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FIRST COMMERCIAL RESULTS OF THE INTRODUCTION
OF PURSE-SEINES IN THE PIROGUE-FISHERIES OF
SENEGAL

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Introduction

Since 1969 attempts were made in order to introduce purse-seines in the Senegalese artisanal sea-fisheries on board of the traditional pirogues (canoes). Trials and demonstrations were realized during May 1969, April 1970, May to July 1971 and April-May 1972. With the trials several Senegalese fishermen were trained to the operation of the purse-seine on board of the pirogues.

After the last trials, during April and May 1972 the development of the seine, its adaptation to the pirogues and the training of crews were considered to be sufficiently far advanced. The decision was taken to allocate a few nets to Senegalese fishermen in order to be used freely on behalf of commercial fishing. Three purse-seines were constructed by the crews under the supervision of the projects fishing-gear technologist with materials put at their disposal by the project. By the end of June the first net was ready and in the middle of July the third became operational.

These nets were allocated to the chiefs of the crews on certain conditions, among which was mentioned the obligation to provide all the desired information on the fishing operations and their results.

A provisional report on the results obtained between the end of June and the beginning of October (Crasset, 1972b) was published during October 1972. During November 1972 a fourth seine was allocated.

The present report covers the results of the fishing-operations by the four nets from the beginning until the 31th December 1972. It provides the quantities caught and the catch composition for each net by monthly periods, as well as the mean catches per day and per haul. Comparisons were made with the results of the traditional fisheries (surrounding gillnets). Commercial results are given in CFA francs and in US dollars.

The selectivity for Sardinella species of the purse-seines compared with the surrounding gillnets is discussed at the hand of samples of length-frequencies.

Acknowledgements

This report is primarily based on the former reports by Grasset and a daily inquiry among the fishermen. On behalf of comparisons the author could make an ample use of several inedited sources of information ,for which he wishes to express his gratitude.

The information on the landings of Sardinella species made with the surrounding gillnets and one of the purse-seines at M'Bour were provided by the Centre de Recherches Océanographiques Dakar Thiaroye (CRODT) which carries out a regular survey of Sardinella landings at the major landing-sites on the Senegalese coast. Actual information which covers also the determination of lengthfrequencies in some catches , was collected by mr.Ibrahima BADIOU and mr.Alassane SYLLA under the supervision of mr.M. ROELY.

Data on the quantities landed at Joal were provided by Mr.A.BLANC , Regional Inspector of the Direction of Oceanography and Sea-fisheries, at the centre of Joal.

The data on the landings of the purse-seines at Joal were kindly collected by mr.Chérif Younous N'DIAYE et Cheikh Sikhe Tidiane M'BAYE.

Fishing operations and fishing places

The pirogues of M'Bour and Joal at the Petit Côte of Senegal regularly go to sea during the early morninghours between 6 and 8 o'clock and in most cases they return the same day at the end of the afternoon between 16 and 19 hours. The pirogues are of the traditional type , about 12 - 14 meters long (see Grasset 1972a). The purse-seines are 200 - 280 meters long and 40 meters deep.

For most of the daily cruises of the purse-seining pirogues the fishingplaces were noted (see also Map). Nearly all these places lie within a 20 n.m. radius from Joal (about 110 km south of Dakar) and practically always in waters less than 20 meters deep.

Fishingplaces in 273 out of 319 cruises were spread as follows:

North of M'Bour	5 cruises	(around N'Gaparou and Yene)
M'Bour to Pointe Sarène	31 cruises	(mainly Banc de M'Bour, Bouée 50 and surroundings of Nianing)
Pointe Sarène	26 cruises	
Pointe Sarène to Joal	54 cruises	(maily Joal and N'Gazobil)
Joal to Samsam	-	
Samsam to Pointe Sangomar	110 cruises	(mainly between Palmarin and Djifere)
Pointe Sangomar	47 cruises	

The distance between M'Bour and Joal is about 18 n.m., between Joal and Palmarin 10 n.m. and between Palmarin and Pointe Sangomar also 10 n.m.

