as Mistura would not be more than 5% of the total weight of that species. The difference between catch and landing of Mistura may be greater than this. It is probably larger for those boats which fish farther from the port and do not wish to transport large quantities of relatively cheap fish to the market and the quantity landed is generally dependent on the catch and value of the other species.

We now consider the data presented in Table IV by species from two points of view: a) to see the distribution of landing per hour fishing according to area and b) to see the relative efficiency of each type of gear. In practice, we have found it more useful for certain comparisons to group the rectangles and extract a figure for landing per hour of fishing using only those rectangles in which the same gear was used.

CORVINA — From Table IV *A* and Fig. 3 *a*, it can be seen that for all rectangles north of rectangle 48-27 in which there was fishing, there is a low landing per hour fishing. South of latitude 28° south, the landing per unit fishing time is many times higher and we may assume that the density of Corvina in these rectangles is higher. In those rectangles with a high density of Corvina there is no fishing by the small Parejas and the small trawlers landing at Santos.

In Table IV we have grouped the rectangles into three quite arbitrary groups to give a northern, central and southern region within the fished area and for each region we have extracted two figures for landing per hour fishing. One figure represents the landing per hour of all rectangles fished in the region and the other figure gives the landing per hour fishing for those rectangles which are fished by each of the gears under comparison. (In practice these figures do not differ greatly.)

The landing per hour fishing by the medium and large Parejas for each region is: — Northern region, 9.5 kilos; Central region, 12.2 kilos, and Southern region 106.2 kilos. For the large and medium trawlers the figures are: Northern region, 1.0 kilo; Central region, 5.9 kilos, and Southern region 122.2 kilos.

These figures give some idea of the increase in fishable density towards the south.

Comparing the rectangles within each region which are fished by all types of gear, we find for the northern region that the landing per hour of fishing is:

Small Parejas	*Large and Medium Parejas*
4.1 kilos	9.3 kilos
Large and Medium Trawlers	*Small Trawlers*
1.0 kilos	0.3 kilos

In this area, the landing per hour by the medium and large Parejas is twice that of the small Parejas and about nine times that of the medium and large trawlers which land in turn about three times as much per hour as the small trawlers. It should

TABLE IV-A — Total weight landed (July 1958-June 1959) from each statistical

CORVINA

Rectangles		Pareja (small)	Weight Hour fishing	No. hours-fishing	Pareja Medium & Large	Weight Hour fishing
					NORTHERN REGION	
43 — 23		—	—	—	—	—
44 — 23		500	4.2	120	8,550	18.4
45 — 23		7,300	7.5	972	23,570	9.9
45 — 24		54,657	7.2	7,599	58,920	14.1
46 — 23		3,499	2.5	1,424	10,825	39.7
46 — 24		70,911	3.1	22,756	72,455	6.6
47 — 24		2,200	8.5	260	25,850	8.7
Landing/hour all rectangles		139,067	4.2	33,131	200,170	9.5
Landing/hour using common rectangles	1*	139,067	4.2	33,131	200,170	9.5
	2*	131,267	4.1	32,039	168,050	9.3
					CENTRAL REGION	
47 — 25		2,600	4.7	548	130,549	7.1
48 — 25		400	8.0	50	650	5.2
48 — 26		—	—	—	43,345	23.1
48 — 27		—	—	—	30,675	10.3
48 — 28		—	—	—	39,085	277.2
48 — 29		—	—	—	—	—
49 — 28		—	—	—	46,633	119.3
	3*	—	—	—	244,304	10.4
Landing/hour all rectangles		3,000	5.0	598	290,937	12.2
					SOUTHERN REGION	
49 — 29		—	—	—	193,790	93.5
49 — 30		—	—	—	54,022	89.0
50 — 30		—	—	—	199,554	132.2
50 — 31		—	—	—	14,062	97.0
51 — 31		—	—	—	7,450	128.4
51 — 32		—	—	—	1,312	37.5
52 — 32		—	—	—	—	—
Landing/hour all rectangles		—	—	—	470,190	106.2
Landing/hour using common rectangles	3*	—	—	—	402,106	109.4
All regions Total		142,067	4.2	33,729	961,297	19.5

1* Rectangles common to small, medium and large Parejas and medium and large trawlers.
2* Rectangles common to all gears.
3* Rectangles common to medium and large Parejas and medium and large trawlers.

rectangle with number of hours fishing and landing per hour (kilogrammes)

CORVINA						
No. hours-fishing	Otter trawl M. & L.	Weight Hour fishing	No. hours-fishing	Otter trawl (Baleeira) Small	Weight Hour fishing	No. hours-fishing
NORTHERN REGION						
—	0	0	33	—	—	—
464	891	0.3	3,165	—	—	—
2,361	1,000	0.5	2,022	—	—	—
3,831	10,230	0.5	21,399	445	0.3	1,317
273	0	0	192	175	0.6	302
11,019	19,649	0.9	20,917	115	0.014	7,736
2,979	16,250	19.7	823	2,500	20.8	120
20,927	48,020	1.0	48,551	3,235	0.3	9,475
20,927	48,020	1.0	48,518	—	—	—
18,102	46,129	1.0	43,331	3,235	0.3	9,475
CENTRAL REGION						
18,366	7,540	5.1	1,488	—	—	—
125	2,050	4.7	436	—	—	—
1,854	27,400	14.1	1,950	—	—	—
2,970	64,410	4.2	15,415	—	—	—
141	8,700	14.8	555	—	—	—
—	7,500	11.7	64	—	—	—
391	—	—	—	—	—	—
23,456	110,100	5.5	19,844	—	—	—
23,847	117,600	5.9	19,908	—	—	—
SOUTHERN REGION						
2,072	18,875	56.9	332	—	—	—
607	—	—	—	—	—	—
1,509	19,200	218.2	88	—	—	—
145	—	—	—	—	—	—
58	21,250	93.2	228	—	—	—
35	14,200	78.9	180	—	—	—
—	58,500	229.4	255	—	—	—
4,426	132,025	122.2	1,083	—		—
3,674	73,525	88.8	828	—		—
49,200	297,645	4.3	69,542	3,235	0.3	9,475

TABLE IV-B — Total weight landed (July 1958-June 1959) from each statistical

PESCADA FOGUETE

Rectangles	Pareja (Small)	Weight Hour fishing	No. hours-fishing	Pareja Medium & Large	Weight Hour fishing
				NORTHERN REGION	
43 — 23	—	—	—	—	—
44 — 23	250	2.1	120	7,400	15.9
45 — 23	14,150	14.6	972	38,450	16.3
45 — 24	65,277	8.6	7,599	48,259	12.5
46 — 23	12,730	8.9	1,424	5,500	20.1
46 — 24	148,952	6.5	22,756	171,020	15.5
47 — 24	4,100	15.8	260	58,890	19.8
Landing/hour all rectangles	245,459	7.4	33,131	329,519	15.7
Landing/hour using common rectangles 1*	245,459	7.4	33,131	329,519	15.7
Landing/hour using common rectangles 2*	231,059	7.2	32,039	283,669	15.7
				CENTRAL REGION	
47 — 25	13,540	24.7	548	446,347	24.3
48 — 25	750	15.0	50	4,500	36.0
48 — 26	—	—	—	48,780	26.3
48 — 27	—	—	—	77,225	26.0
48 — 28	—	—	—	533	3.8
48 — 29	—	—	—	—	—
49 — 28	—	—	—	49,708	127.1
3*	—	—	—	577,385	24.6
Landing/hour all rectangles	14,290	23.9	598	627,093	26.3
				SOUTHERN REGION	
49 — 29	—	—	—	446,413	212.6
49 — 30	—	—	—	86,689	142.8
50 — 30	—	—	—	359,180	238.0
50 — 31	—	—	—	26,006	179.4
51 — 31	—	—	—	18,975	327.2
51 — 32	—	—	—	7,338	209.7
52 — 32	—	—	—	—	—
Landing/hour all rectangles	—	—	—	938,601	212.0
Landing/hour using common rectangles 3*	—	—	—	825,906	224.8
All regions	259,749	7.7	33,729	1,895,213	38.5

1* Rectangles common to small, medium and large Parejas and medium and large trawlers.
2* Rectangles common to all gears.
3* Rectangles common to medium and large Parejas and medium and large trawlers.

rectangle with number of hours fishing and landing per hour (kilogrammes)

PESCADA FOGUETE

No. hours-fishing	Otter trawl M. & L.	Weight Hour fishing	No. hours-fishing	Otter trawl (Baleeira) (Small)	Weight Hour fishing	No. hours-fishing
NORTHERN REGION						
—	0	0	33	—	—	—
464	1,800	0.6	3,165	—	—	—
2,361	5,280	2.6	2,022	—	—	—
3,831	39,754	1.4	21,399	360	0.3	1,317
273	0	0	192	15	0.05	302
11,019	9,350	0.4	20,917	682	0.1	7,736
2,979	9,000	10.9	823	750	6.3	120
20,927	65,184	1.3	48,551	1,807	0.2	9,475
20,927	65,184	1.3	48,518	—	—	—
18,102	58,104	1.3	43,331	1,807	0.2	9,475
CENTRAL REGION						
18,366	43,540	29.3	1,488	—	—	—
125	380	0.1	436	—	—	—
1,854	4,400	2.3	1,950	—	—	—
2,970	10,150	0.7	15,415	—	—	—
141	9,000	16.2	555	—	—	—
—	10,000	156.3	64	—	—	—
391	—	—	—	—	—	—
23,456	67,470	3.4	19,844	—	—	—
23,847	77,470	3.9	19,908	—	—	—
SOUTHERN REGION						
2,072	38,900	117.2	332	—	—	—
607	—	—	—	—	—	—
1,509	12,200	138.6	88	—	—	—
145	—	—	—	—	—	—
58	9,750	42.8	228	—	—	—
35	11,500	63.9	180	—	—	—
—	13,500	52.9	255	—	—	—
4,426	85,850	79.3	1,083	—	—	—
3,674	72,350	87.4	828	—	—	—
49,200	228,504	3.2	69,542	1,807	0.2	9,475

be remembered that the figure given for the Parejas is for a fishing unit of two boats.

We are unable to make a similar comparison between all gears and all sizes of boats in the other regions because no small Parejas or small trawlers land in Santos from the regions to the south, but we can compare the relative efficiency of the medium and large Parejas with the medium and large trawlers using common rectangles as follows:

	Pareja (M. & L.)	*Trawl* (M. & L.)	*Ratio P/T*
Northern region	9.5	1.0	9.5
Central region	10.4	5.5	1.9
Southern region	109.4	88.8	1.2

In each region the Pareja is more efficient than the trawl but the relative efficiency of the trawl compared whith the Pareja is greater to the south. This difference in relative efficiency cannot be understood with the data available and a further examination of the assumptions which have been made is necessary. It may be that the gear is not the same or that the gear is the same in each of the regions but the behaviour of the fish is different between the regions so favouring one gear in preference to the other, or the gears are not distributed within the area in the same manner, i.e., one is fished nearer the coast than the other.

PESCADA FOGUETE — From Table IV *B* and Fig. 3 *b*, it can be seen that north of latitude 29° south the landing per hour of fishing by the larger Parejas and trawlers is small in comparison with south of this latitude. However, whereas the landing per hour by the larger Parejas continues to increase towards the south, the larger trawlers reach a maximum production per hour between 29° south and 31° south whereafter the landing per hour falls.

The small Parejas and trawlers fish only in the more northern rectangles where landing per hour by the larger boats is much smaller than in the south.

Comparing the regions, the larger Parejas land from the northren region 15.7 kilos/hour, from the central region 26.3 kilos, and from the southern region 212.0 kilos/hour. The figures for the larger trawlers are: for the northern region 1.3 kilos, for the central region 3.9 kilos, and for the northern region 79.3 kilos/hour, which again shows a general increase in density to the south.

Comparing the common rectangles fished by all types of gear in the northern region we have the following result:

Small Parejas	*M. & L. Parejas*	*M. & L. Trawlers*	*Small Trawlers*
7.2	15.7	1.3	0.2

The landing per hour fishing of the larger Parejas is twice that of the smaller Parejas and about eleven times greater than that of the larger trawlers. The larger trawlers land about six times the weight per hour of the small trawlers.

Using only the larger Parejas and the larger trawlers, fishing in the same rectangles, comparison can be made in the central and southern regions as follows:

	Pareja (M. & L.)	*Trawl* (M. & L.)	*Ratio P/T*
Northern region	15.7	1.3	12.0
Central region	24.6	3.4	7.2
Southern region	224.8	87.4	2.6

In all regions the Pareja is more efficient than the trawl, but towards the south the efficiency of the trawl in comparison to the Pareja is increased.

GOETE — From Fig. 3 *c* and Table IV C, no center of high landing per hour of fishing can be seen. There is no marked tendency to increased landing per hour towards the south as in the previous examples but there are considerable fluctuations between rectangles.

The landing per hour of fishing for the larger Parejas is in the northern region 14.5 kilos, for the central region, 12.3 kilos, and for the southern region 18.6 kilos per hour, and for the larger trawlers in the northern region 0.4 kilos, in the central region 1.1 and in the southern region 4.9 kilos per hour. Although there is no clear increase in the Parejas towards the south, there is for the trawlers but in all regions the trawler landing is low.

Comparing the rectangles within each region which are fished by all types of gear it can be seen that for the northern region the landing per hour of fishing is as follows:

Small Parejas	*M. & L. Parejas*	*M. & L. Trawlers*	*Small Trawlers*
15.9	14.9	0.35	0.1

TABLE IV-C — Total weight landed (July 1958-June 1959) from each statistical

GOETE

Rectangles	Pareja (Small)	Weight Hour fishing	No. hours-fishing	Pareja Medium & Large	Weight Hour fishing
				NORTHERN REGION	
43 — 23	—	—	—	—	
44 — 23	1,450	12.1	120	8,900	19.2
45 — 23	15,209	15.6	972	26,675	11.3
45 — 24	109,010	14.3	7,599	49,450	12.9
46 — 23	9,600	6.7	1,424	8,050	29.5
46 — 24	387,678	17.0	22,756	194,155	17.6
47 — 24	3,300	12.7	260	17,610	5.9
Landing/hour all rectangles	526,247	15.8	33,131	304,840	14.5
Landing/hour using common rectangles 1*	526,247	15.8	33,131	304,840	14.5
2*	509,588	15.9	32,039	269,265	14.9
				CENTRAL REGION	
47 — 25	16,270	29.7	548	245,380	13.4
48 — 25	500	10.0	50	350	2.8
48 — 26	—	—	—	12,895	7.0
48 — 27	—	—	—	29,973	10.1
48 — 28	—	—	—	2,519	17.9
48 — 29	—	—	—	—	—
49 — 28	—	—	—	2,514	6.4
3*	—	—	—	291,117	12.4
Landing/hour all rectangles	16,770	28.0	598	293,631	12.3
				SOUTHERN REGION	
49 — 29	—	—	—	44,898	21.7
49 — 30	—	—	—	13,772	22.7
50 — 30	—	—	—	21,745	14.4
50 — 31	—	—	—	2,093	14.4
51 — 31	—	—	—	250	4.3
51 — 32	—	—	—	0	0
52 — 32	—	—	—	—	—
3*	—	—	—	66,893	18.2
Landing/hour all rectangles	—	—	—	82,758	18.6
All regions	543,017	16.0	33,729	681,229	13.8

1* Rectangles common to small, medium and large Parejas and medium and large trawlers.
2* Rectangles common to all gears.
3* Rectangles common to medium and large Parejas and medium and large trawlers.

rectangle with number of hours fishing and landing per hour (kilogrammes)

GOETE

No. hours-fishing	Otter trawl M. & L.	Weight Hour fishing	No. hours-fishing	Otter trawl (Baleeira) (Small)	Weight Hour fishing	No. hours-fishing
NORTHERN REGION						
—	0	0	33	—	—	—
464	2,935	0.9	3,165	—	—	—
2,361	1,752	0.9	2,022	—	—	—
3,831	8,004	0.4	21,399	333	0.3	1,317
273	0	0	192	50	0.2	302
11,019	6,133	0.3	20,917	1,015	0.1	7,736
2,979	1,150	1.4	823	—	—	120
20,927	19,974	0.4	48,551	1,398	0.1	9,475
20,927	19,974	0.4	48,518	—	—	—
18,102	15,287	0.35	43,331	1,398	0.1	9,475
CENTRAL REGION						
18,366	10,575	7.1	1,488	—	—	—
125	0	0	436	—	—	—
1,854	5,900	3.0	1,950	—	—	—
2,970	3,900	0.3	15,415	—	—	—
141	0	0	555	—	—	—
—	2,500	39.5	64	—	—	—
391	—	—	—	—	—	—
23,456	20,375	1.0	19,844	—	—	—
23,847	22,875	1.1	19,908	—	—	—
SOUTHERN REGION						
2,072	3,509	10.6	332	—	—	—
607	—	—	—	—	—	—
1,509	0	0	88	—	—	—
145	—	—	—	—	—	—
58	0	0	228	—	—	—
35	900	5.0	180	—	—	—
—	1,000	3.9	255	—	—	—
3,674	4,409	5.3	828	—	—	—
4,426	5,409	4.9	1,083		—	—
49,200	48,258	0.7	69,542	1,398	0.1	9,475