The results of the purse-seine catches

The monthly results for each of the four purse-seines between July and December 1972 are given in tables 1 - 4. A review of the totals is given in table 5. Each of these tables provides :

- a) the quantities of each species landed , expressed in tons
- b) the number of cruises
- c) the number of hauls (not always known)
- d) the percentage of the Sardinella species in the total landing,
- e) the quantities caught per day and per haul
- f) the commercial values for the Sardinella species and the others separately both in CFA francs and US dollars.

At the landing sites the volumes of the catches are usually expressed in numbers of baskets. Sometimes the quantity of fish is estimated on sight considering the volume it occupies in the pirogue. A basket of fish at M'Bour contains about 60 kilos. A basket of fish at Joal is supposed to contain 30 kilo's. The weights per baskets need to be verified, but these relations between volume and weight are accepted by the fishermen and the fishmongers and for this reason may not be far from the truth.

Surrounding gillnets are still prevailing in the artisanal pelagic sea-fisheries at M'Bour and Joal. They capture mainly Sardinella eba and / or Ethmalosa fimbriata (Grasset, 1972a). The tables 1 - 5 show that the Sardinella species still constitute a 70 - 75 percent majority in the catches of the purse-seiners, but also that several other species are caught regularly.

The Senegalese fishermen often use one name for both Sardinella species (YABOYE) besides those for the different species : MEREUQUE for Sardinella aurita and TASS for Sardinella eba. For this reason the Sardinella species are often not discriminated in the information. However Sardinella aurita is certainly prevailing in the purse-seine catches.

Between July and December 1972 the technician of CRODT working at the beach of M'Bour collected 23 samples of Sardinella from the purse-seine catches. On the same days, together with 16 samples of Sardinella aurita from the purse-seines, he collected only 3 samples of the same species from the catches of the surrounding gillnets. On the other hand on the same days as 7 samples of Sardinella eba he collected 29 samples of that species from catches of the surrounding gillnets. The main explanation for these differences in the ratio between the two Sardinella species in the catches of the two types of nets, has to be found in the behaviour of the species, as observed formerly by Grasset (Grasset, 1971b)

Sardinella aurita tends to keep the formation as a school during the surrounding operation , whereas Sardinella eba tends to spread, which makes the capture of Sardinella aurita with purse-seines much easier. On the other hand the surrounding gillnets are well adapted to the behaviour of Sardinella eba

The following list names the other species caught, in order of importance , together with their vernacular names (Ouloff) :

Carangidae Caranx carangus	Saca
Caranx senegalus	Saffar
often not separated	
Pomadasys spp. (mainly P. jubelini)	Sompat
Arits gambiensis	Kong
Cybium tritor	N'dioun
Chloroscombrus chrysurus	Lagna-lagna
Ethmalosa fimbriata	Cobo

Among the several other species , grouped as divers , must be noted :

Caranx ronchus	Diai
Sphyraena spp.	Seudde
Galeoides decadactylus	Thiékem
Pseudotolithus spp.	Tounoun,Feute

Only a few Ethmalosa are caught with the purse-seines (see table 5), which is remarkable because of the second place they take in the landings of the Senegalese artisanal sea-fisheries. E.g.: The fishing-statistics from Joal indicates a total landing of 5360 tons Sardinella, 2740 tons Ethmalosa and 550 tons Pseudotolithus during 1972.

The next table presents the fishingplaces for the most important species as compared with the "spread" of all the catches :

Fishing-places	Number of cruises (quantities landed in tons)				
	Carangidae	Pomadasys	Arius	Cybium	All species
North of M'Bour	-	-	-	1 (0.1)	5 (1,9)
M'Bour to Joal	5 (7.7)	7 (19.6)	6 (2.5)	9 (2.0)	111 (222.0)
Joal to Pte.Sangomar	25 (49.6)	3 (11.4)	16 (6.2)	10 (6.2)	157 (289.2)

The combined mouths of the rivers Saloum and Cambia probably have some influence on the species composition of the catches at the different fishing-places.

However the indications of this influence are not so clear from the figures.

Another ,important influence on the "spread" of the different species is the selective fishing-policy of the seiners by trying to avoid Sardinella species in order to capture more valuable other species. The four fishermen are not to the same degree succesful in this policy. The best results had El Hadj Niang both through skill and effort and he works mainly between Joal and Pointe Sangomar. On the other hand the interpretation of the figures is also hindered by the still low numbers of catches, whereas they are spread over most of the fishing areas

The effectiveness of the purse-seines

The effectiveness of the purse-seines can be considered as the quantity caught per day, the catch per haul or from the financial results. Tables 1 - 5 show these aspects of the effectiveness for the four purse-seines. While discussing these data a few point have to be kept in mind :

- a) The fishingpirogues of El Hadj Niang, El Hadj Gueye and Mamadou Diame are normally accompagnied by another pirogue on behalf of transport.
- b) El Hadj M'Beye started only the 15th of November and he had a purse-seine of only 200 meters long. For first reason his overall results are much under the influence of the lack of pelagic fish along the Petit Côte during the month December.

- c) The mean catch per haul by El Hadj Gueye is certainly negatively influenced by a lack of information on his number of hauls during October , which was for him a very favourable month.
- d) The mean catch per day of Mamadou Diamé is certainly exaggerated , because he provided practically no information on his cruises without catch.

The main point of fishing with more than one pirogue is the possibility to load more than the about 2.5 tons which is indicated as a maximum loading capacity of a pirogue (Grasset,1972a) .The next table provides a coarse review of the frequencies of the quantities landed per day by the four purse-seiners.

Frequencies of the quantities landed after the daily cruises (in tons)

Tons landed	0	0-2	2	3	4	5	6	7	8	9	10	Total	Hauls/day
El Hadj Niang	17	59	23	23	7	5	1	2	1	-	1	139	1.6
	(12%)	(--59%--)	(-----29%-----)										
El Hadj Gueye	22	30	8	9	10	4	2	1	-	-	-	86	1.7
	(26%)	(--44%--)	(-----30%-----)										
El Hadj M'Beye	6	14	3	-	1	-	-	-	-	-	-	24	1.1
	(25%)	(--71%--)	(---4%--)										
Mamadou Diamé	7?	43	20	-	-	-	-	-	-	-	-	70?	2.5
	(10%)	(--90%--)											

The table shows that catches over 2 - 3 tons per day are far from being exceptional. In the case of El Hadj Niang and El Hadj Gueye landings of more than 3 tons occur even in about 30% of their cruises , so they need their transport-pirogues rather often. Also neighbouring pirogues are called if necessary. If no sufficient transport is available , the surplus catch is set free or a less valuable catch is set over board , as happened a few times.

In order to judge the effectiveness of the purse-seines on board of pirogues practically only the data of El Hadj Niang and El Hadj Gueye are left for consideration .

The crew of Mamadou Diamé is certainly not yet skilled enough in the operation of the net, as may be concluded from their low mean catch per haul (table 4). Most probably very often they do not succeed to close the net in time.

The data of El Hadj M'Beye cover only 24 fishing days, half of which during the generally bad period of December. This leaves only half a month of good results to judge the possibilities of purse-seining with one pirogue only. Even during this half month he moved from Thiaroye to Joal after three days for a lack of fish in the Bay of Goree. A few good catches, all made in single hauls, indicate his possibilities. However it is not yet certain if his loading capacity is the restricting factor for his mean landing per day.

El Hadj Niang and El Hadj Gueye both landed a quantity of about 2 tons per day. El Hadj Niang made the most continuous effort. He started on the 13th of July, spent about two weeks at home during the Ramadan, but went to sea most of the rest of the time. His pirogues made generally more than 20 n.m. a day because his main fishing-places were around Palmarin and Point Sangomar.

El Hadj Gueye made a less strenuous effort. He also started on the 13th of July, but interrupted his fishing very often. Occasionally he had bad luck or he took too much risk, which resulted to about 14 extra days of reparations and rescue operations. A few times one of his pirogues was overloaded and capsized. His fishing results are less stable than those of El Hadj Niang which can be concluded from the catches per day as well as the catches per haul (table 2).

Considering the continuous effort, the careful fishing and the completeness in the information of El Hadj Niang, at present it might be the best to consider his results as the possible effectiveness of the purse-seines on board of pirogues.