TABLE IV-D — Total weight landed (July 1958-June 1959) from each statistical

MISTURA

Rectangles		Pareja (Small)	Weight Hour fishing	No. hours-fishing	Pareja Medium & Large	Weight Hour fishing
					NORTHERN REGION	
43 — 23		—	—	—	—	—
44 — 23		1,850	15.4	120	10,450	22.5
45 — 23		22,230	22.9	972	51,710	21.9
45 — 24		130,355	17.2	7,599	102,410	26.5
46 — 23		28,622	20.1	1,424	9,900	36.3
46 — 24		367,637	16.2	22,756	234,140	21.2
47 — 24		3,900	15.0	260	53,350	17,9
Landing/hour all rectangles		554,594	16.7	33,131	461,960	22.1
Landing/hour using common rectangles	1*	554,594	16.8	33,131	461,960	22.1
	2*	530,514	16.6	32,039	399,800	22.1
					CENTRAL REGION	
47 — 25		8,900	16.2	548	390,050	21.2
48 — 25		500	10.0	50	2,500	20.0
48 — 26		—	—	—	24,642	13.3
48 — 27		—	—	—	28,350	9.5
48 — 28		—	—	—	450	3.2
48 — 29		—	—	—	—	—
49 — 28		—	—	—	995	2.5
	3*	—	—	—	445,992	19.0
Landing/hour all rectangles		9,400	1.8	598	446,987	18.7
					SOUTHERN REGION	
49 — 29		—	—	—	4,816	2.3
49 — 30		—	—	—	606	1.0
50 — 30		—	—	—	2,306	1.5
50 — 31		—	—	—	75	0.5
51 — 31		—	—	—	0	0
51 — 32		—	—	—	152	4.3
52 — 32		—	—	—		
	3*	—	—	—	7,274	2.0
Landing/hour all rectangles		—	—	—	7,955	1.8
All regions		563,994	1.7	33,729	916,902	18.6

1* Rectangles common to small, medium and large Parejas and medium and large trawlers.
2* Rectangles common to all gears.
3* Rectangles common to medium and large Parejas and medium and large trawlers.

rectangle with number of hours fishing and landing per hour (kilogrammes)

MISTURA

No. hours-fishing	Otter trawl M. & L.	Weight Hour fishing	No. hours-fishing	Otter trawl (Baleeira) Small	Weight Hour fishing	No. hours-fishing
NORTHERN REGION						
—	800	24.2	33	—	—	—
464	11,100	3.5	3,165	—	—	—
2,361	6,852	3.4	2,022	—	—	—
3,831	110,028	5.1	21,399	1,931	1.5	1,317
273	1,472	7.7	192	230	0.8	302
11,019	111,020	5.3	20,917	7,480	1.0	7,736
2,979	6,500	7.9	823	1,000	8.3	120
20,927	247,772	5.1	48,551	10,641	1.1	9,475
20,927	246,972	5.1	48,518	—	—	—
18,102	229,020	5.3	43,331	10,641	1.1	9,475
CENTRAL REGION						
18,366	23,010	15.5	1,488	—	—	—
125	2,190	5.0	436	—	—	—
1,854	11,000	5.6	1,950	—	—	—
2,970	109,556	7.1	15,415	—	—	—
141	8,250	14.9	555	—	—	—
—	500	7.8	64	—	—	—
391	—	—		—	—	—
23,456	154,006	7.8	19,844	—	—	—
23,847	154,506	7.8	19,908	—	—	—
SOUTHERN REGION						
2,072	13,414	40.4	332	—	—	—
607	—	—	—	—	—	—
1,509	0	0	88	—	—	—
145	—	—	—	—	—	—
58	0	0	228	—	—	—
35	3,000	16.7	180	—	—	—
	1,000	3.9	255	—	—	—
3,674	164,414	19.8	828	—	—	—
4,426	17,414	16.0	1,083	—	—	—
49,200	419,692	6.0	69,542	10,641	1.1	9,475

The small Parejas land the same quantity as the medium and large Parejas per hour of fishing and the landing by the trawlers is minute in comparison.

Using only the data from the larger trawlers and the larger Parejas, a comparison can be made between the northern, central and southern regions as follows:

	Pareja (M. & L.)	*Trawl* (M. & L.)	*Ratio P/T*
Northern region	14.5	0.4	38.2
Central region	12.4	1.0	12.4
Southern region	18.2	5.3	3.4

The weight per hour of fishing landed by the trawlers in all regions is less than that of the Parejas but the trawler yield increases towards the south in relation to the Parejas.

MISTURA — From Fig. 3 *d* it can be seen that the landing per hour of Mistura is higher in the north than in the south, except for one rectangle in the south. However, it should be remembered that Mistura is of low commercial value and may be thrown away at sea in preference to the more valuable species; therefore, those boats which take higher quantities of Corvina and Pescada in the south will select these species and not necessarily transport for sale on the market the total quantity of Mistura caught. The extractions in Table IV *D* must be treated with some caution and a valid comparison is probably only possible in the northern region. This shows the following:

Small Parejas	*M. & L. Parejas*	*M. & L. Trawlers*	*Small Trawlers*
16.6	22.1	5.3	1.1

Parejas of all sizes land per hour of fishing large quantities of Mistura in relation to the trawlers, and the small Parejas land per hour a weight high in proportion to the larger Parejas. The medium and large trawlers land less than a quarter of the weight landed by the larger Parejas per unit fishing time.

CAMARÃO ROSA — It has already been seen that the landing per hour fishing of Camarão Rosa made by the larger trawlers is many times higher than that made by any other type of gear. From Table IV *E* and Fig. 3 *e*, it can be seen that a high landing per hour occurs in two rectangles to the north, and two other rectangles in the south. Between these two areas the level of landing per hour is lower. The landings are spread over a large number of rectangles.

TABLE IV-E — Total weight landed (July 1958-June 1959) from each statistical rectangle with number of hours fishing and landing per hour (kilogrammes)

RECTANGLES	CAMARÃO						ROSA					
	PAREJA (SMALL)	WEIGHT Hour-Fishing	Nº Hours Fishing	PAREJA Medium & Large	WEIGHT Hour-Fishing	Nº Hours Fishing	OTTER TRAWL M. & L.	WEIGHT Hour-Fishing	Nº Hour-Fishing	OTTER TRAWL (BALEEIRA) Small	WEIGHT Hour-Fishing	Nº Hours Fishing
				NORTHERN REGION								
43-23							600	18,2	33			
44-23	20	0,2	120	10	0	464	56.346	17,8	3.165			
45-23	50	0	972	180	0	2.361	14.370	6,0	2.022			
45-24	1.745	0,2	7.599	2.260	0,6	3.831	201.998	9,4	21.399	400	0,3	1.317
46-23	0	0	1.424	0	0	273	0	0	192	0	0	302
46-24	1.150	0	22.756	1.720	0,2	11.019	161.576	7,7	20.917	350	0	7.736
47-24	0	0	260	960	0,3	2.979	0	0	823	0	0	120
Landing/hour all rectangles	2.965	0,1	33.131	5.130	0,2	20.927	434.890	9,0	48.551	750	0,08	9.475
Landing/hour using common rectangles	1* 2.965	0,1	33.131	5.130	0,2	20.927	434.290	8,9	48.518	-	-	-
	2* 2.895	0,1	32.039	4.940	0,3	18.102	353.574	8,4	43.331	750	0,08	9.475
				CENTRAL REGION								
47-25	0	0	548	5.510	0,2	18.366	8.250	6,3	1.488			
48-25	0	0	50	150	1,2	125	2.700	6,3	436			
48-26				1.750	0,9	1.854	11.275	5,7	1.950			
48-27				930	0,3	2.970	168.065	10,9	15.415			
48-28				0	0	141	5.650	10,1	555			
48-29				-	-	-	0	0	64			
49-28				235	0,6	391	-	-	-			
Landing/hour all rectangles	0	0	598	8.575	0,4	23.847	195.940	9,8	19.908			
Landing/hour using common rectangles	3* -	-	-	8.340	0,4	23.456	195.940	9,8	19.844			
				SOUTHERN REGION								
49-29				120	0	2.072	2.175	5,6	332			
49-30				643	1,0	607	-	-	-			
50-30				315	0,2	1.509	0	0	88			
50-31				0	0	145	-	-	-			
51-31				0	0	58	0	0	228			
51-32				0	0	35	400	2,2	180			
52-32				-	-	-	0	0	255			
Landing/hour all rectangles				1.078	0,2	4.426	2.575	2,3	1.083			
Landing/hour using common rectangles	3* -	-	-	435	0,1	3.674	2.575	3,1	828			
All regions	2.965	0	33.729	14.783	0,3	49.200	633.405	9,1	69.542	750	0,08	9.475

1* Rectangles common to small, medium and large Parejas and medium and large trawlers.
2* Rectangles common to all gears.
3* Rectangles common to medium and large Parejas and medium and large trawlers.

For the northern region the following landing per hour was estimated:

Small Parejas	*M. & L. Parejas*	*M. & L. Trawlers*	*Small Trawlers*
0.1	0.3	8.4	0.08

The larger trawler is the most important unit.

Comparing the larger trawlers and Parejas in the other regions, the following is seen:

	Pareja (M. & L.)	*Trawl* (M. & L.)	*Ratio P/T*
Northern region	0.2	8.9	0.02
Central region	0.4	9.9	0.04
Southern region	0.1	3.1	0.03

The larger trawlers have a landing per hour considerably greater than the Parejas in all regions and the landing per hour in the central region is equal, or is probably higher than in the northern region. There is little difference in the relative efficiency of each gear with respect to region.

CAMARÃO SETE BARBAS — The landing per hour fishing of Camarão Sete Barbas, Fig. 3 *e* and Table 4 *F*, is high in the northern region only, and is high for only the small Parejas or the small trawlers as follows:

Small Parejas	*M. & L. Parejas*	*M. & L. Trawlers*	*Small Trawlers*
10.9	0.18	0.15	18.1

The small Parejas and trawlers do not fish in the other regions, and it is therefore impossible to say whether the yield would be high from these regions. However, from the landing per hour made by the larger Parejas, it can be seen that landings are restricted to the more northerly rectangles of the central region. In the remaining rectangles of the central region, however, there is no landing of Camarão Sete Barbas by the larger Parejas and this suggests that the species is restricted in its distribution to the north of 26°S.

CAMARÃO LEGÍTIMO — The landing per hour of Camarão Legítimo is restricted to rectangles in the north viz. 23° south to 26° south, and is highest between 24° and 26° south. (Fig. 3 *e* and Table 4 *G*).

TABLE IV-F — Total weight landed (July 1958-June 1959) from each statistical rectangle with number of hours fishing and landing per hour (kilogrammes)

	C A M A R Ã O			7 B A R B A S								
RECTANGLES	PAREJA (SMALL)	WEIGHT Hour-Fishing	Nº Hours Fishing	PAREJA Medium & Large	WEIGHT Hour-Fishing	Nº Hours Fishing	OTTER TRAWL M.. & L.	WEIGHT Hour-Fishing	Nº Hours Fishing	OTTER TRAWL (Baleeira) Small	WEIGHT Hour-Fishing	Nº Hours Fishing
				N O R T H E R N R E G I O N								
43-23							0	0	33			
44-23	200	1,7	120	400	0,9	464	0	0	3.165			
45-23	950	1,0	972	315	0,1	2.361	0	0	2.022			
45-24	71.667	9,4	7.599	925	0,2	3.831	1.500	0	21.399	17.368	13,2	1.317
46-23	23.190	16,3	1.424	50	0,2	273	0	0	192	5.170	17,1	302
46-24	254.778	11,2	22.756	910	0	11.019	4.945	0,2	20.917	149.397	19,3	7.736
47-24	0	0	260	1.300	0,4	2.979	0	0	823	0	0	120
Landing/hour all Rectangles	350.785	10,6	33.131	3.900	0,19	20.927	6.445	0,13	48.551	171.935	18,1	9.475
Landing/hour using common rectangles	1* 350.785	10,6	33.131	3.900	0,19	20.927	6.445	0,13	48.518	-	-	-
	2* 349.635	10,9	32.039	3.185	0,18	18.102	6.445	0,15	43.331	171.935	18,1	9.475
				C E N T R A L R E G I O N								
47-25	680	1,2	548	1.200	0	18.366	0	0	1.488			
48-25	0	0	50	500	4	125	0	0	436			
48-26				0	0	1.854	0	0	1.950			
48-27				0	0	2.970	0	0	15.415			
48-28				0	0	141	0	0	555			
48-29				-	-	-	0	0	64			
49-28				0	0	391	-	-	-			
Landing/hour all rectangles	680	1,1	598	1.700	0	23.847	0	0	19.908			
Landing/hour using common rectangles	3* -	-	-	1.700	0,07	23.456	0	0	19.844			
				S O U T H E R N R E G I O N								
49-29				0	0	2.072	0	0	332			
49-30				0	0	607	-	-	-			
50-30				0	0	1.509	0	0	88			
50-31				0	0	145	-	-	-			
51-31				0	0	58	0	0	228			
51-32				0	0	35	0	0	180			
52-32				-	-	-	0	0	255			
Landing/hour all rectangles				0	0	4.426	0	0	1.083			
Landing/hour using common rectangles	3* -	-	-	0	0	3.674	0	0	828			
All regions	351.465	10,5	33.729	5.600	1,1	49,200	6.445	0	69.542	171.935	18,1	9.475

1* Rectangles common to small, medium and large Parejas and medium and large trawlers.
2* Rectangles common to all gears.
3* Rectangles common to medium and large Parejas and medium and large trawlers.

TABLE IV-G — Total weight landed (July 1958-June 1959) from each statistical rectangle with number of hours fishing and landing per hour (kilogrammes)

	C A M A R Ã O			L E G Í T I M O								
RECTANGLES	PAREJA (Small)	WEIGHT Hour-Fishing	Nº Hours Fishing	PAREJA Medium & Large	WEIGHT Hour-FISHING	Nº Hours Fishing	OTTER TRAWL M. & L.	WEIGHT Hour-Fishing	Nº Hours Fishing	OTTER TRAWL (Baleeira) Small	WEIGHT Hour-Fishing	nº Hours Fishing
				N O R T H E R N R E G I O N								
43-23							0	0	33			
44-23	5	0	120	0	0	464	0	0	3.165			
45-23	750	0,7	972	528	0,2	2.361	0	0	2.022			
45-24	2.461	0,3	7.599	2.306	0,6	3.831	480	0	21.399	15	0	1.317
46-23	536	0,4	1.424	50	0,2	273	0	0	192	6	0	302
46-24	5.391	0,2	22.756	8.939	0,8	11.019	189	0	20.917	261	0	7.736
47-24	410	1,6	260	4.745	1,6	2.979	0	0	823	0	0	120
Landing/hour all rectangles	9.553	0,3	33.131	16.568	0,8	20.927	669	0	48.551	282	0	9.475
Landing/hour using common rectangles	1* 9.553	0,3	33.131	16.568	0,8	20.927	669	0	48.518	-	-	-
	2* 8.798	0,3	32.039	16.040	0,9	18.102	669	0	43.331	282	0	9.475
				C E N T R A L R E G I O N								
47-25	241	0,4	548	20.842	1,6	18.366	0	0	1.488			
48-25	0	0	50	50	0,4	125	0	0	436			
48-26				1.254	0	1.854	0	0	1.950			
48-27				550	0,2	2.970	250	0	15.415			
48-28				0	0	141	0	0	555			
48-29				-	-	-	0	0	64			
49-28				0	0	391	-	-	-			
Landing/hour all rectangles	241	0,4	598	22.696	0,9	23.847	250	0	19.908	-	-	-
Landing/hour using common rectangles	3* -	-	-	22.696	1,0	23.456	250	0	19.844			
				S O U T H E R N R E G I O N								
49-29				0	0	2.072	0	0	332			
49-30				0	0	607	-	-	-			
50-30				0	0	1.509	0	0	88			
50-31				0	0	145	-	-	-			
51-31				0	0	58	0	0	228			
51-32				0	0	35	0	0	180			
52-32				-	-	-	0	0	255			
Landing/hour all rectangles				0	0	4.426	0	0	1.083			
Landing/hour using common rectangles	3* -	-	-	0	0	3.674	0	0	828			
All regions	9.794	0,3	33.729	39.264	0,7	49.200	919	0	69.542	282	0	9.475

1* Rectangles common to small, medium and large Parejas and medium and large trawlers.
2* Rectangles common to all gears.
3* Rectangles common to medium and large Parejas and medium and large trawlers.

In the northern region, the comparative figures for each gear are:

Small Parejas	*M. & L. Parejas*	*M. & L. Trawlers*	*Small Trawlers*
0.3	0.9	0	0

The larger Parejas land the highest weight per hour.

The landing per hour by trawlers from all regions is negligible, but from the central region and particularly those rectangles to the north of the central region there is a relatively high landing per hour by the larger Parejas.

This species has a distribution which extends slightly farther to the South than Camarão Sete Barbas, but not so far south as Camarão Rosa.

VIII — SEASONAL DISTRIBUTION OF LANDING PER UNIT EFFORT

In Table IV *a*, *b*, *c*, *d*, etc., the total weight of each species landed by each gear is shown together with the landing per hour of fishing by months.

CORVINA — Taking all the fished area without area subdivisions, the landing of Corvina per hour of fishing by the larger Parejas is seen to be seasonal displaying two peaks of high landing during the twelve months. One of these is centered about the month of September, and the other in January. For the smaller Parejas there is little variation between months and except for the month of June the larger landing per hour by the larger trawlers shows no marked seasonal variation.

In Table V *A* the total landing and landing per hour per month for the larger Parejas and trawlers is shown separately for each of the three regions used in Table IV. These data are shown diagrammaticaly in Fig. 4 *a*. The larger Parejas show two seasons of higher landing per hour fishing, one about September-October, and one in January-February, and the period of higher production is a month or so later in the south than in the north, and the September-October peak is more important than the later peak. The reverse in the central and northern regions.