This amounts to a mean catch of 2 tons par day , with a mean haul of 1.2 tons , om condition that the transport of the fish is ensured.

The effectiveness of the purse-seines as compared with Grassetts experiments and the surrounding gillnets.

The results of different nets during different periods and for the Sardinella species only, are summarized in the next table.

	P u r s e - s e i n e			Surrounding gillnets	
	ton/day	ton/haul		ton/day	ton/haul
April 1970	2.5	1.1	(G)	-	-
May - July 1971	2.5	2.2	(G)	-	-
April - May 1972	1.2	1.2	(G)	1.0	0.3
July-December 1972	2.3	1.2	(N)	0.7*	?
July-December 1972	2.2	?(N+Gu+MB)			

(G) = experiments of Grasset

(N) = results of El Hadj Niang , as far as numbers of hauls were available

(N+Gu+MB) = all results of El Hadj Niang, El Hadj Gueye and El Hadj M'Beye

*) = mean of all the landings of all the periode July-December at M'Bour

Grassetts experiments were first of all aimed at a demonstration of the technical possibilities of the purse-seine , without taking into account the marketvalue of the catches. As the surrounding gillnets capture Sardinella species only a comparison had to be aimed at these species. For this reason results of experiments and commercial fishing are given for Sardinella-catches only, and this had to be done with exclusion of the days without catch and days with catches of several species.

The table shows that the results of commercial fishing are near to those of the experiments. This is especially true if the following arguments are taken into consideration :

- 1) on behalf of commercial fishing small Sardinella are avoided because only seldom there is a market for these catches. Sometimes even all Sardinella schools are avoided and more time is spent on searching more valuable fish.
- 2) Crasset's experiments were always made during a season which is in general more favourable for the pelagic fisheries. E.g. the fishing-statistics at Joal shows that during the first semester of 1972 about 2 times as much Sardinella was landed than during the second semester. The fishing cooperation at Joal landed 2600 tons of Sardinella with a mean of 24 pirogues between January and June , whereas 1180 tons of Sardinella were landed by a mean of 28 pirogues between July and December 1972.

A comparison of the purse-seines with the surrounding gill-nets indicates that the catch per haul of the purse-seines can be nearly 4 times as big , whereas for the time being the mean daily captures are about 2 to 3 times as big. To obtain these results the pirogues with surrounding gill-nets have to spent more time at sea and have to make more hauls per day, than the purse-seiners.

The difference between the mean volumes caught per day by the surrounding gillnets during April-May 1972 and July-December 1972 indicates that the difference in the availability of pelagic fish might have its influence also on the purse-seine catches and that the effectiveness of these nets has not yet attained its mean annual level.

Financial results

The tables 1 - 5 present also the financial results of the catches in CFA francs and in US dollars. The total financial results can be summarized as follows :

	Number of days	Total catch (tons)	Values in		Mean income per Fishing - day		Centre
			CFA x 1000	US \$	CFA	US \$	
El Hadj Niang	139	271	7.667	29.945	55.100	215	Joal
El Hadj Gueye	86	173	2.765	10.800	32.100	126	M'Bour
El Hadj M'Beye	24	27	748	2.910	31.200	121	Joal
Mamadou Diamé	70?	69	1.259	4.920	18.000	70	Joal

The total revenues as well as the mean incomes per day at sea are rather different. These differences can be explained in several ways.

- 1) The first reason of course , is the difference in the numbers of days at sea and in the mean quantities landed per day.
- 2) However , also there is a considerable difference between the market-prices at Joal and at M'Bour. The prices per ton of fish at the two places , extracted from the informations of El Hadj Niang and El Hadj Gueye , can be summarized as follows :

	Price per ton of fish			
	Sardinella spp.		Other spp.	
	CFA	US \$	CFA	US \$
Joal	25.000	98	35.600	140
M'Bour	12.400	48	26.500	104

This indicates that the price of Sardinella at M'Bour is half the price at Joal , which is remarkable because the two places are connected by a 32 km long, straight asphalt road. Apart from the considerable difference in the total landing in both places , there is also most probably a difference in the consuming markets.