TABLE V-A — Total landing and landing

GEAR	C O R V I N A						P E S C A D A					
	OTTER TRAWL Medium and Large		OTTER TRAWL (Baleeira) Small		P A R E J A Medium and Large		P A R E J A Small		OTTER TRAWL Medium and Large		OTTER TRAWL (Baleeira) Small	
MONTHS	T.L.	L.p/H	T.L.	L.p/H	T.L.	L.p/H	T.L.	L.p/H	T.L.	L.p/H	T.L.	L.p/H
JULY	24.300	2,9	-	-	45.005	14,0	2.740	0,8	80.084	9,5	-	-
N.	4.100	0,6	-	-	8.260	7,3	-	-	40.104	6,8	-	-
C.	20.200	8,2	-	-	18.140	9,2	-	-	39.980	16,3	-	-
S.	0	0	-	-	18.605	127,4	-	-	0	0	-	-
AUGST	17.590	2,4	2.805	2,8	90.553	30,5	6.980	2,5	29.000	3,9	800	0,8
N.	12.580	2,1	-	-	9.470	7,0	-	-	18.560	3,1	-	-
C.	5.010	3,0	-	-	13.250	10,5	-	-	10.440	6,4	-	-
S.	-	-	-	-	67.833	185,8	-	-	-	-	-	-
SEPT	8.445	1,9	-	-	107.781	32,2	7.045	3,3	8.500	1,9	62	0
N.	1.195	0,3	-	-	18.775	11,9	-	-	1.100	0,2	-	-
C.	7.250	9,1	-	-	25.443	17,1	-	-	7.400	9,3	-	-
S.	-	-	-	-	63.563	223,8	-	-	-	-	-	-
OCT	7.325	1,6	210	0,3	96.510	20,1	11.568	5,1	150	0	-	-
N.	425	0,1	-	-	29.960	10,4	-	-	50	0	-	-
C.	6.900	4,3	-	-	24.700	14,0	-	-	100	0	-	-
S.	-	-	-	-	41.850	225,0	-	-	-	-	-	-
NOV	32.708	5,7	105	0,2	62.488	16,1	14.224	4,7	10.450	1,8	250	0,3
N.	12.823	11,3	-	-	17.060	9,9	-	-	5.100	4,5	-	-
C.	9.885	2,2	-	-	22.878	11,9	-	-	2.850	0,6	-	-
S.	10.000	74,0	-	-	22.550	97,1	-	-	2.500	18,5	-	-
DEC	37.010	4,8	25	0	83.805	17,3	17.485	5,1	15.750	2,1	100	0,1
N.	2.980	0,8	-	-	13.055	7,2	-	-	0	0	-	-
C.	24.030	5,9	-	-	26.750	10,1	-	-	750	0,2	-	-
S.	10.000	57,1	-	-	44.000	112,8	-	-	15.000	3,7	-	-
JAN	11.347	2,3	-	-	137.535	41,7	10.378	4,1	0	0	30	0
N.	4.897	1,3	-	-	34.560	23,3	-	-	0	0	-	-
C.	6.450	4,3	-	-	80.014	51,0	-	-	0	0	-	-
S.	-	-	-	-	22.961	91,8	-	-	-	-	-	-
FEB	35.752	7,1	-	-	70.243	24,7	11.820	5,8	47.600	9,4	53	0,2
N.	1.677	0,5	-	-	14.980	12,3	-	-	300	0,1	-	-
C.	1.625	0,8	-	-	21.884	15,2	-	-	100	0,1	-	-
S.	32.450	150,2	-	-	33.379	182,3	-	-	47.200	218,5	-	-
MARCH	18.135	2,6	10	0	88.039	21,4	15.290	5,3	3.650	0,5	100	0,1
N.	960	0,1	-	-	6.650	6,0	-	-	0	0	-	-
C.	50	0,4	-	-	22.211	8,5	-	-	0	0	-	-
S.	17.125	169,5	-	-	59.178	156,9	-	-	3.650	0,5	-	-
APRIL	3.505	0,5	-	-	66.191	12,2	11.515	3,9	170	0	-	-
N.	455	0,1	-	-	13.400	5,7	-	-	20	0	-	-
C.	3.050	6,7	-	-	17.322	6,7	-	-	150	0,3	-	-
S.	-	-	-	-	35.469	71,5	-	-	-	-	-	-
MAY	29.305	6,4	60	0	56.420	12,5	18.077	6,8	4.850	1,1	235	0,2
N.	1.555	0,3	-	-	7.050	5,5	-	-	0	0	-	-
C.	26.750	49,5	-	-	12.020	5,6	-	-	4.600	8,5	-	-
S.	1.000	25,6	-	-	37.350	35,8	-	-	250	6,4	-	-
JUNE	72.223	24,1	20	0	56.727	9,3	14.945	4,0	28.450	9,5	177	0,2
N.	623	0,3	-	-	26.950	8,5	-	-	0	0	-	-
C.	10.150	12,4	-	-	6.325	2,6	-	-	11.200	13,7	-	-
S.	61.450	206,9	-	-	23.452	49,3	-	-	17.250	58,0	-	-

T.L. = Total landing.

L.p/H = Landing per hour.

per hour-fishing by month and gear

F O G U E T E								G O E T E			
P A R E J A Medium and Large		P A R E J A Small		OTTER TRAWL Medium and Large		OTTER TRAWL (Baleeira) Small		P A R E J A Medium and Large		P A R E J A Small	
T.L.	L.p/H	T.L.	L.p/H	T.L.	L.p/H	T.L.	L.p/H	T.L.	L.p/H	T.L.	L.p/H
241.103	74,8	31.245	9,7	18.477	2,2	50	0,8	20.053	6,2	1.375	0,4
26.620	23,8	-	-	8.677	1,4	-	-	6.380	5,7	-	-
71.980	36,7	-	-	9.800	4,0	-	-	7.950	4,0	-	-
142.503	976,0	-	-	0	0	-	-	5.723	39,1	-	-
181.319	61,0	19.940	7,2	9.015	1,2	-	-	20.996	7,1	4.400	1,6
22.450	16,6	-	-	5.490	0,9	-	-	4.895	3,6	-	-
17.080	13,6	-	-	3.525	2,1	-	-	1.365	1,0	-	-
141.789	388,4	-	-	-	-	-	-	14.735	40,3	-	-
138.086	41,3	15.508	7,2	1.612	0,4	-	-	19.606	5,9	5.500	2,6
19.600	12,4	-	-	1.312	0,3	-	-	8.615	5,4	-	-
27.558	18,5	-	-	300	0,4	-	-	3.223	2,1	-	-
90.928	320,1	-	-	-	-	-	-	7.767	27,3	-	-
167.909	34,9	16.365	7,3	2.025	0,4	-	-	49.258	10,2	20.415	9,1
26.950	9,4	-	-	1.425	0,4	-	-	30.755	10,7	-	-
42.600	24,1	-	-	1.600	0,4	-	-	14.370	8,1	-	-
98.359	528,8	-	-	-	-	-	-	4.133	22,2	-	-
132.539	34,3	21.147	6,9	3.012	0,5	333	0,7	52.795	13,7	57.175	18,7
23.819	13,8	-	-	462	0,4	-	-	23.880	13,9	-	-
62.370	32,5	-	-	2.550	0,5	-	-	27.115	14,1	-	-
46.350	199,7	-	-	0	0	-	-	1.800	7,7	-	-
200.055	41,4	19.040	5,5	1.900	0,2	785	0,8	103.120	21,3	105.290	30,5
33.890	18,8	-	-	700	0,2	-	-	45.320	25,2	-	-
79.765	30,0	-	-	1.200	0,2	-	-	51.775	19,5	-	-
86.400	221,5	-	-	0	0	-	-	6.025	15,4	-	-
88.320	26,8	15.060	5,9	243	0	-	-	106.057	32,2	126.630	49,9
32.600	22,0	-	-	193	0,1	-	-	58.795	39,7	-	-
49.356	31,4	-	-	50	0	-	-	33.821	21,5	-	-
6.364	25,4	-	-	0	0	-	-	13.441	53,7	-	-
112.403	39,6	14.120	6,9	1.200	0,2	110	0,4	56.711	20,0	69.833	34,1
22.200	18,2	-	-	550	0,1	-	-	23.650	19,4	-	-
45.623	31,6	-	-	650	0,3	-	-	29.608	20,5	-	-
44.580	243,6	-	-	0	0	-	-	3.453	18,8	-	-
181.796	44,2	26.480	9,2	3.759	0,5	20	0	69.011	16,8	68.489	23,9
20.100	18,0	-	-	550	0,1	-	-	23.200	20,8	-	-
70.503	26,8	-	-	0	0	-	-	41.979	15,9	-	-
91.193	241,8	-	-	3.209	31,7	-	-	3.832	10,1	-	-
181.731	33,5	19.680	6,6	1.057	0,2	-	-	101.644	18,8	53.060	17,9
55.040	23,4	-	-	557	0,1	-	-	54.400	23,1	-	-
61.355	23,8	-	-	500	1,1	-	-	38.100	14,7	-	-
65.336	131,7	-	-	-	-	-	-	9.144	18,4	-	-
134.246	29,8	25.057	9,4	4.500	1,0	-	-	57.500	12,8	20.650	7,7
16.650	12,8	-	-	500	0,1	-	-	13.550	10,4	-	-
49.646	22,9	-	-	3,700	6,8	-	-	32.175	14,8	-	-
67.950	65,2	-	-	300	7,6	-	-	11.775	11,3	-	-
135.706	22,3	36.107	9,7	1.958	0,7	-	-	24.479	4,0	10.200	2,7
29.600	9,3	-	-	58	0	-	-	11.400	3,5	-	-
49.257	20,1	-	-	0	0	-	-	12.150	4,9	-	-
56.849	119,6	-	-	1.900	6,3		-	929	1,9	-	-

TABLE V-A (*Continuation*) — Total landing and landing per hour-fishing by month and gear

M I S T U R A							
OTTER TRAWL Medium and Large		OTTER TRAWL (Baleeira) Small		P A R E J A Medium and Large		P A R E J A Small	
T.L.	L.p/H	T.L.	L.p/H	T.L.	L.p/H	T.L.	L.p/H
63.654	7,5	200	3,0	58.021	18,0	36.302	11,2
44.664	7,5	-	-	21.150	18,9	-	-
18.590	7,6	-	-	36.340	18,5	-	-
400	3,3	-	-	531	3,6	-	-
60.000	8,1	2.050	2,1	44.920	15,1	53.160	19,1
36.370	6,2	-	-	27.310	20,2	-	-
23.630	14,5	-	-	16.740	13,3	-	-
-	-	-	-	870	2,3	-	-
38.227	8,5	905	1,0	67,100	20,1	31.486	14,6
26.427	7,1	-	-	41.300	26,2	-	-
11.800	14,9	-	-	25.155	16,9	-	-
-	-	-	-	645	2,2	-	-
48.973	10,4	296	0,4	86.372	18,0	39.310	17,5
12.073	3,9	-	-	55,610	19,4	-	-
36.900	23,0	-	-	30.612	17,3	-	-
-	-	-	-	150	0,8	-	-
28.040	4,9	605	1,2	60.955	15,8	33.595	11,0
7.140	6,3	-	-	31.280	18,2	-	-
20.900	4,7	-	-	29.350	15,3	-	-
0	0	-	-	325	1,4	-	-
34.206	4,5	450	0,5	83.360	17,2	41.030	11,9
12.220	3,5	-	-	32.460	18,1	-	-
21.986	5,4	-	-	49.400	18,6	-	-
0	0	-	-	1.500	3,8	-	-
22.490	4,5	780	0,8	70.861	21,5	54.545	21,5
17.590	4,9	-	-	40.450	27,3	-	-
4.900	3,3	-	-	29.747	18,9	-	-
-	-	-	-	664	2,6	-	-
31.051	6,1	765	3,0	61.269	21,6	46.545	22,7
14.201	4,9	-	-	35.550	29,2	-	-
4.350	2,2	-	-	25.547	17,7	-	-
12.500	57,8	-	-	172	0,9	-	-
19.514	2,8	1.335	1,8	70.504	17,1	60.145	20,9
18.900	2,7	-	-	23.800	21,3	-	-
100	0,8	-	-	45.917	17,4	-	-
514	5,0	-	-	787	2,1	-	-
27.142	4,1	1.110	1,1	112.029	20,7	60.090	20,3
25.742	4,1	-	-	55.250	23,3	-	-
1.400	3,0	-	-	56.026	21,7	-	-
-	-	-	-	753	1,5	-	-
20.871	4,9	2.041	1,8	80.078	17,8	46.720	17,5
20.871	4,9	-	-	24.150	18,7	-	-
0	0	-	-	55.278	25,5	-	-
0	0	-	-	650	0,6	-	-
28.772	9,6	304	0,3	121.184	19,9	61.066	16,4
10.722	5,6	-	-	73.400	23,1	-	-
14.050	17,2	-	-	46.875	19,2	-	-
4.000	13,4	-	-	909	1,9	-	-

T.L. = Total landing.

L.p/H = Landing per hour.

The data from the trawlers is not so complete. There is an indication of the February-March peak in the southern region, but the seasonal distribution in the central region shows a completely different picture from that given by the Parejas.

There is a difference in the timing of the high landings per hour fishing for the same gear between the regions, and also there is a difference between the yield per unit fishing time of different gears fished in the same area.

PESCADA FOGUETE — Treating the area fished as a whole, there is little seasonal variation in landing per hour fishing of Pescada Foguete made by any gear except the larger Parejas. Treating the regions separately as in Fig. 4 *c*, there are clear differences between the regions.

The landing per hour in the south for the larger Parejas is high in July and falls off during the period; in the other regions there is less fluctuation during the year. There is a tendency for landing per hour fishing to be highest in the period November-March, and lower during the rest of the year when the landing per hour from the south was highest. In the northern region the maximum occurs a month or two later than in the central region.

Data are available for the larger trawlers fishing in the northern and central regions where the maximum is seen to occur in June-July-September period with little fish in the December-January period. This is different from that of the Parejas fishing in the same area, i.e. northern and central regions, but is similar to the Parejas fishing to the South.

GOETE — Goete landings per hour fishing (Table V *A*) show a distinct seasonal variation with one peak centered about January, and a minimum about June-July. The Parejas (Fig. 4 *b*) show a higher landing per hour in each region during the period November-March with a central peak for production in January-February. However, in the southern region there is also a relatively high level from July-September.

The trawlers, for which data is available for the northern and central region alone, land only small quantities of Goete. The months of maximum landing per hour fishing are, however, completely different from the Parejas fishing in the same regions. The maximum landing per hour for Parejas was seen to be centered about January and in the same regions, northern and

central, the maximum landings by trawlers is in March-August period, and the minimum in January.

MISTURA — It has been suggested that the quantity of Mistura landed depends, to a certain extent, on the availability of other more valuable species, therefore landing per hour fishing is not necessarily representative of the density of the available Mistura. However, in practice, little seasonal variation is seen either for the areas as a whole (Table V *A*) or for the regions (Table V *A* and Fig. 4 *d*).

It might be expected that there would be variation in the quantity either directly dependent on the density of available Mistura or inversely in proportion to the other species caught. In practice this is not so. There may be a slight decrease about November, but this is hardly significant.

CAMARÃO ROSA — The landing per hour of Camarão Rosa reaches a maximum about October and decreases until May-June. When the regions are considered separately (see Fig. 4 *e*), the larger trawlers show the same result, i.e. a maximum about October and a reduction until May-June. In the south the decline is more rapid and the Camarão disappears earlier than in the central region. A higher landing per hour commences earlier in the year in the northern region and the high level is sustained for more months of the year than in the others regions. The Parejas land only a small amount per hour and the peak of production is a month or two earlier than for the trawlers.

CAMARÃO LEGÍTIMO — Both for trawlers and Parejas the main seasons are September to November, and March to June, the later being more important than the former. Fishing is confined mainly to the northern region but where it occurs in the central region, the seasonal distribution is essentially the same as for the north.

CAMARÃO SETE BARBAS — The fishing by the small Parejas (Fig. 4 *g*) is confined to fishing in the northern region. The landings decrease from July to February and then increase again — maximum about July and minimum at about February. The small trawlers fishing in the same area give a different seasonal picture. The maximum occurs about March-May, and the minimum about August to October.

TABLE V-B — Total landing and landing per hour-fishing by month and gear

GEAR	SHRIMP - C. ROSA								SHRIMP - C. 7 BARBAS								SHRIMP - C. LEGITIMO							
	OTTER TRAWL Medium and Large		OTTER TRAWL Small (Balseira)		PAREJA (Trawl de Parelha) medium and large		PAREJA (Trawl de Parelha) Small		OTTER TRAWL MEDIUM and Large		OTTER TRAWL Small (Balseira)		PAREJA (Trawl de Parelha) medium and Large		PAREJA (Trawl de Parelha) Small		OTTER TRAWL Medium and Large		OTTER TRAWL Small (Balseira)		PAREJA (Trawl de Parelha) medium and Large		PAREJA (Trawl de Parelha) Small	
MONTHS	Total Landg.	Landg. p/hour	Total Landg.	Landg. p/hour	Total Landg.	Landg. p/hour	Total Landg.	Landg. p/hour	Total Landg.	Landg. p/hour	Total Landg.	Landg. p/hour	Total Landg.	Landg. p/hour	Total Landg.	Landg. p/hour	Total Landg.	Landg. p/hour	Total Landg.	Landg. p/hour	Total Landg.	Landg. p/hour	Total Landg.	Landg. p/hour
JULY	105.544	12,4	0	0	3.360	1,0	600	0,2	0	0	9.205	13,9	1.300	0,4	52.390	16,2	0	0	0	0	0	0	0	0
N	74.594	12,7	0	0	1.170	1,0	600	0,2	0	0	9.205	13,9	600	0,5	52.390	16,2	0	0	0	0	0	0	0	0
C	29.250	12,0	-	-	2.190	1,1	-	-	0	0	-	-	700	0,4	-	-	0	0	-	-	0	0	-	-
S	1.700	14,1	-	-	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-
AUGUST	65.375	8,8	250	0,3	4.250	1,4	480	0,2	1.100	0,1	10.330	10,4	310	0,1	31.295	11,3	0	0	0	0	0	0	0	0
N	51.685	8,9	250	0,3	1.450	1,0	480	0,2	1.100	0,2	10.330	10,4	310	0,2	31.295	11,3	0	0	0	0	0	0	0	0
C	13.690	8,4	-	-	2.800	2,2	-	-	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-
S	-	-	-	-	0	0	-	-	-	-	-	-	0	0	-	-	-	-	-	-	0	0	-	-
SEPT	57.739	12,9	0	0	1.173	0,3	135	0	15	0	12.015	13,4	1.920	0,6	28.323	13,2	0	0	0	0	554	0,2	337	0,2
N	50.189	13,6	0	0	200	0,1	135	0	15	0	12.015	13,4	920	0,6	28.323	13,2	0	0	0	0	339	0,2	337	0,2
C	7.550	9,5	-	-	770	0,5	-	-	0	0	-	-	1.000	0,7	-	-	0	0	-	-	215	0,1	-	-
S	-	-	-	-	203	0,7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	-
OCT	68.945	14,6	0	0	1.450	0,3	445	0,2	400	0	8.783	10,7	810	0,2	26.107	11,6	1.240	0,3	4	0	2.297	0,5	956	0,4
N	43.345	13,9	0	0	960	0,3	445	0,2	400	0,1	8.783	10,7	810	0,3	26.107	11,6	1.190	0,4	4	0	1.903	0,6	956	0,4
C	25.600	15,9	-	-	490	0,3	-	-	0	0	-	-	0	0	-	-	50	0	-	-	394	0,2	-	-
S	-	-	-	-	0	0	-	-	-	-	-	-	0	0	-	-	-	-	-	-	0	0	-	-
NOV	59.131	10,4	0	0	1.090	0,3	150	0	1.100	0,2	7.750	15,5	600	0,2	45.640	20,3	13	0	11	0	1.279	0,3	510	0,2
N	10.156	9,0	0	0	550	0,3	150	0	1.100	1,0	7.750	15,5	600	0,3	45.640	20,3	13	0	11	0	1.151	0,7	510	0,2
C	48.575	11,0	-	-	540	0,3	-	-	0	0	-	-	0	0	-	-	0	0	-	-	128	0	-	-
S	400	3,0	-	-	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-
DEC	63.392	8,3	0	0	1.900	0,4	155	0	1.050	0,1	16.710	17,9	410	0	24.640	8,0	250	0	0	0	622	0,1	168	0
N	26.092	7,6	0	0	400	0,2	155	0	1.050	0,3	16.710	17,9	410	0,2	24.640	8,0	50	0	0	0	110	0	168	0
C	37.125	9,2	-	-	1.500	0,6	-	-	0	0	-	-	0	0	-	-	200	0	-	-	512	0,2	-	-
S	175	1,0	-	-	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-
JAN	46.975	9,4	0	0	1.335	0,4	-	-	0	0	18.675	20,0	0	0	24.230	9,5	0	0	30	0	627	0,2	9	0
N	33.025	9,4	0	0	300	0,2	0	0	0	0	18.675	20,0	0	0	24.230	9,5	0	0	30	0	340	0,2	9	0
C	13.600	9,2	-	-	285	0,2	0	0	0	0	-	-	0	0	-	-	0	0	-	-	287	0,2	-	-
S	-	-	-	-	1.100	4,4	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-	-	-
FEB	43.575	8,6	0	0	175	0	0	0	50	0	3.530	13,8	0	0	5.785	2,8	0	0	65	0,3	1.000	0,4	63	0
N	27.975	9,8	0	0	100	0	0	0	50	0	3.530	13,8	0	0	5.785	2,9	0	0	65	0,3	70	0	63	0
C	15.600	7,9	-	-	0	0	0	0	0	0	-	-	0	0	0	0	0	0	-	-	930	0,5	0	0
S	0	0	-	-	75	0,4	-	-	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-
MARCH	46.250	6,6	350	0,5	0	0	1.000	0,3	0	0	17.037	22,7	0	0	15.250	5,3	20	0	0	0	0	0	913	0,3
N	44.600	6,5	350	0,5	0	0	1.000	0,4	0	0	17.037	22,7	0	0	15.200	5,9	20	0	0	0	0	0	913	0,3
C	1.650	1,4	-	-	0	0	0	0	0	0	-	-	0	0	50	0,2	0	0	-	-	0	0	0	0
S	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-
APR	41.330	6,2	0	0	0	0	0	0	2.730	0,4	22.040	21,6	0	0	19.800	6,7	46	0	158	0,2	9.100	1,7	2.552	0,9
N	39.430	6,4	0	0	0	0	0	0	2.730	0,4	22.040	21,6	0	0	19.170	6,9	46	0	158	0,2	4.250	1,8	2.311	0,8
C	1.900	4,2	-	-	0	0	0	0	0	0	-	-	0	0	630	3,4	0	0	-	-	4.850	1,9	241	1,3
S	-	-	-	-	0	0	-	-	-	-	-	-	0	0	-	-	-	-	-	-	0	0	-	-
MAY	24.230	5,3	150	0,1	0	0	0	0	0	0	26.810	23,0	0	0	30.160	11,3	100	0	0	0	10.350	2,3	1.253	0,5
N	24.230	5,3	150	0,1	0	0	0	0	0	0	26.810	23,0	0	0	30.160	11,3	100	0	0	0	3.400	2,6	1.253	0,5
C	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-	6.950	3,0	-	-
S	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-
JUNE	10.969	3,7	0	0	0	0	0	0	0	0	19.050	16,6	250	0	47.845	12,9	0	0	14	0	9.705	1,6	3.026	0,8
N	9.569	5,0	0	0	0	0	0	0	0	0	19.050	16,6	250	0	47.845	13,2	0	0	14	0	4.155	1,3	3.026	0,8
C	1.400	1,7	-	-	0	0	0	0	0	0	-	-	0	0	0	0	0	0	-	-	5.550	2,3	0	0
S	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-	0	0	-	-

IX — DISCUSSION

It was said at the beginning of this paper that the primary object of the research started in Santos in July 1958 was to estimate the size of the available stock of fish in order to make some assessment of the optimum usage of this stock. This paper is a first contribution to an understanding of the existing fishery and is based on data collected during a limited period; the first twelve months, from July 1958 to June 1959, of the programme.

It will be seen by reference to the data collected by Ripley (1956) that the character of the fishery has changed considerably during the last few years. Although it has become a more offshore fishery, it is shown in this paper that the distribution of a species (as shown by landing per hour of fishing). Albacore, along the coast to the south of Santos until Rio Grande do Sul. Within this area it is shown that a number of regions are beginning to emerge; regions which are defined by the fishable density of a species (as shown by landing per hour of fishing). Albacore, Tuna and Cação are exceptions which support a commercial fishery over a very wide area. The other important species show a more restricted distribution. For instance, the Sardine fishery and landing per hour of fishery is restricted to a limited area to the north of Santos. Unfortunately as there is no commercial fishery for Sardine to the south of Santos by the boats fishing from Santos, the distribution of this species is unknown to the south. Within the commercially fished area, the region from a little north of Santos to the State of Santa Catarina, is essentially a shrimp area within which the three species of shrimp show some slight differences of distribution. From this area, only small quantities of fish are taken by the gears at present used. Towards the south, Corvina and Pescada become increasingly dense.

It is suggested, although needing confirmation, that each species is limited in its distribution or at least the centres of greatest availability, are clearly defined and limited. The evidence presented is based on the landing per hour of those gears in use at the moment, namely Parejas and otter trawls. Until other gears are used, or modifications to the existing gears, we cannot be certain that our results are not biased by the sampling restrictions imposed by the type of net used in the fishery.

We have shown that the ratio of landing per hour of fishing of the Parejas compared with the trawlers for a particular species is different for different areas. This may be due to the inclusion of an error caused by the assumption that within each area the distribution of the two types of gear under comparison is similar.

If, in practice, this is not so and one gear tends to be fished within a different part of the same area, such an error may arise although it is unlikely for the same type of distribution should occur in every area. However, we hope to investigate this more fully in the future by using smaller areas. It appears more likely that those differences in the efficiency of one gear compared with another when fished in one area compared with another area, are more possibly due to differences in fish behaviour or changes in the availability of the fish to a gear.

In this respect, it is of interest to note that off Rio Grande do Sul and Argentine, a bottom trawl is used (The Fishery of Rio Grande, in preparation) and within the Santos fishing fleet the trawl becomes progressively less efficient when compared with the more higher mouthed Pareja, as it is fished farther to the north. Again an indication of a more "off the bottom habit" towards the north of the area exploited at least with respect to Corvina and Pescada. The more typically pelagic fish — Sardine and Albacore — are also distributed more towards the north of the area fished.

The greater part of the analysis made in this paper depends on the use of landing per hour of fishing, and we have used the annual figures. In practice this may give rise to an error because certain of the species exhibit seasonal variations in abundance or landing per hour. Other species do not show seasonal differences and additionally whilst one species in a certain area may be seasonal, this one species is not in another area. There are then, periods of high availability and we do not know whether this is due to migration or due to behaviour changes. If it is due to migration, we do not know whether it is one stock migrating or due to successive influences into the area of different stocks. All that can be detected from the seasonal results is that there are, in certain cases, progressive movements of the peak of high availability earlier in the year when comparing in a north-south or vice versa direction.

Finally we should point out that although the treatment of the data has been in terms of weight, the very large variation in price between, for instance, Camarão and the fish or between species of fish, it would be more realistic to treat the fishery in terms of value of the landed product. Although monetarily Camarão are very important, in terms of food value, i.e. weight, they are not of major importance. Also Mistura is an economically unimportant category but is landed in large quantities, and probably caught but discarded at sea, in even larger quantities. As this category includes the young of certain of the fish which

as adults command a high price and are important food species, the destruction of the young fish may be an important influence on the future of the stock.

In presenting this paper, we realize the limitations of the data which we hope to improve in the future. The most serious limitation is, however, that we can only deal with the area sampled by the commercial fleet, what the size of the stock of available fish is outside this area, we do not know and cannot estimate from commercial boats.

X — SUMMARY

This paper summarizes and analyses the landing data collected at Santos, Brazil, during the 12 months period, July 1958-June 1959. These data are given in terms of weight landed of the more important fish and shrimp and also in terms of value.

The distribution of the landings of each of the more important species is shown both according to the type of fishing gear used and fishing area. The fishing area is given in the form of statistical rectangles of 60 miles square.

The landings are broken down to obtain a figure for the landing per hour of fishing for each species, for each gear and for each rectangle fished. This figure of landing per unit fishing time is used to compare one area with another, one gear with another, and one month with another for each of the important species.

In this way, comparisons of the available density of a species by time, area and fishing gear are made.

XI — RESUMO

Êste trabalho sintetiza e analisa os dados coletados em Santos, Brasil, sôbre o desembarque de pescado durante o período de 12 meses, de julho de 1958 a junho de 1959. Êstes dados são apresentados em têrmos de pêso desembarcado, para as espécies de peixes mais importantes e camarões e, também, em têrmos de valor econômico.

A distribuição dos desembarques de cada uma das espécies mais importantes é apresentada tanto em relação ao tipo de aparelho de pesca usado, como em relação à área de pesca. Essa área é dada sob forma de retângulos estatísticos de 60 milhas quadradas.

Os desembarques são classificados para se obter o valor do desembarque por hora de pesca para cada espécie, para cada aparelho e para cada retângulo pescado. Êste valor do desembarque por unidade de tempo de captura é usado para comparar as áreas entre si, os aparelhos de captura entre si e os meses do ano entre si, em relação a cada espécie importante.

Dêste modo são feitas as comparações da densidade disponível de uma espécie no tempo, na área de pesca e por aparelho de pesca.

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XIII — APPENDIX I

Common names of the marine fish species which constitute 83% of the total landings in Santos (State of São Paulo, Brazil) with their corresponding scientific names. Also for the three species of shrimps, which represent 8% of the total landings — Santos (1952), Lara (1948), Carvalho (1957).

Common name	*Scientific name*
Albacora branca / Albacora de laje — Albacora	*Germo alalunga* / *Neothunnus albacore*
Sardinha	*Sardinella allecia*
Corvina	*Micropogon furnieri*
Pescada Foguete	*Macrodon ancylodon*
Goete	*Cynoscion petranus*
Tainha	*Mugil brasiliensis*
Cação	Various species including:
Cação pinto	*Scyliorhinus haeckelii*
Cação lixa	*Nebrius cirratum*
Cação anequim	*Carcharodon carcharias*
Cação rapôsa	*Alopias vulpinus*
Cação frango	*Scoliodon terrae novae*
Cação marracho	*Eulamia lamia*
Cação serra garoupa	*Eulamia limbata*
Cação martelo	*Sphyrna zygaena*
Cação bagre	*Squalus fernandinus*
Cação sebastião	*Mustelus canis*

SHRIMPS

Camarão Sete Barbas	*Xyphopenaeus kroyeri*
Camarão Rosa	*Penaeus brasiliensis*
Camarão Legítimo	*Penaeus setiferus*

APPENDIX II

Mistura is the name under which boxes of mixed species are sold. Included are the young, small fish of economically important species such as *Corvina, Goete* and *Pescada Foguete.* The larger proportion of *Mistura* is, however, made up of species which, although adult, are small or are regarded as poor tasting. The commonest species found in *Mistura* are, in decreasing order of importance:

01 — Roncador (*Conodon nobilis*)

02 — Betara (*Menticirrhus americanus*)

03 — Oveva (*Larimus breviceps*)

04 — Caratinga (*Diapterus brasilianus*)

05 — Corcoroca (*Haemulon sciurus*)

06 — Bagres (Species of the Genus: *Bagre, Arius, Genidens* and *Netuma*)

07 — Corvina (*Micropogon furnieri*)

08 — Galos (*Selene vomer, Vomer setapinnis* and *Alectis ciliaris*)

09 — Palombeta (*Chloroscombrus chrysurus*)

10 — Maria Luísa (*Paralonchurus brasiliensis*)

11 — Gordinho (*Preprilus paru*)

12 — Goete (*Cynoscion petranus*)

13 — Pescada Foguete (*Macrodon ancylodon*)

14 — Paru (*Pomacanthus arcuatus*)

15 — Others (composed by 26 species approximately)

FIGURE 1

(*a, b, c, d*)

Charts showing the weight of fish (in tons) landed from each statistical rectangle during the period July 1958-June 1959.

a) Corvina *b*) Goete *c*) Pescada Foguete *d*) Sardine.

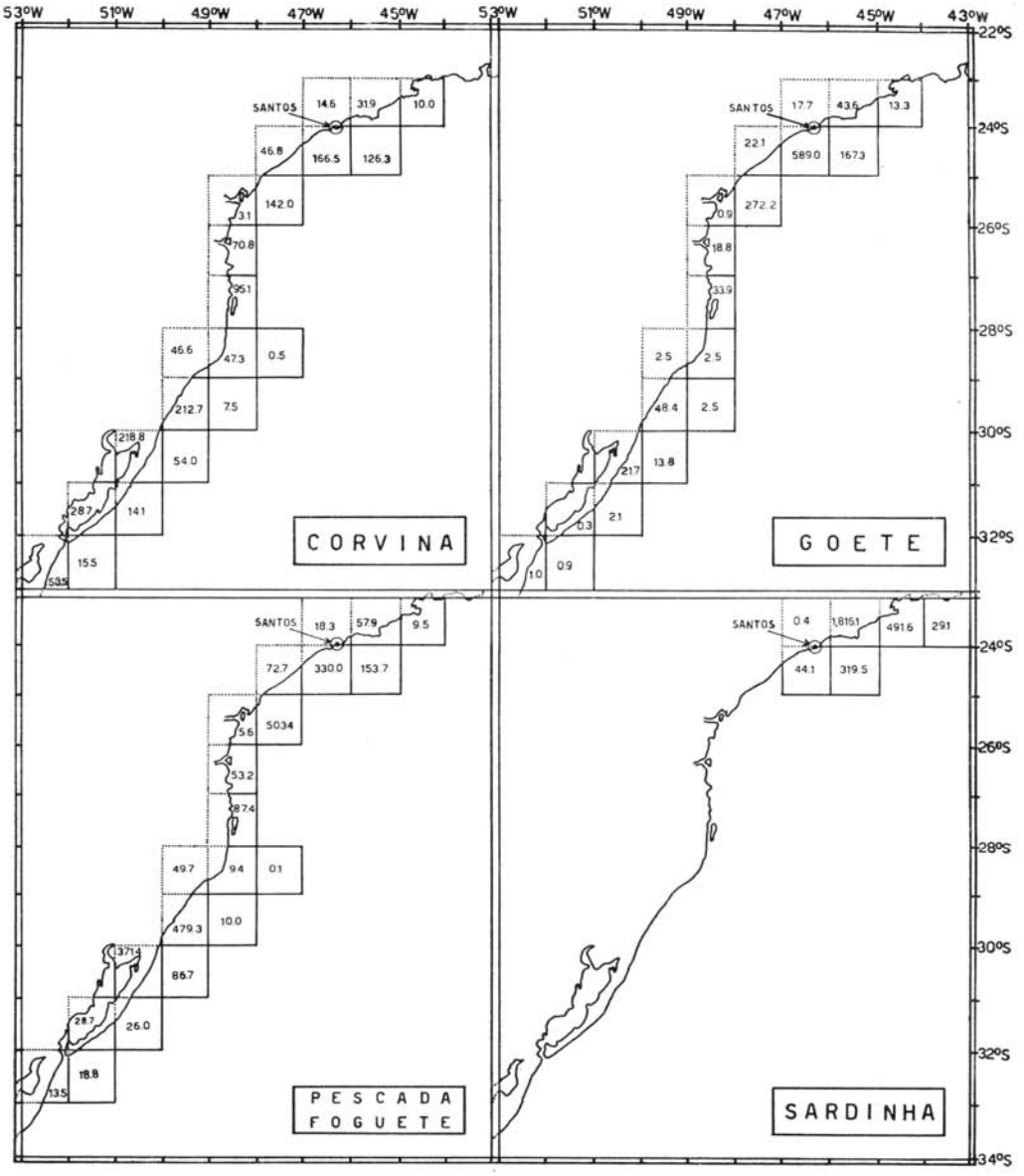

53°W
51°W
49°W
47°W
45°W
43°W
22°S
24°S
26°S
28°S
30°S
32°S
34°S
SANTOS
14.6
31.9
10.0
46.8
166.5
126.3
3.1
142.0
70.8
95.1
46.6
47.3
0.5
212.7
7.5
218.8
54.0
28.7
14.1
15.5
5.3.5
CORVINA
SANTOS
17.7
43.5
13.3
22.1
589.0
167.3
0.9
272.2
18.8
33.9
2.5
2.5
48.4
2.5
21.7
13.8
0.3
2.1
1.0
0.9
GOETE
SANTOS
18.3
57.9
9.5
72.7
330.0
153.7
5.6
50.34
53.2
87.4
49.7
9.4
0.1
479.3
10.0
137.4
86.7
28.7
26.0
18.8
13.5
PESCADA
FOGUETE
SANTOS
0.4
1,815.1
491.6
29.1
44.1
319.5
SARDINHA

FIGURE 1

(*e, f, g, h*)

Charts showing the weight of fish (in tons) landed from each statistical rectangle during the period July 1958-June 1959.

e) Camarão Rosa *f*) Camarão Legitimo *g*) Camarão 7 Barbas

h) Tainha.