3) The species-composition of the catches is important for the mean price per ton of the other species than Sardinella. The prices paid for a ton of the principal species at Joal were:

Pomadasys	sompat	80.000 - 85.000 CFA
Carangidae	saca saffar	50.000 - 65.000 CFA
Arius	kong	35.000 - 40.000 CFA
Cybium	n'dioun	ca.50.000 CFA
Chloroscombrus	lagna-lagna	ca.20.000 CFA

Those prices are valid especially for large quantities. At M'Bour the same prices were paid for about double the quantities.

The financial results , especially at Joal , will most probably decrease sooner or later. This will certainly happen with an increase of the landings due to the development of purse-seining with pirogues. At present the market for several species is not yet saturated. The prices actually paid at M'Bour are perhaps a good example of what might happen with the prices at Joal.

A provisional prognosis of the possible rentability of purse-seining with pirogues at the moment might be best approximated with the results of El Hadj Niang against the prices of M'Bour.

The selectivity of the purse-seines for the Sardinella species as compared with the surrounding gillnets.

The selectivity of the purse-seines with respect to the Sardinella species and in comparison with the selectivity of the surrounding gillnets , has been a subject of former studies (Grasset 1971 a and b)

Between July and December 1972 samples of lengthfrequencies in catches of Sardinella with surrounding gillnets and one of the purse-seines were collected by a technician of CRODT at M'Bour. The results of this sampling can be found in tables 7. Samples collected between May and July 1971 are presented in table 6. The totals of the sampling during all the principal periods , are summarized in table 8.

The results of the sampling show clearly the following points :

- 1) Among the catches made with the surrounding gillnets , the mode of the forklength of Sardinella eba lies nearly always between 19 and 21 cm. In the same catches the mode of forklength (FL) of Sardinella aurita lies less clearly between 21 and 23 cm. The FL of both Sardinella species in catches of the surrounding gillnets was practically not lower than 17 cm and seldom exceeded 24 cm (see table 8)
- 2) Among the Sardinella catches made with the purse-seines the modes of FL are varying*; the range of FL lies between 9 and 30 cm for Sardinella aurita and between 12 and 28 cm for Sardinella eba (table 8)

As was expected the purse-seines are less selective than the surrounding gillnets. In fact the purse-seines may catch every fish which is not too small for the meshes. However there are important differences between the FL-ranges found during Grasset's experiments and during the commercial fishing. As can be seen in tables 7 and 8 the FL range for both Sardinella species in the commercial purse-seine catches goes from 18 cm upwards , with only one exception.

*) between 14 and 26 cm

As was observed before there is practically seldom a market for small Sardinella. Because the fishermen can discriminate the size of fish before catching , the small fish can be avoided.

So actually the selectivity of the purse-seines is determined by the fishermen. The situation may change as soon as there is a market for the small fish. Unless there comes an industrial demand , sudden changes in the market can not yet be expected. On the contrary , the development of purse-seining will increase the general supply of Sardinella on the consuming markets , which will decrease the price and this will certainly retain the fishermen to exploit the smaller fish.

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The reports from 1972 bear the projects new classification Projet SEN 66/508

This english version will be followed by a translation in french.

Table : 1 Weights and values of catches landed by El Hadj Niang (Joal)

Tableau : 1 Poids et valeur des captures débarquées par El Hadj Niang (Joal)

Month Mois	Sar.	Car.	Pom.	Ethm.	Arius	Cybium	Chlor.	Divers	Total	Number/Nombre	
										Days Jours	Hauls Coups
7	8.5	7.0	-	-	5.1	2.4	0.8	-	23.8	15	29
8	40.4	10.5	0.4	1.2	2.1	0.1	0.5	0.1	55.3	27	?
9	45.0	13.9	2.4	0.2	5.2	-	0.4	0.6	67.7	29	55
10	31.8	2.9	14.0	-	-	0.1	0.4	1.9	51.1	26	44
11	28.4	6.9	-	-	1.0	0.6	0.1	0.8	37.8	18	36
12	35.6	0.1	-	-	-	-	-	-	35.7	24	17
Total	189.7	41.3	16.8	1.4	13.4	3.2	2.2	3.4	271.4	139	(181)

weights expressed in tons / poids en tonnes

Month Mois	% Sar.	Catch / per day par jour	Prise per haul par coup	Commercial value / Valeur commerciale		
				Sardinella CFAX1000/US \$	Other spp. CFAX1000/US \$	Total CFAX1000/US \$
7	35.8	1.58	0.82	199 / 775	685 / 2675	884 / 3450
8	73.3	2.05	?	944 / 3690	667 / 2605	1611 / 6295
9	66.4	2.33	1.23	1182 / 4615	906 / 3540	2080 / 8155
10	62.7	1.96	1.15	602 / 2350	117 / 460	719 / 2810
11	75.1	2.10	1.05	685 / 2675	531 / 2075	1216 / 4750
12	99.6	1.49	2.10	1142 / 4460	7 / 25	1149 / 4485
Total	70.0%	1.95	1.19	4754 / 18565	2913 / 11380	7667 / 29945

Sar. = Sardinella Car.=Carangidae Pom.=Pomadasys Ethm.=Ethmalosa
Chlor.=Chloroscombrus

1 US \$ = 256 CFA

The financial results of July and August are estimated with help of the prices during September to December , for a lack of exact information.

Les resultats commerciaux des mois juillet et août sont estimés sur base des prix dans la période septembre - décembre à cause d'un manque d'information.

Table : 2 Weights and values of catches landed by El Hadj Gueye (M'Bour)

Tableau : 2 Poids et valeur des captures débarquées par El Hadj Gueye (M'Bour)

Month Mois	Sar.	Car.	Pom.	Ethm.	Arius	Cybiurn	Chlor.	Divers	Total	Number Days Jours	/Nombre Hauls Coups
7	11.5	2.9	9.0	-	1.3	0.5	-	0.7	25.9	15	25
8	3.4	-	7.4	-	0.3	-	1.1	0.0	12.2	7	19
9	8.2	4.8	-	-	1.4	0.6	1.1	2.5	18.6	12	29
10	67.9	-	9.6	-	-	0.8	-	-	78.3	18	?
11	25.9	-	-	-	-	-	-	0.2	26.1	15	?
12	11.6	-	0.1	-	-	-	-	-	11.7	19	16
Total	128.5	7.7	26.1	-	3.0	1.9	2.2	3.4	172.8	86	(89)

Weights in tons / poids en tonnes

Month Mois	% Sar.	Catch / per day par jour	Prise per haul par coup	Commercial value / Valeur commerciale		
				Sardinella CFAx1000/US \$	Other spp. CFAx1000/US \$	Total CFAx1000/US \$
7	44.4	1.73	1.04	88 / 345	389 / 1520	477 / 1865
8	27.6	1.74	0.64	32 / 125	274 / 1070	306 / 1195
9	43.9	1.55	0.64	136 / 530	215 / 840	351 / 1370
10	86.7	4.35	?	849 / 3315	261 / 1020	1110 / 4335
11	99.3	1.74	?	364 / 1420	32 / 125	396 / 1545
12	99.9	0.62	0.73	120 / 470	5 / 20	125 / 490
Total	74.3	2.01	0.77	1589 / 6205	1176 / 4595	2765 / 10800

Explanations under table 1
Explications sous tableau 1

1 US \$ = 256 CFA

Table : 3 Weights and values of catches landed by El Hadj M'Beye (Joal)

Tableau : 3 Poids et valeur des captures débarquées par El Hadj M'Beye (Joal)

Month Mois	Sar.	Car.	Pom.	Ethm.	Arius	Cybium	Chlor.	Divers	Total	Number/Nombre	
										Days Jours	Hauls Coups
11	12.6	3.3	2.2	-	-	-	-	-	18.1	12	16
12	7.6	0.9	-	-	-	-	-	-	8.5	12	10
Total	20.2	4.2	2.2	-	-	-	-	-	26.6	24	26

Weights in tons / Poids en tonnes

Month Mois	% Sar.	Catch per day par jour	Prise per haul par coup	Commercial value / Valeur commerciale		Total CFAx1000/US \$
				Sardinella CFAx1000/US \$	Other spp. CFAx1000/US \$	
11	69.7	1.51	1.13	230 / 895	258 / 1005	488 / 1900
12	89.2	0.71	0.85	222 / 865	38 / 145	260 / 1010
Total	75.9	1.11	1.02	452 / 1760	296 / 1150	748 / 2910

Explanations under table 1
Explications sous tableau 1

1 US \$ = 256 CFA

Table : 4 Weights and value of catches landed by Mamadou Diamé (Joal)

Tableau : 4 Poids et valeur des captures débarquées par Mamadou Diamé(Joal)

Month Mois	Sar.	Car.	Pom.	Ethm.	Arius	Cybium	Chlor.	Divers	Total	Number Days Jours	/Nombre Hauls Coups
7	1.7	1.9	-	3.1	2.2	1.0	0.8	0.2	10.9	16	32
8	8.0	0.5	-	-	0.2	-	0.1	3.0	11.8	14	38
9	8.9	-	-	-	-	-	-	0.4	9.3	8	20
10	3.4	2.0	-	0.1	-	-	-	3.4	8.9	10	22
11	1.3	6.3	-	0.2	2.7	2.9	1.8	1.9	17.1	16	46
12	9.0	2.0	-	-	-	-	-	-	11.0	6	?
Total	32.3	12.7	-	3.4	5.1	3.9	2.7	8.9	69.0	70	(158)

Weights in tons / poids en tonnes

Month Mois	% Sar.	Catch per day par jour	/ Prise per haul par coup	Commercial value Sardinella CFAX1000/US \$	/ Other spp. CFAX1000/US \$	Valeur commerciale Total CFAX1000/US \$
7	16.0	0.68	0.34	16 / 60	144 / 560	160 / 620
8	67.8	0.84	0.31	46 / 180	121 / 470	167 / 650
9	96.1	1.16	0.46	59 / 230	29 / 115	88 / 345
10	38.2	1.11	0.40	25 / 100	168 / 655	193 / 755
11	7.5	1.07	0.37	11 / 45	481 / 1880	492 / 1925
12	81.8	1.83	?	99 / 385	60 / 235	159 / 620
Total	52.9	0.96	0.34	256 / 1000	1003 / 3915	1259 / 4915

Explanations under table 1
Explications sous tableau 1

1 US \$ = 256 CFA

Table : 5 Totals of weights and values landed by the four purse-seines between July and December 1972

Tableau : 5 Totales des poids et valeurs des captures débarquées par les quatre sennes tournantes pendant la période juillet-décembre 1972

	Sar.	Car.	Pom.	Ethm.	Arius	Cybiurn	Chlor.	Divers	Total	Number Nombre Days/Jours
El Hadj Niang	189.7	41.3	16.8	1.4	13.4	3.2	2.2	3.4	271.4	139
El Hadj Gueye	128.5	7.7	26.1	-	3.0	1.9	2.2	3.4	172.8	86
El Hadj M'Beye	20.2	4.2	2.2	-	-	-	-	-	26.6	24
Mamadou Diamé	32.3	12.7	-	3.4	5.1	3.9	2.7	8.9	69.0	70
Total	370.7	65.9	45.1	4.8	21.5	9.0	7.1	15.7	539.8	319
Total in %	68.7	12.2	8.4	0.9	4.0	1.7	1.3	2.9	100.1	

Weights in tons / poids en tonnes

	% Sar.	Catch per day par jour	Prise per haul par coup	Commercial values/valeurs commerciales Sardinella CFAX1000/US \$	Other spp. CFAX1000/US \$	Total CFAX1000/US \$
El Hadj Niang	70.0	1.95	1.19	4754 / 18565	2913 / 11380	7667 / 29945
El Hadj Gueye	74.3	2.01	0.77	1589 / 6205	1176 / 4595	2765 / 10800
El Hadj M'Beye	75.9	1.11	1.02	452 / 1760	296 / 1150	748 / 2910
Mamadou Diamé	52.9	0.96	0.34	256 / 1000	1003 / 3915	1259 / 4915
Total	68.7	1.69	0.80	7051 / 27530	5388 / 21040	12439 / 48570

Explanations under table 1
Explications sous tableau 1

Table : 6 Length-frequencies of Sardinella catches with purse-seines obtained during May - July 1971 (trials Grasset at M'Bour)