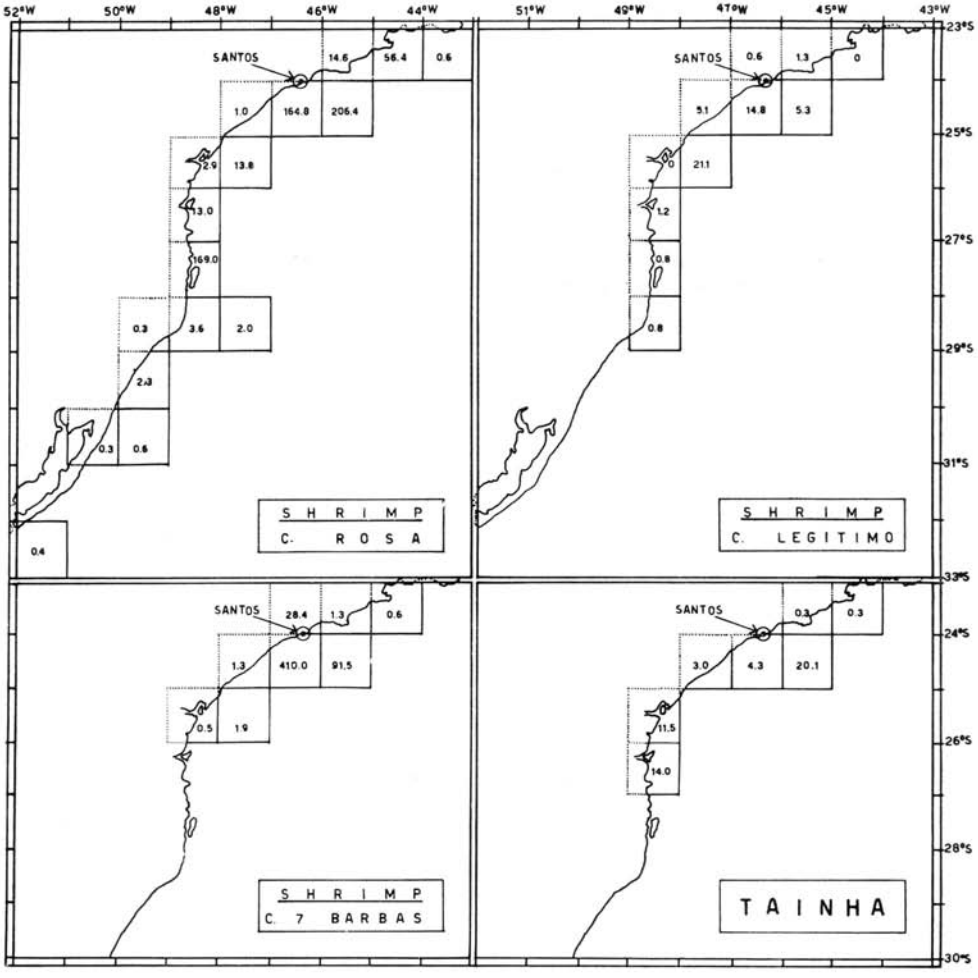

52°W
50°W
48°W
46°W
44°W
SANTOS
14.6
56.4
0.6
1.0
164.8
206.4
2.9
13.8
13.0
169.0
0.3
3.6
2.0
2.3
0.3
0.6
0.4
SHRIMP
C. ROSA
51°W
49°W
47°W
45°W
43°W
SANTOS
0.6
1.3
0
5.1
14.8
5.3
0
21.1
1.2
0.8
0.8
SHRIMP
C. LEGITIMO
23°S
25°S
27°S
29°S
31°S
33°S
SANTOS
28.4
1.3
0.6
1.3
410.0
91.5
0.5
1.9
SHRIMP
C. 7 BARBAS
SANTOS
0.3
0.3
3.0
4.3
20.1
11.5
14.0
TAINHA
24°S
26°S
28°S
30°S

FIGURE 1

(i)

Chart showing the weight of Mistura (in tons) landed from each statistical rectangle during the period July 1958-June 1959.

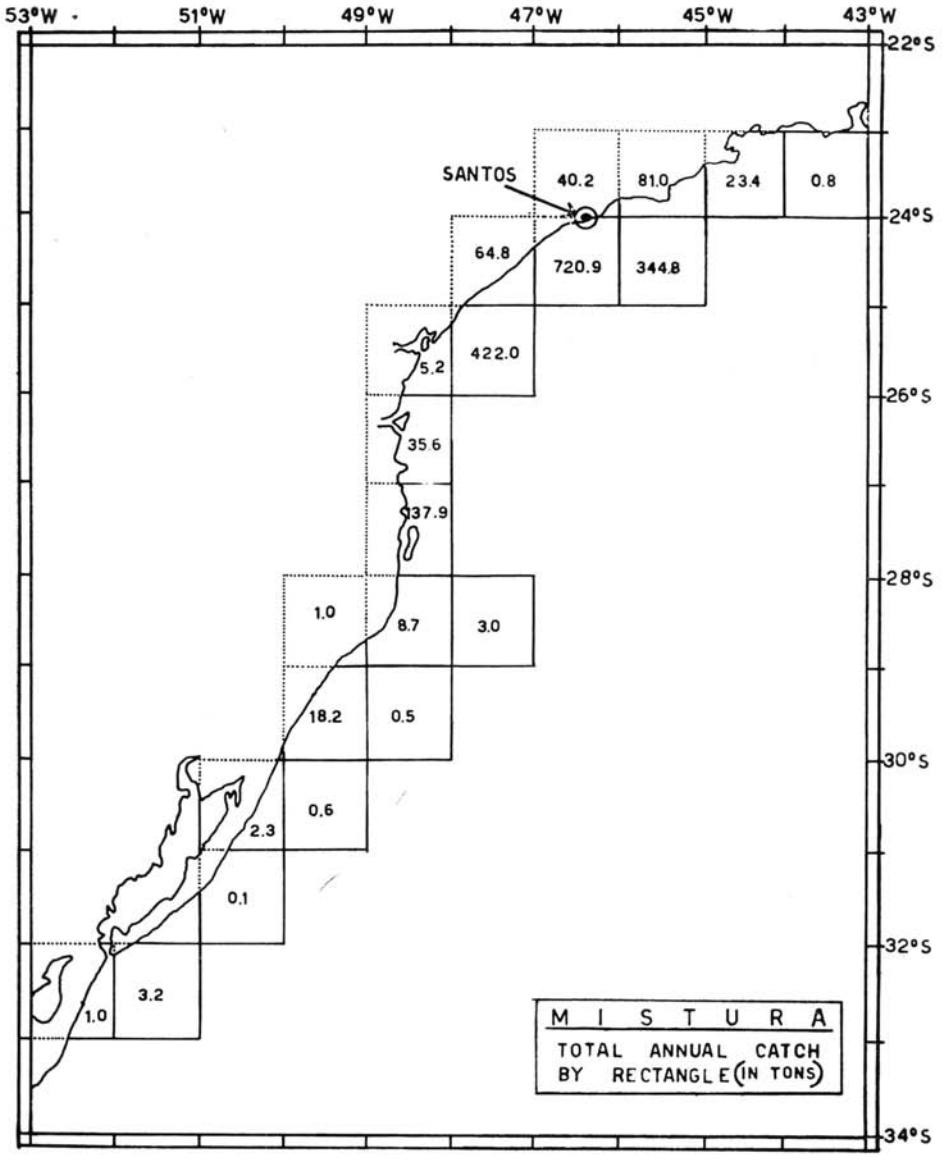

53°W
51°W
49°W
47°W
45°W
43°W
22°S
24°S
26°S
28°S
30°S
32°S
34°S
SANTOS
40.2
81.0
23.4
0.8
64.8
720.9
344.8
5.2
422.0
35.6
37.9
1.0
8.7
3.0
18.2
0.5
2.3
0.6
0.1
1.0
3.2
M I S T U R A
TOTAL ANNUAL CATCH
BY RECTANGLE (IN TONS)

FIGURE 1

(*j*)

Chart showing the weight of Albacore (in tons) landed from each statistical rectangle during the period July 1958-June 1959.

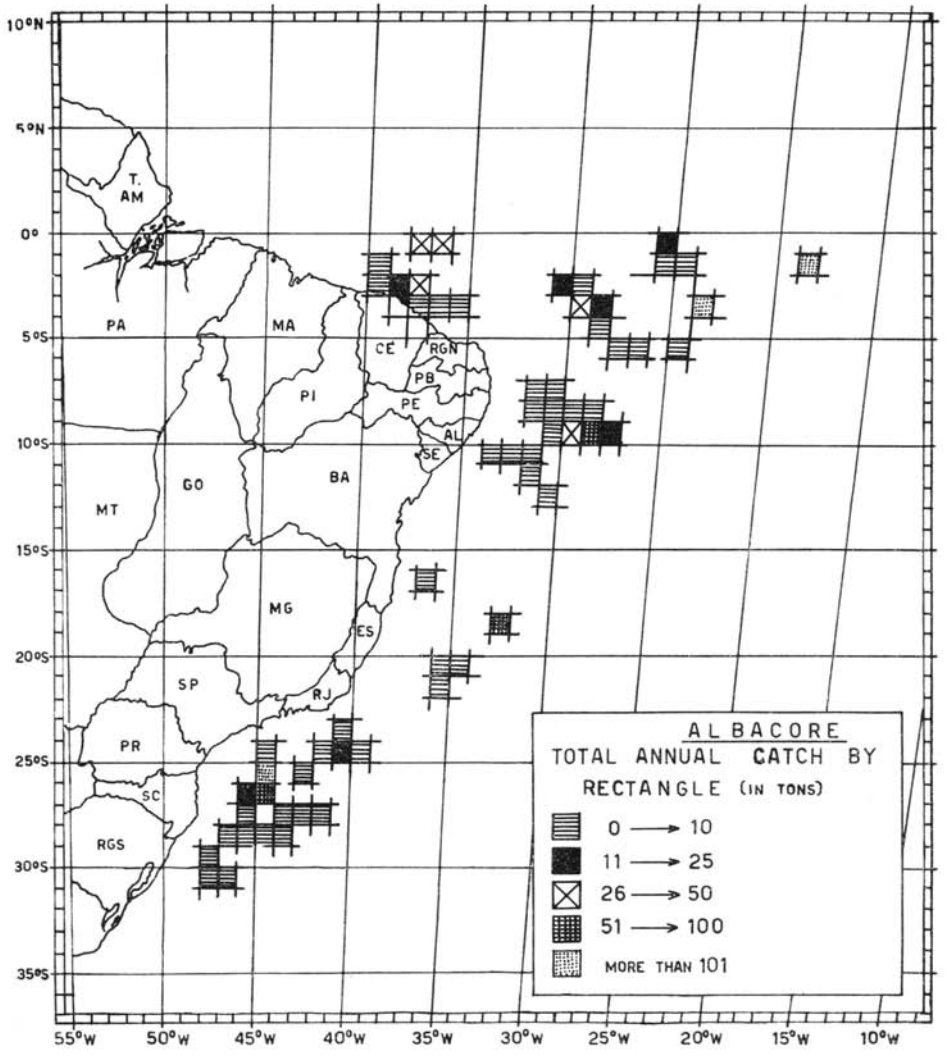

10°N
5°N
0°
5°S
10°S
15°S
20°S
25°S
30°S
35°S
55°W
50°W
45°W
40°W
35°W
30°W
25°W
20°W
15°W
10°W
T.
AM
PA
MA
CE
RGN
PB
PE
AL
SE
PI
BA
GO
MT
MG
ES
SP
RJ
PR
SC
RGS
ALBACORE
TOTAL ANNUAL CATCH BY
RECTANGLE (IN TONS)
0 → 10
11 → 25
26 → 50
51 → 100
MORE THAN 101

FIGURE 1

(*k*)

Chart showing the weight of Cação (in tons) landed from each statistical rectangle during the period July 1958-June 1959.

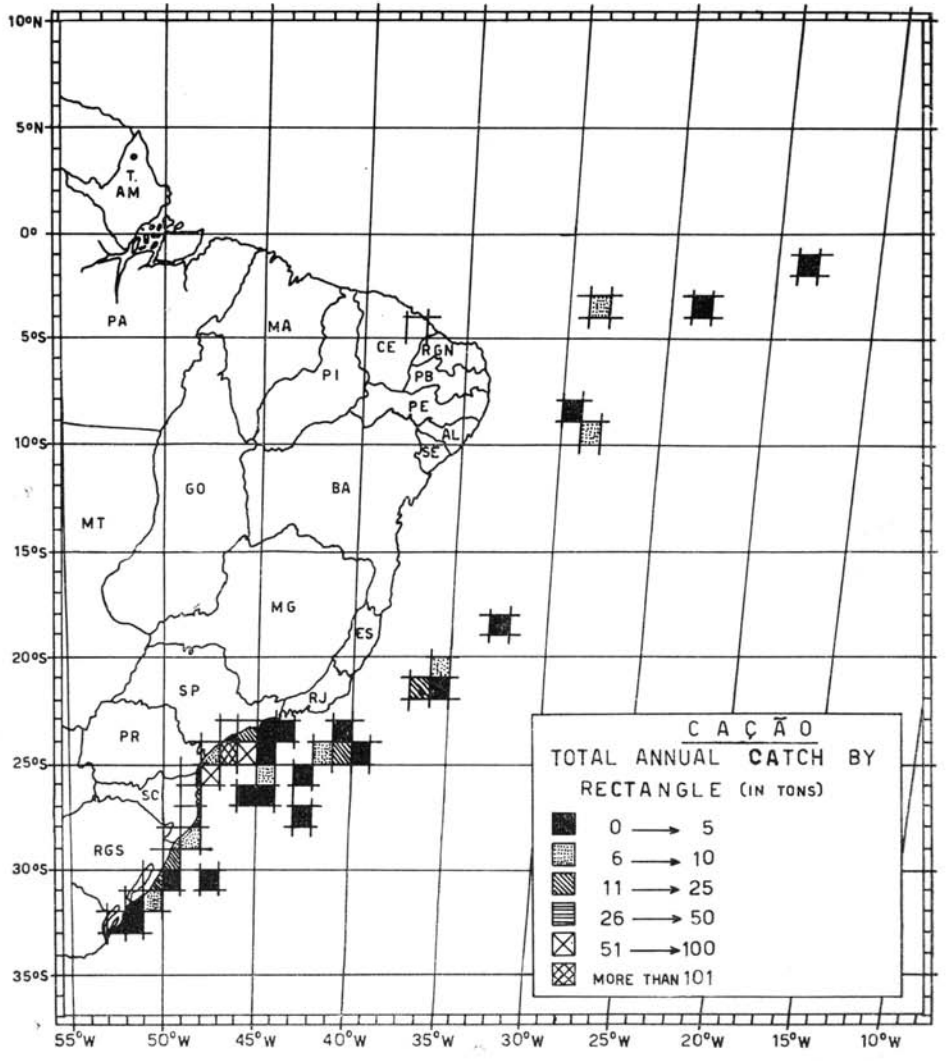

10°N
5°N
0°
5°S
10°S
15°S
20°S
25°S
30°S
35°S
55°W
50°W
45°W
40°W
35°W
30°W
25°W
20°W
15°W
10°W
T.
AM
PA
MA
CE
RGN
PB
PE
AL
SE
PI
GO
BA
MT
MG
ES
SP
RJ
PR
SC
RGS
CAÇÃO
TOTAL ANNUAL CATCH BY
RECTANGLE (IN TONS)
0 → 5
6 → 10
11 → 25
26 → 50
51 → 100
MORE THAN 101

FIGURE 2

Chart showing the number of hours fishing (to nearest 1,000) in each statistical rectangle by each type of fishing gear during the period July 1958-June 1959.