Tableau : 6 Fréquences de la longueur fourche des Sardinelles , obtenus des captures de la senne tournante à M'Bour pendant les essais de Grasset entre mai et juillet 1971

cm	<u>S a r d i n e l l a e b a</u>					<u>S a r d i n e l l a a u r i t a</u>						
	28/5	26/6	24/6	8/7	Total	28/5	1/6	14/6	24/6	26/6	13/7	Total
9											2	2
10											12	12
11							<u>76</u>				<u>78</u>	<u>154</u>
12							<u>76</u>				60	126
13	4				4		12				8	20
14	26				26							
15	<u>71</u>				<u>71</u>	1			1			2
16	43	1	1		45	5		5				10
17	12	3	12	2	29	<u>9</u>		21	3			33
18	1	9	<u>37</u>	14	<u>61</u>	3		<u>83</u>	24			<u>110</u>
19	1	18	17	<u>22</u>	58			39	<u>63</u>	5		107
20		25	9	14	48	3		5	27	7		42
21		26	3	1	30	19			31	<u>14</u>		64
22	1	<u>29</u>	2		<u>32</u>	<u>71</u>			6	6		<u>83</u>
23		22		1	23	38			1	2		41
24		3			3	5			1			6
25		3			3	2						2
26		2			2							
27		1			1							
28												
29												
30												
Total	159	142	81	54	436	156	164	153	<u>157</u>	34		814

Table : 7 Lengthfrequencies of Sardinella eba in catches with purse-seines landed at M'Bour between July and December 1972

Tableau : 7 Fréquences de la longueur fourche des Sardinella eba collectés des prises de la senne tournante à M'Bour entre juillet et décembre 1972.

cm								
12								
13								1
14								1
15								4
16								$\frac{5}{1}$
17								1
18		1			1			
19			3	5	12			
20	1	6	1	16	6			
21	4	10	3	11	$\frac{28}{12}$		1	
22	5	18	5	$\frac{20}{5}$	23	5	5	
23	7	15	$\frac{10}{7}$	11	1	3		
24	7	$\frac{21}{9}$	8	1		7	7	
25	5	6	4	1		6	8	1
26	$\frac{10}{6}$		4	1		$\frac{12}{3}$	$\frac{12}{3}$	1
27	5		3	1		4	6	1
28	7					2		
29	3		2					
30	3							
31	2		1				1	
32	3							
33	2							
34								
35	1							

Table : 8 Totals of length-frequencies measured on catches of Sardinella with purse-seines and surrounding gillnets at M'Bour

Tableau : 8 Totales des fréquences de longueur échantillonnées des prises de Sardinella avec les sennes tournantes et les filets encerclants à M'Bour

cm	<u>S a r d i n e l l a e b a</u>					<u>S a r d i n e l l a a u r i t a</u>				
	April 1970 SC	April 1970 PS	May - July 1971 PS	July-December 1972 SC	July-December 1972 PS	April 1970 PS	May - July 1971 PS	July-December 1972 SC	July-December 1972 PS	
9							2			
10							12			
11							154			
12							126			
13			4		5		20		1	
14			26		6				1	
15			71		1		2		1	
16		1	45	1	1		10		1	
17	1	14	29	16	1	18	33			
18	39	74	61	183	28	108	110		2	
19	100	86	58	528	85	34	107	18	45	
20	72	123	48	599	114	13	42	54	114	
21	44	52	30	313	106	33	64	49	233	
22	30	18	32	125	72	55	83	77	271	
23	9	6	23	20	28	15	41	51	194	
24	1	1	3	6	12	4	6	24	62	
25	1		3	1	7		2	2	30	
26			2		5			1	17	
27			1						9	
28					1				9	
29									5	
30									2	
31										
Total	297	375	436	1792	473	280	814	276	997	

SC = surrounding gillnet = filet encerclant maillant

PS = purse-seine = senne tournante

Figure : The data of table 8 , expressed as % of their totals

- surrounding gillnets July-December 1972
- + commercial purse-seines July-December 1972
- - Grasset's experiments 1970 and 1971