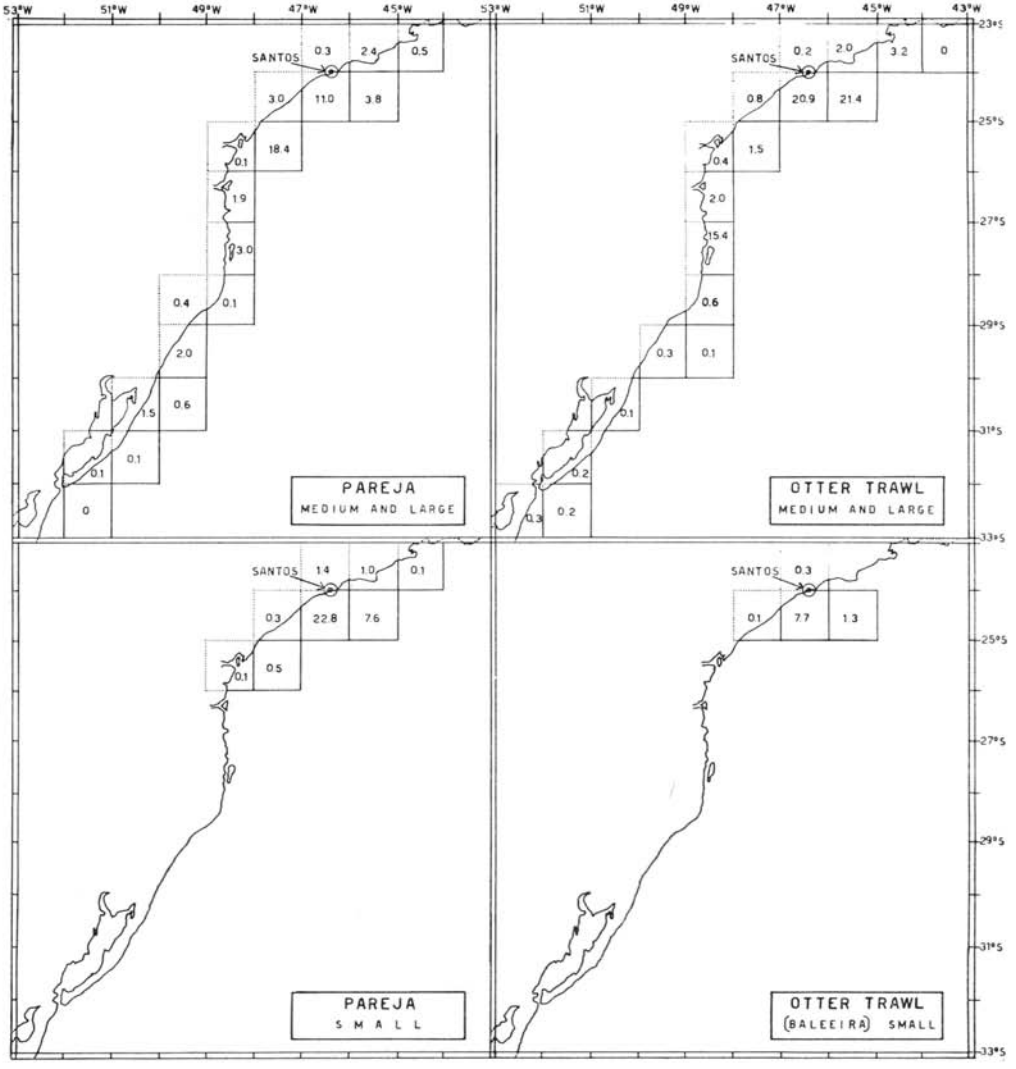

53°W
51°W
49°W
47°W
45°W
43°W
23°S
25°S
27°S
29°S
31°S
33°S
SANTOS
0.3
2.4
0.5
3.0
11.0
3.8
18.4
0.1
1.9
3.0
0.4
0.1
2.0
0.6
1.5
0.1
0.1
0
PAREJA
MEDIUM AND LARGE
SANTOS
0.2
2.0
3.2
0
0.8
20.9
21.4
1.5
0.4
2.0
15.4
0.6
0.3
0.1
0.1
0.2
0.3
0.2
OTTER TRAWL
MEDIUM AND LARGE
SANTOS
1.4
1.0
0.1
0.3
22.8
7.6
0.1
0.5
PAREJA
SMALL
SANTOS
0.3
0.1
7.7
1.3
OTTER TRAWL
(BALEEIRA) SMALL

FIGURE 3

(*a*)

Average weight landed per hour of fishing from each statistical rectangle during 12 months. — CORVINA

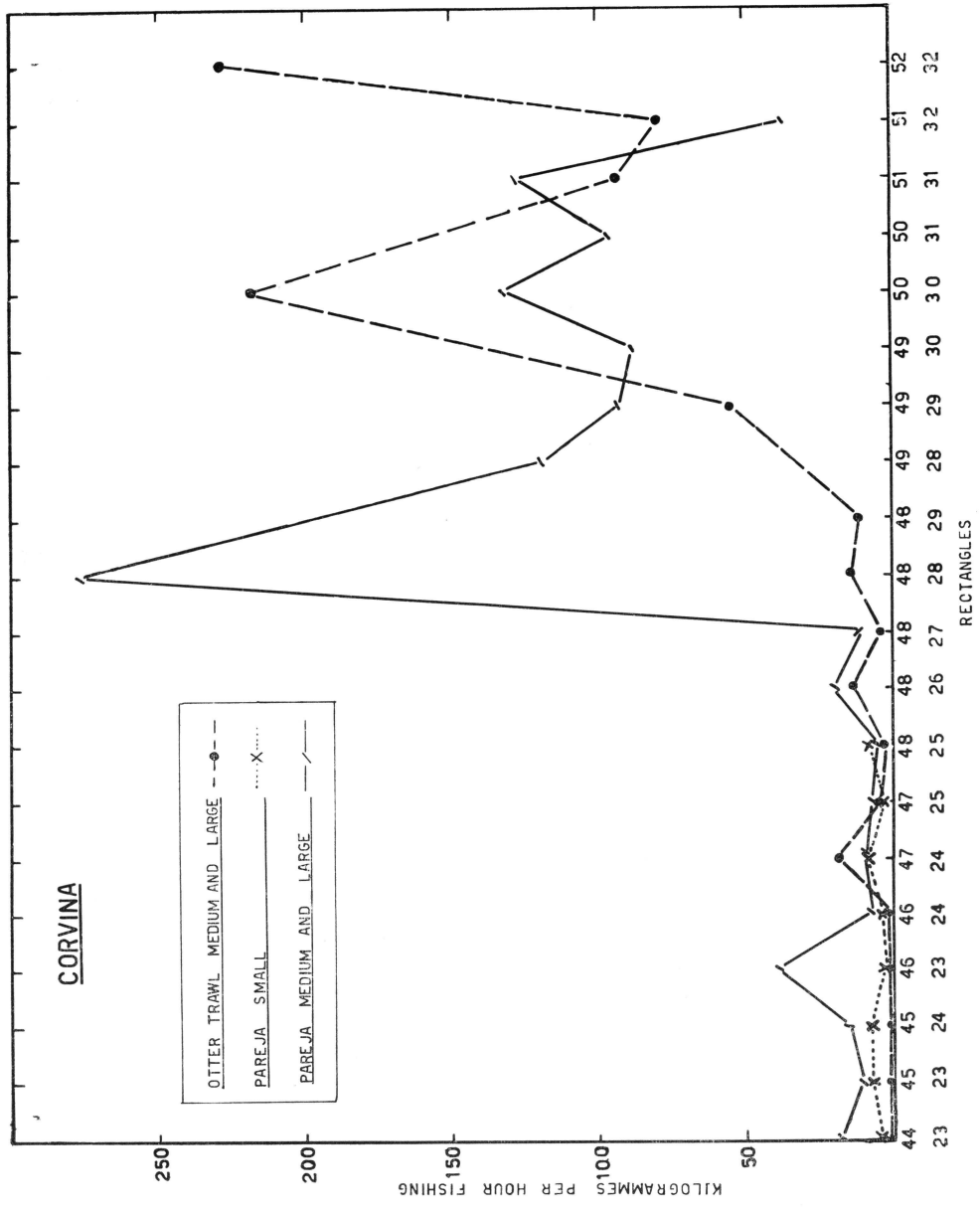

CORVINA
OTTER TRAWL MEDIUM AND LARGE
PAREJA SMALL
PAREJA MEDIUM AND LARGE
KILOGRAMMES PER HOUR FISHING
250
200
150
100
50
RECTANGLES
44 45 46 47 48 49 50 51 52
23 24 23 24 25 26 27 28 29 30 31 32 32

FIGURE 3

(*b*)

Average weight landed per hour of fishing from each statistical rectangle during 12 months. — PESCADA FOGUETE

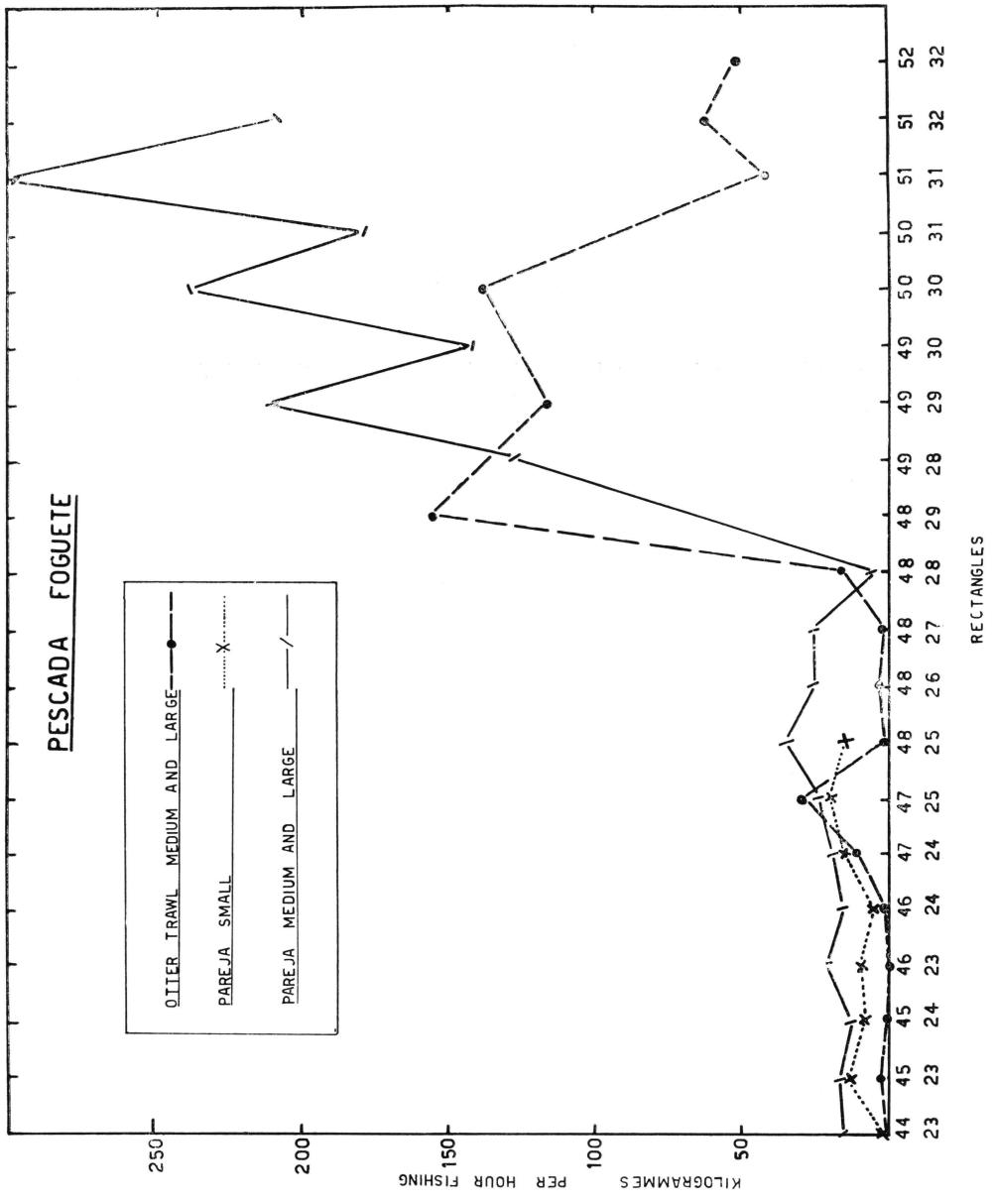

PESCADA FOGUETE
OTTER TRAWL MEDIUM AND LARGE
PAREJA SMALL
PAREJA MEDIUM AND LARGE
KILOGRAMMES PER HOUR FISHING
250
200
150
100
50
RECTANGLES
44 45 46 47 48 49 50 51 52
23 24 25 26 27 28 29 30 31 32

FIGURE 3

(*c*)

Average weight landed per hour of fishing from each statistical rectangle during 12 months. — GOETE

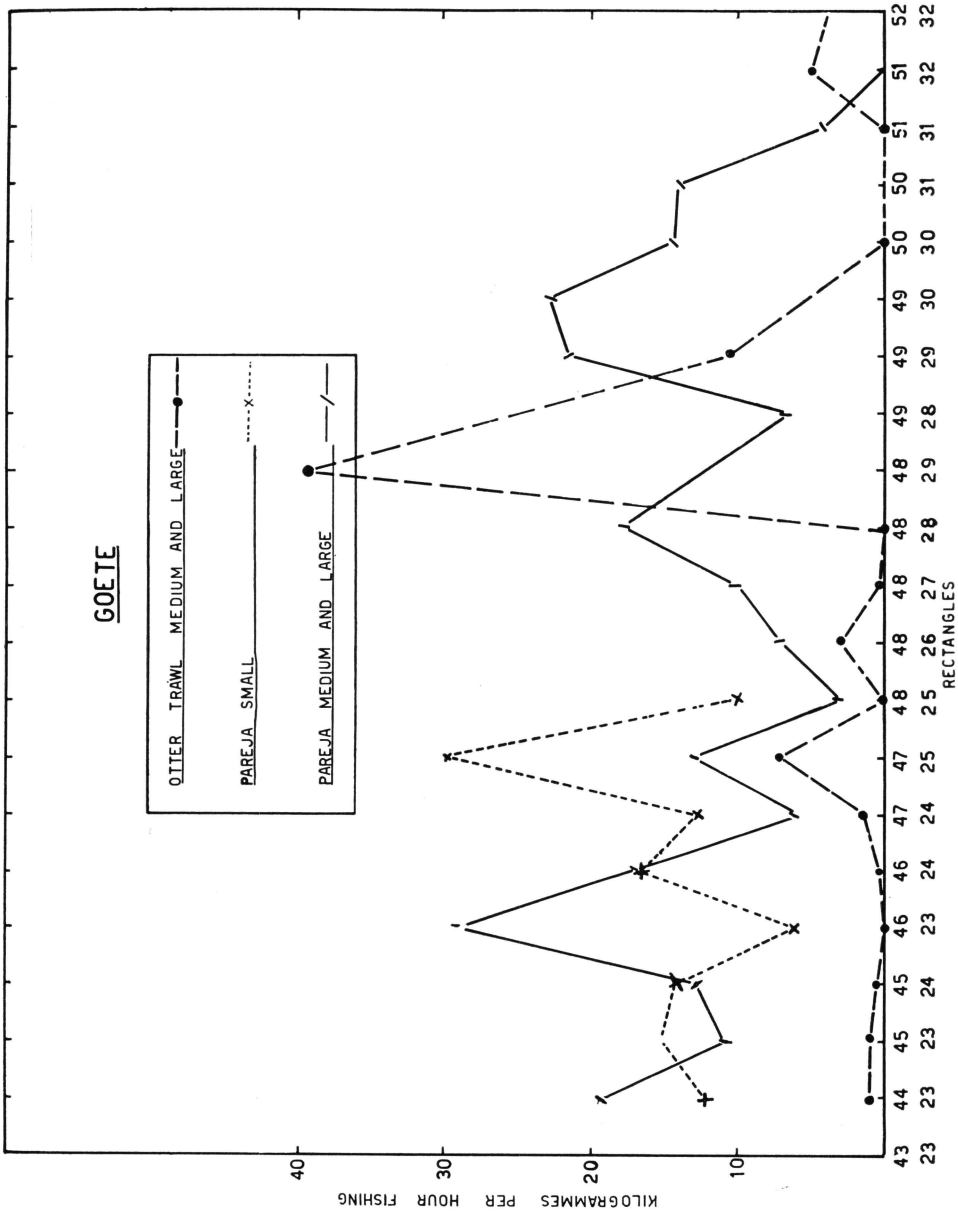

GOETE
OTTER TRAWL MEDIUM AND LARGE
PAREJA SMALL
PAREJA MEDIUM AND LARGE
KILOGRAMMES PER HOUR FISHING
10
20
30
40
RECTANGLES
43 44 45 46 47 48 49 50 51 52
23 23 23 24 24 24 25 26 27 28 29 30 31 32

FIGURE 3

(*d*)

Average weight landed per hour of fishing from each statistical rectangle during 12 months. — MISTURA

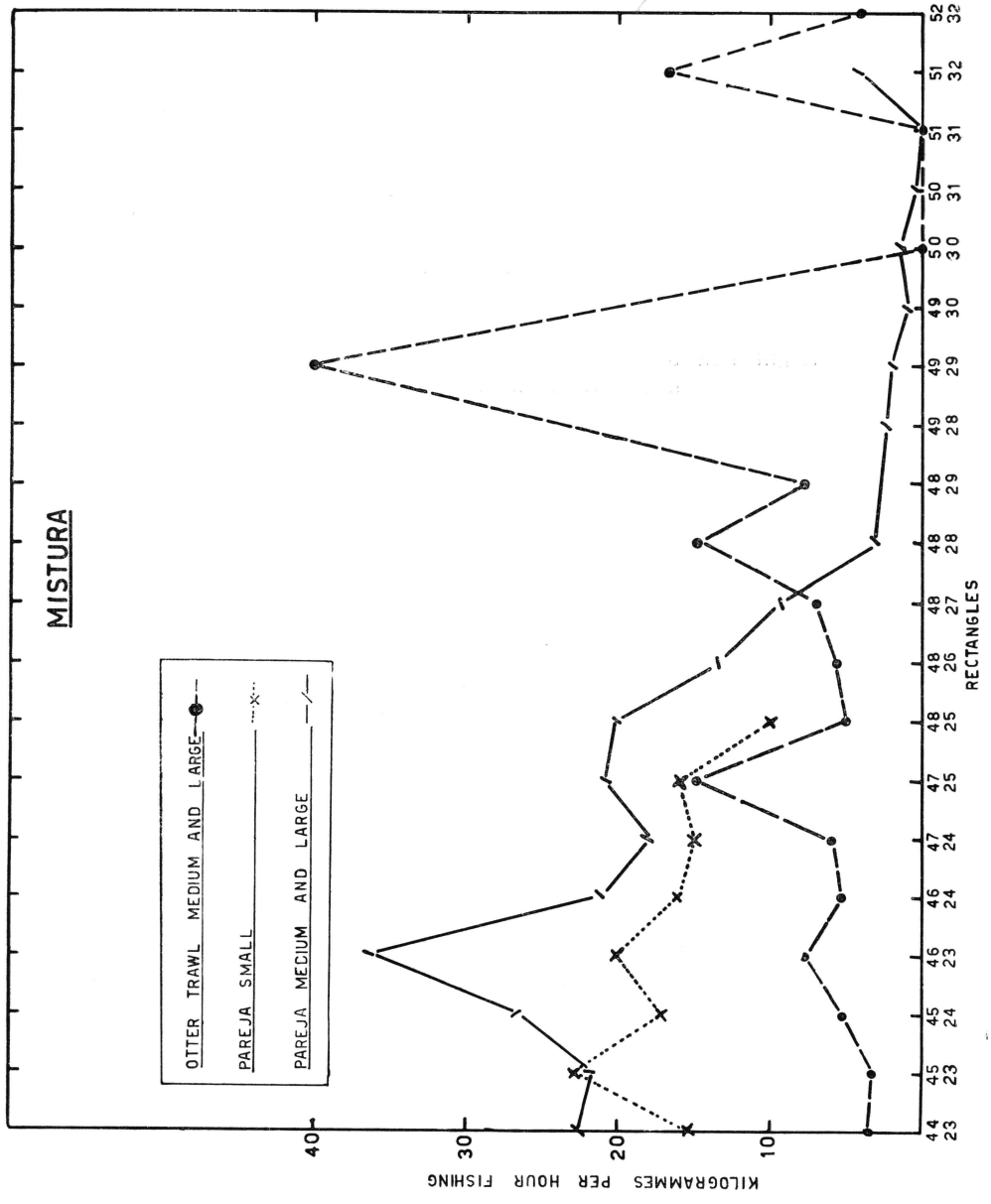

MISTURA
OTTER TRAWL MEDIUM AND LARGE
PAREJA SMALL
PAREJA MECIUM AND LARGE
KILOGRAMMES PER HOUR FISHING
RECTANGLES

FIGURE 3

(*e*)

Average weight landed per hour of fishing from each statistical rectangle during 12 months. — CAMARÃO 7 BARBAS
CAMARÃO LEGíTIMO
CAMARÃO ROSA

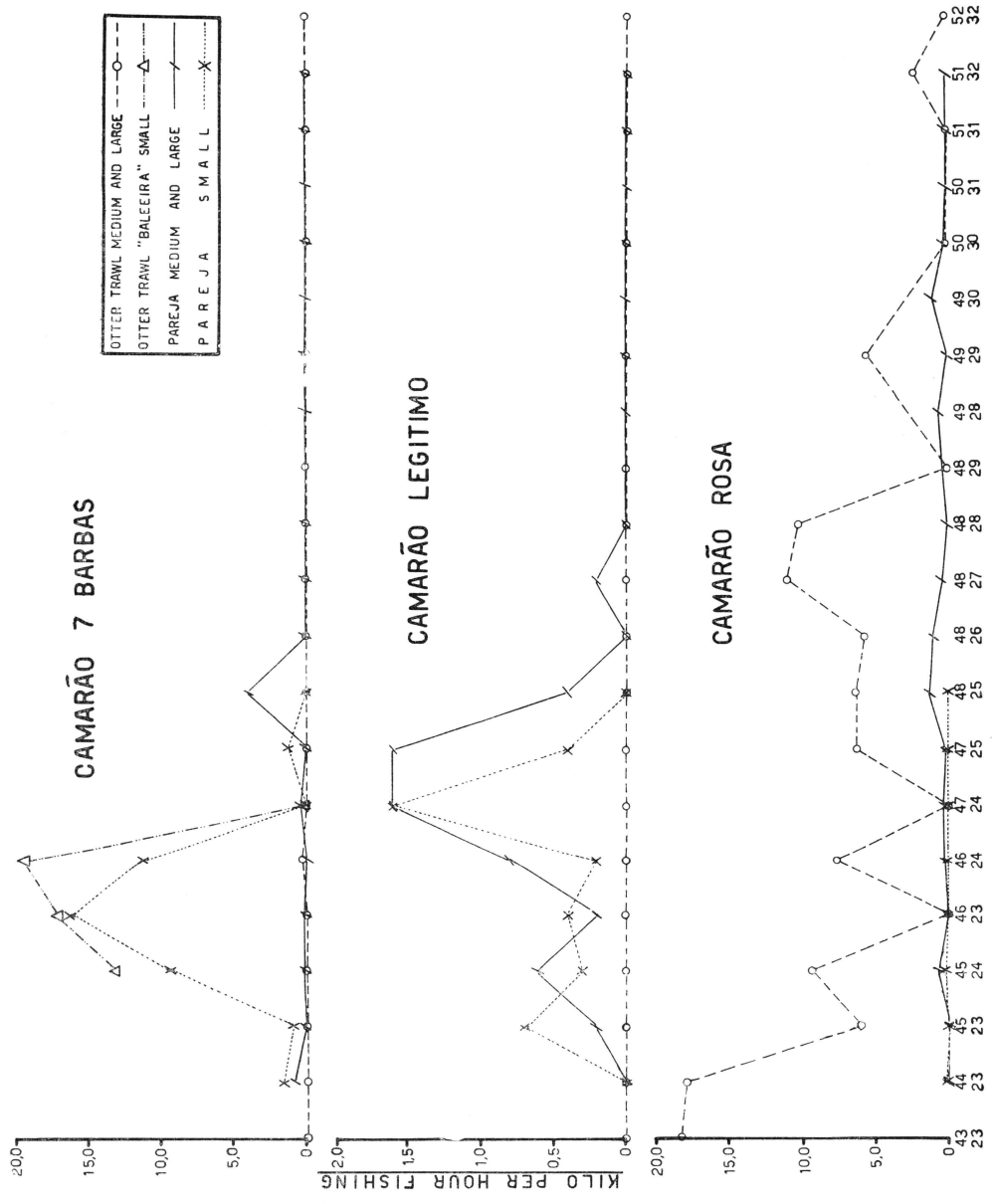

OTTER TRAWL MEDIUM AND LARGE
OTTER TRAWL "BALEEIRA" SMALL
PAREJA MEDIUM AND LARGE
P A R E J A S M A L L
CAMARÃO 7 BARBAS
CAMARÃO LEGITIMO
CAMARÃO ROSA
KILO PER HOUR FISHING
20,0
15,0
10,0
5,0
0
2,0
1,5
1,0
0,5
0
43 23
44 23
45 23
45 24
45 23
46 24
46 23
47 24
47 25
48 25
48 26
48 27
48 28
48 29
49 28
49 29
49 30
50 30
50 31
51 31
51 32
52 32

FIGURE 4

(*a*)

Average landing per hour of fishing by the medium and large Parejas (above) and the medium and large trawlers (below) for each month. The northern, central and southern groups of statistical rectangles are shown separately.

CORVINA

FIGURE 4

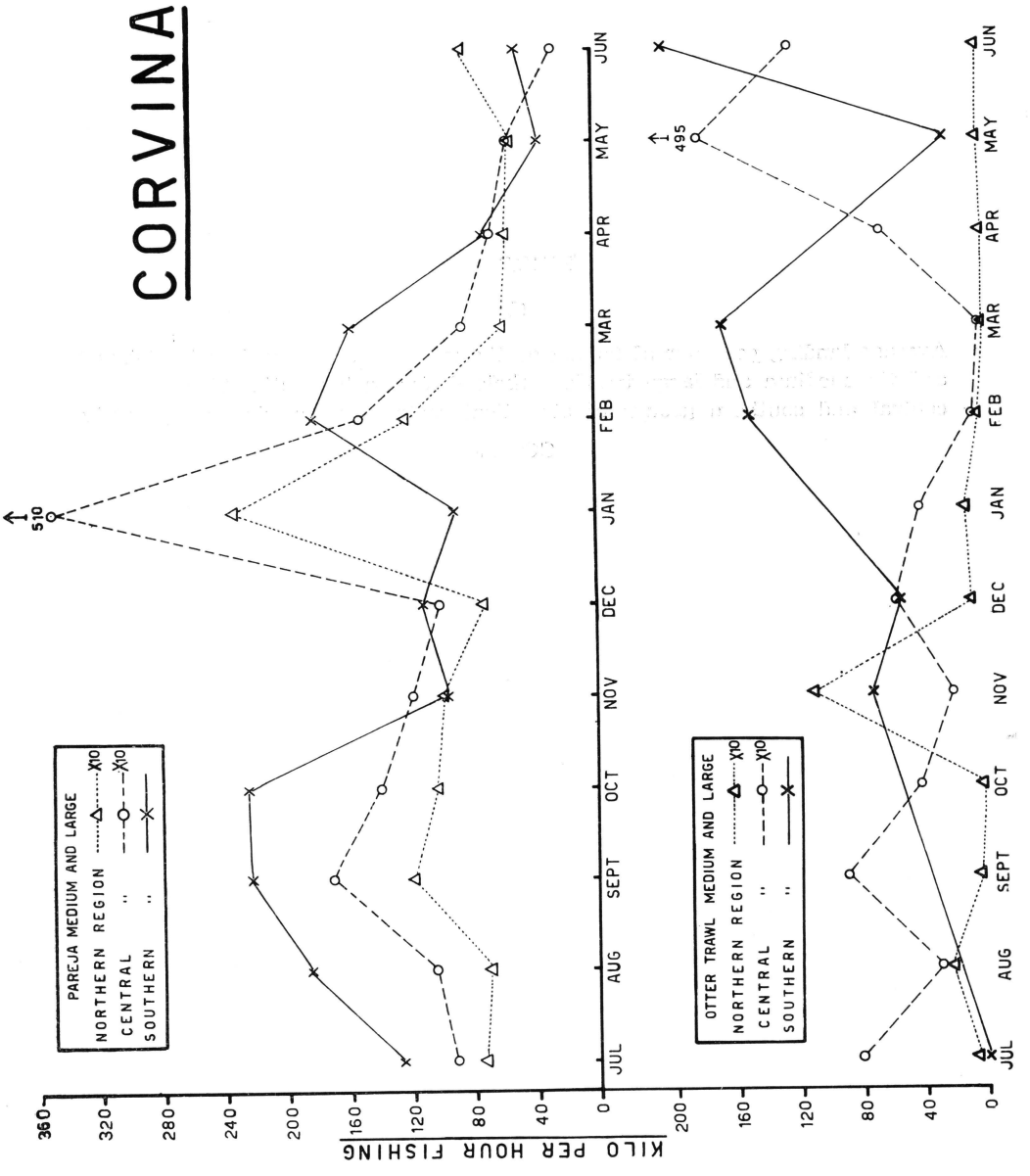

CORVINA
PAREJA MEDIUM AND LARGE
NORTHERN REGION X10
CENTRAL " X10
SOUTHERN "
OTTER TRAWL MEDIUM AND LARGE
NORTHERN REGION X10
CENTRAL " X10
SOUTHERN "
KILO PER HOUR FISHING
510
495
JUL AUG SEPT OCT NOV DEC JAN FEB MAR APR MAY JUN
0 40 80 120 160 200 240 280 320 360

FIGURE 4

(*b*)

Average landing per hour of fishing by the medium and large Parejas (above) and the medium and large trawlers (below) for each month. The northern, central and southern groups of statistical rectangles are shown separately.

GOETE

FIGURE 4

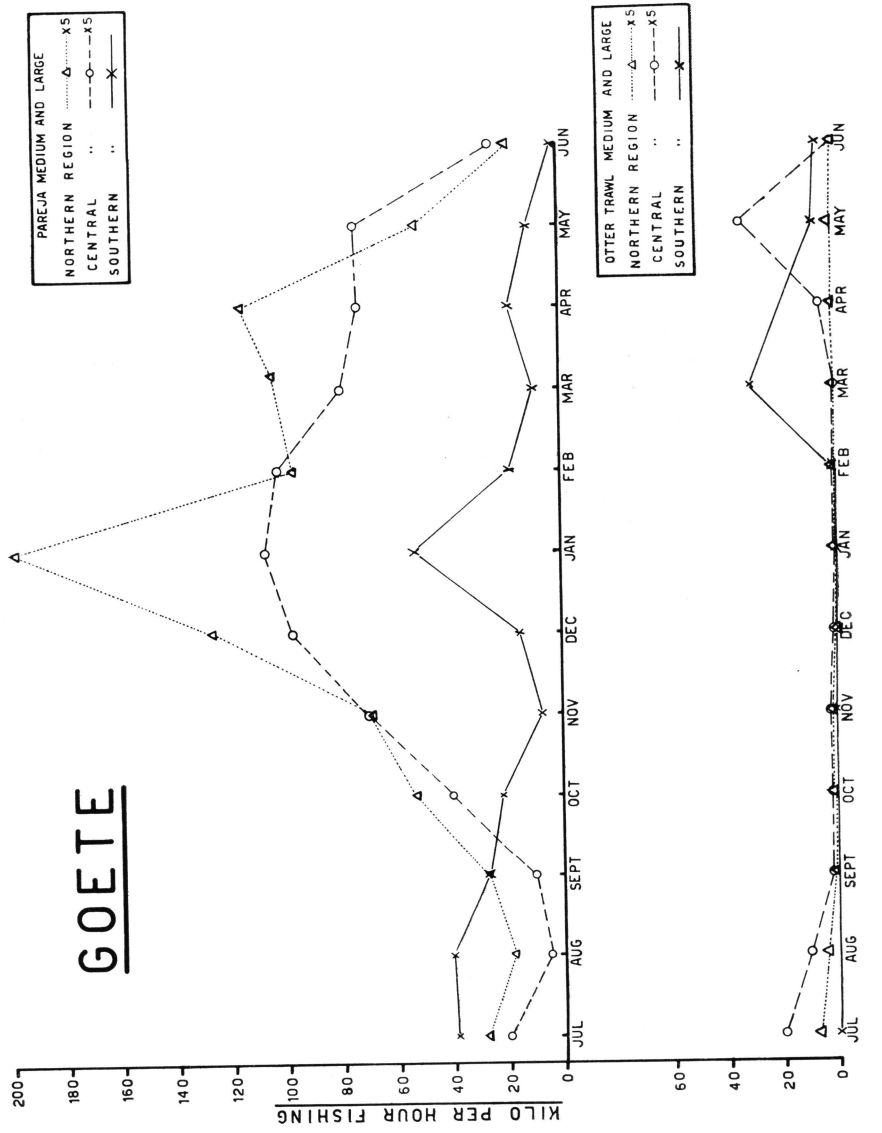

GOETE
PAREJA MEDIUM AND LARGE
NORTHERN REGION ..... XS
CENTRAL .. ---XS
SOUTHERN .. ——
OTTER TRAWL MEDIUM AND LARGE
NORTHERN REGION ..... XS
CENTRAL .. ---XS
SOUTHERN .. ——
KILO PER HOUR FISHING
0 20 40 60 80 100 120 140 160 180 200
JUL AUG SEPT OCT NOV DEC JAN FEB MAR APR MAY JUN
0 20 40 60
JUL AUG SEPT OCT NOV DEC JAN FEB MAR APR MAY JUN

FIGURE 4

(*c*)

Average landing per hour of fishing by the medium and large Parejas (above) and the medium and large trawlers (below) for each month. The northern, central and southern groups of statistical rectangles are shown separately.

PESCADA FOGUETE

FIGURE 4

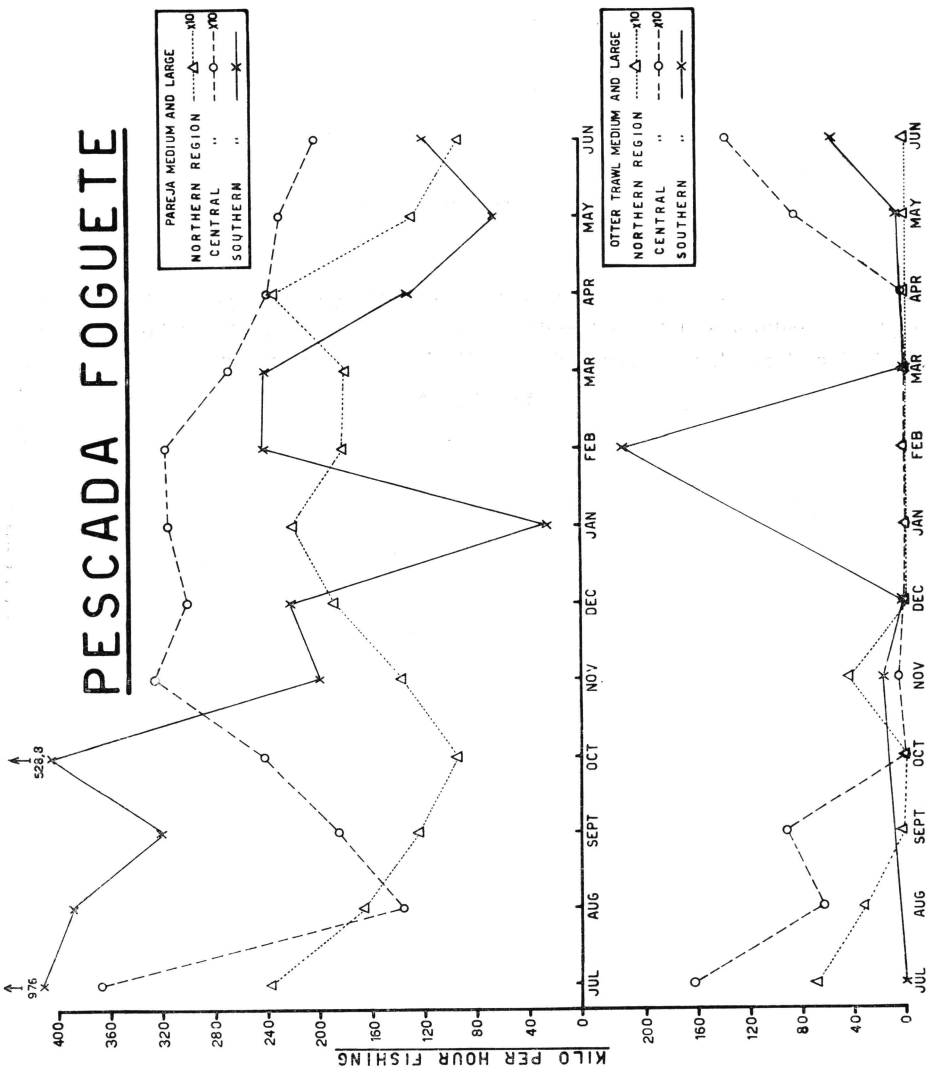

PESCADA FOGUETE
PAREJA MEDIUM AND LARGE
NORTHERN REGION x10
CENTRAL " x10
SOUTHERN "
OTTER TRAWL MEDIUM AND LARGE
NORTHERN REGION x10
CENTRAL " x10
SOUTHERN "
KILO PER HOUR FISHING
976
528,8
JUL AUG SEPT OCT NOV DEC JAN FEB MAR APR MAY JUN
0 40 80 120 160 200 240 280 320 360 400

FIGURE 4

(*d*)

Average landing per hour of fishing by the medium and large Parejas (above) and the medium and large trawlers (below) for each month. The northern, central and southern groups of statistical rectangles are shown separately.

MISTURA

FIGURE 4

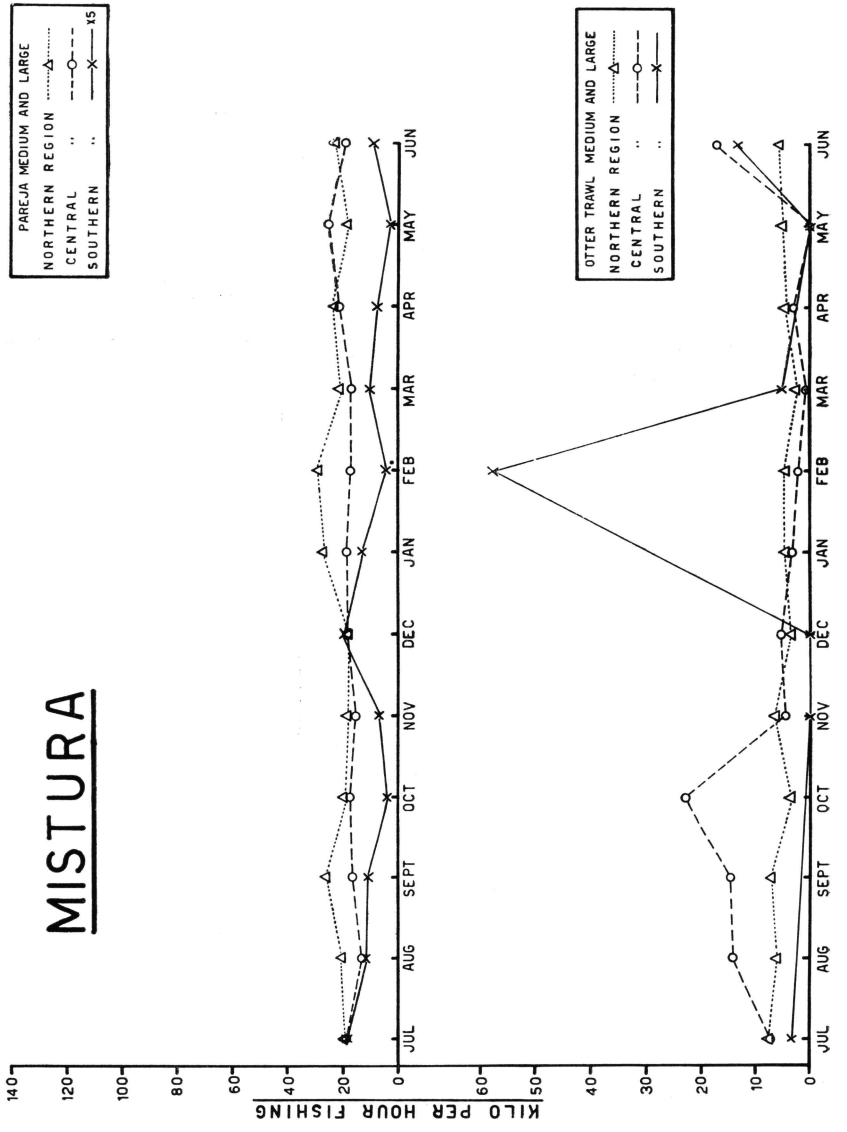

MISTURA
PAREJA MEDIUM AND LARGE
NORTHERN REGION
CENTRAL
SOUTHERN
X5
OTTER TRAWL MEDIUM AND LARGE
NORTHERN REGION
CENTRAL
SOUTHERN
KILO PER HOUR FISHING
JUL
AUG
SEPT
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN

FIGURE 4

(*e*)

Average landing per hour of fishing by the medium and large trawlers (above) and the medium and large Parejas (below) for each month. The northern, central and southern groups of statistical rectangles are shown separately.

CAMARÃO ROSA

FIGURE 4

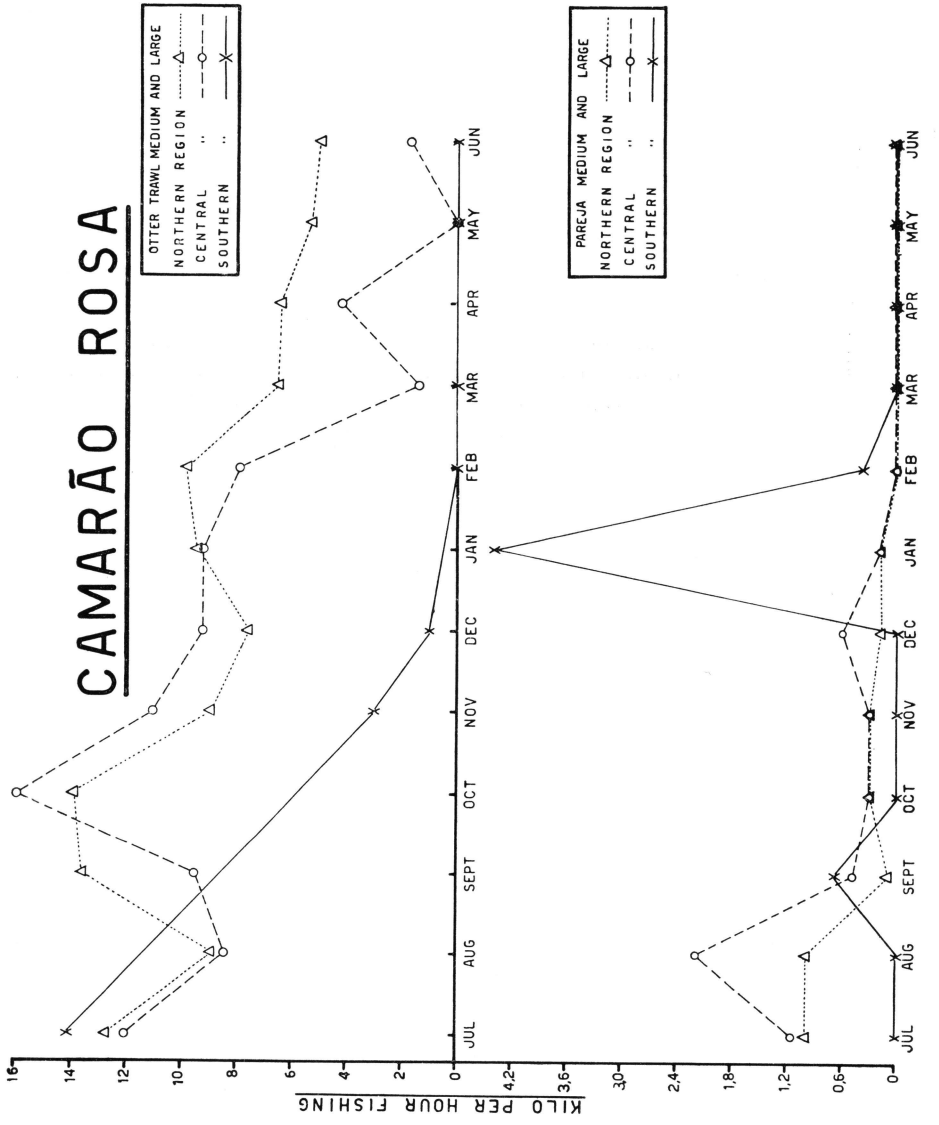

CAMARÃO ROSA
OTTER TRAWL MEDIUM AND LARGE
NORTHERN REGION
CENTRAL
SOUTHERN
PAREJA MEDIUM AND LARGE
NORTHERN REGION
CENTRAL
SOUTHERN
KILO PER HOUR FISHING
JUL
AUG
SEPT
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN

FIGURE 4

(*f*)

Average landing per hour of fishing by the medium and large Parejas (above) and the medium and large trawlers (below) for each month. The northern, central and southern groups of statistical rectangles are shown separately.

CAMARÃO LEGÍTIMO

FIGURE 4

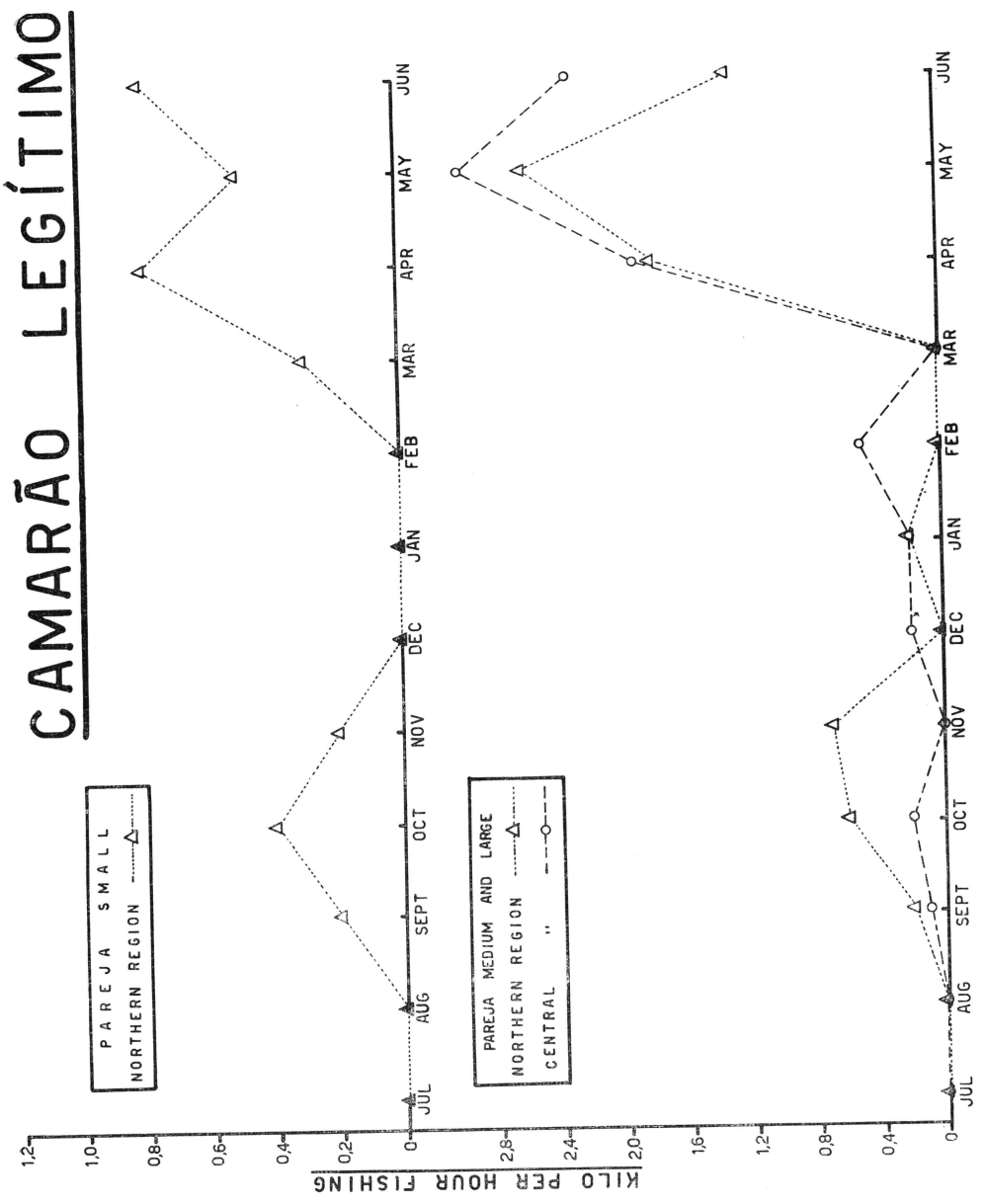

CAMARÃO LEGÍTIMO
PAREJA SMALL
NORTHERN REGION
PAREJA MEDIUM AND LARGE
NORTHERN REGION
CENTRAL
KILO PER HOUR FISHING
JUL
AUG
SEPT
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN

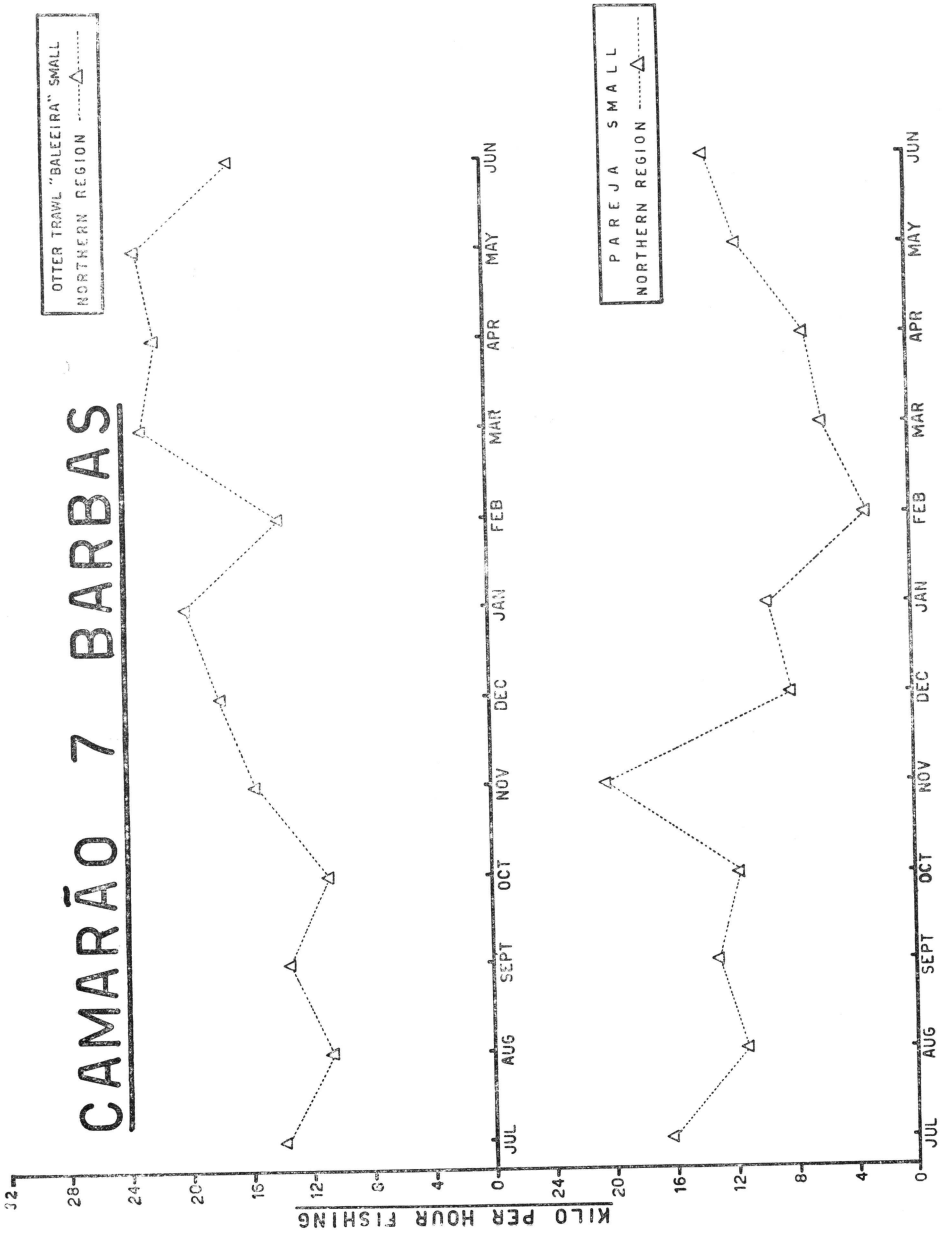
FIGURE 4

(*g*)

Average landing per hour of fishing by the medium and large trawlers (above) and the medium and large Parejas (below) for each month. The northern, central and southern groups of statistical rectangles are shown separately.

CAMARÃO 7 BARBAS

FIGURE 4


CAMARÃO 7 BARBAS
OTTER TRAWL "BALEEIRA" SMALL
NORTHERN REGION
PAREJA SMALL
NORTHERN REGION
KILO PER HOUR FISHING
JUL
AUG
SEPT
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN