



CRUISE REPORTS "DR. FRIDTJOF NANSEN"

SURVEYS OF THE FISH RESOURCES OF MOZAMBIQUE

Preliminary Cruise Report No II

9 August - 1 September 1990

The "DR. FRIDTJOF NANSEN" research programme is sponsored by the Norwegian Agency for Development Assistance NORAD, the Food and Agriculture Organization of the United Nations FAO, and the United Nations Development Programme UNDP. The programme in Mozambique is being conducted and planned under agreements between NORAD, Mozambique authorities, IIP Maputo and the Institute of Marine Research, Bergen, Norway.

The programme will comprise several surveys the timing of which is foreseen as follows:

Survey 1	4 weeks, 20 April to 14 May
" 2	4 " primo August-primo September
" 3	6 " primo November-mid December

This preliminary cruise report describes the work and some of the results of the second survey.

CHAPTER 1 INTRODUCTION

1.1 OBJECTIVES

The objectives of the "DR. FRIDTJOF NANSEN" programme in Mozambique in 1990 were discussed in a general way at the annual MOZ-038 project meeting in Maputo in October 1989. At a meeting in Maputo on 9 August before the start of the cruise the following objectives were defined:

- (i) Conduct an acoustic survey of the Sofala Bank area from Angoche at 16°10' to Bazaruto at 21°30' with a transect distance of 15 nm and reduce to a denser grid when fish aggregations are detected. Trawling for identification of acoustic targets when necessary.
- (ii) Conduct a trawl survey on the shrimp resources on the Sofala Bank. Positions for the hauls are given by IIP using a random sample programme. 53 stations are allocated.
- (iii) Run a detailed hydrographical programme on the Sofala Bank in order to study the freshwater flux on the Bank using CTD sonde equipment of IIP. In addition, as time would permit, cover the standard hydrographical sections extending up to 180 nm offshore.

1.2 PARTICIPATION

The scientific staff From IIP, Maputo was:

Rui de Paula e Silva, Elsa Dionisio, Boavida Matavela,
Daniel Fernando, Feliciano Manjate.

The scientific staff from NORAD Project Mo 038 was:

Jan Erick Steen

The scientific staff from IMR, Bergen:

T. Strømme, B. Ellertsen, Martin Dahl, Reidar Johannessen.

1.3 NARRATIVE

The course tracks with fishing stations and the main hydrographical profiles are shown in Figure 1.

After departure from Maputo on 9 August the vessel steamed 2 days to commence the survey at the northern part of the Sofala Bank. On way, a rig with current meter was anchored southeast of Quelimane at 15 m depth. The Sofala Bank was covered with acoustic transects approximately 15 nm apart. As no major aggregations of pelagic fish was detected, a more intensified sampling

programme was not implemented. During daytime, when in shallow waters, neighbouring preallocated random trawl hauls were worked out as part of the shrimp survey. 45 trawl stations were carried out as part of the shrimp survey.

As detected pelagic resources on the Sofala Bank were less than expected, the acoustic survey was continued southwards on the narrow shelf from Bazaruto island to Boa Paz Bank, to look for possible migration into this area.

Calibration of the acoustic instruments was tried behind Bazaruto Island where sheltered conditions were found. However, the tidal currents in the channel between the island and mainland proved out to be too strong to enable positioning of the copper sphere, and the exercise was interrupted.

The cruise was completed with work on the two southern standard hydrographical sections. Arrival Maputo was on 31 August.

CHAPTER 2 HYDROGRAPHY

In addition to the continuous recording of the surface temperature, a dense net of CTD stations were sampled on the Sofala Bank as shown in Figure 1a-b. The collected oceanographical data will be processed and interpreted by IIP.

CHAPTER 3 DISTRIBUTION AND ABUNDANCE OF PELAGIC FISH FROM THE ACOUSTIC OBSERVATIONS.

The acoustic integration system provides observations of fish densities. The units of acoustic reflection used is $0.1 \times m/nm^2$ reflecting surface. Because of low fish densities and a high number of species no attempt was made to allocate the integrator values among the types of fish, carangids, clupeids, engraulids and scombrids which contributed to them. This type of analysis may be tried in a general way later on the basis of the catch rates and frequency of appearance of the various main groups by depth strata. Reference is made to Annex I for description of the instruments and their use.

An arbitrary scale is used in the distribution charts to illustrate different levels of concentration.

Figure 2 shows the distribution of all fish based on the fractions of the integrator readings allocated to fish. As in the previous survey, the overall densities are low and with no aggregations detected that could be target for industrial fishing activities. For most part of the Sofala Bank, the integrator readings are close to the detection threshold of the acoustic system. From this follows that the precision of the method becomes low because of the difficulties of discerning the mostly very scattered traces of fish from those of commonly occurring plankton.

The pelagic resources between Angoche and Bazaruto is estimated to 127 thousand tonnes. During the survey few occasions gave reasons for targeted trawling on acoustic registrations.

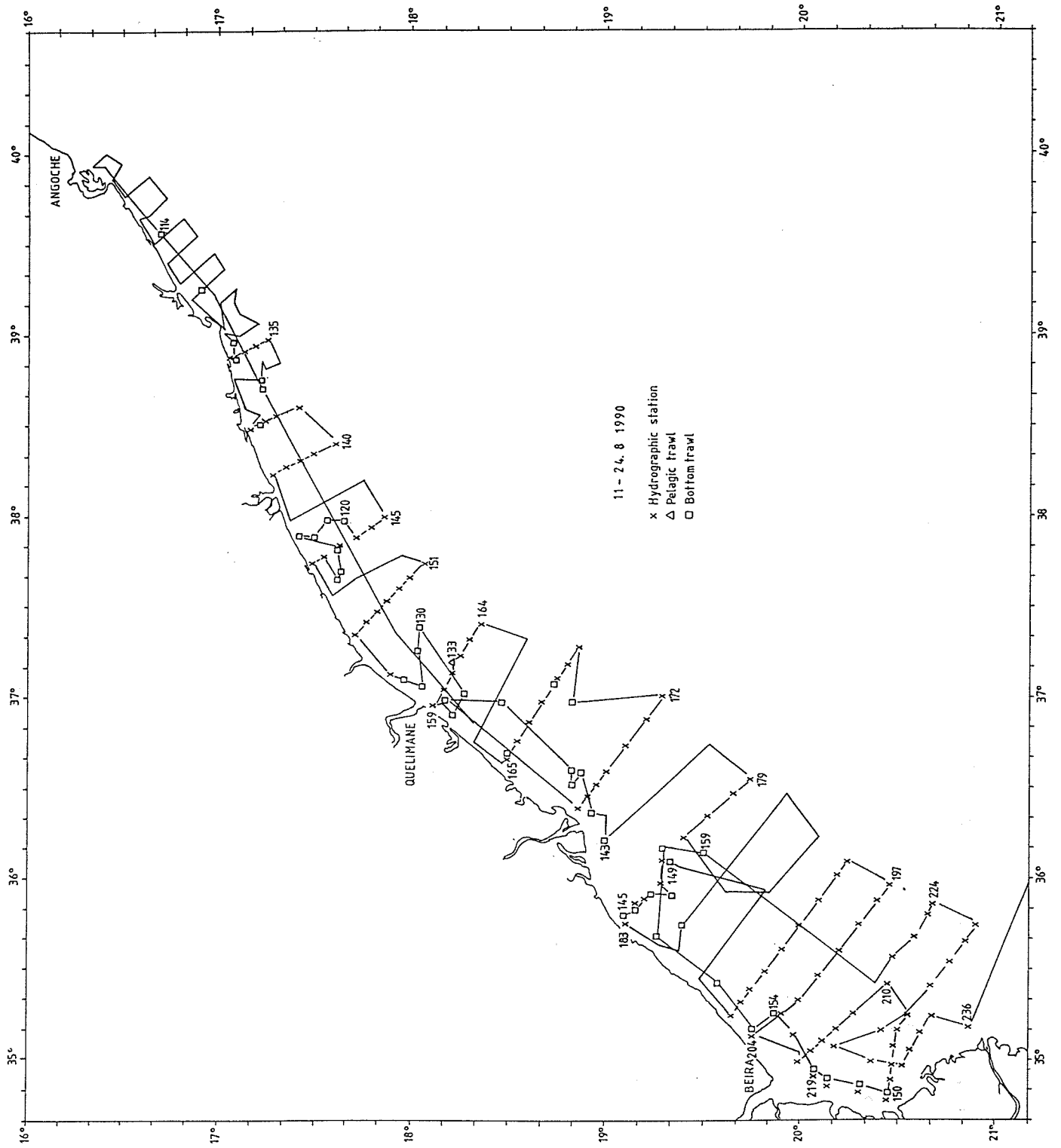


Figure 1a. Sofala Bank. Course tracks, fishing and hydrographical stations

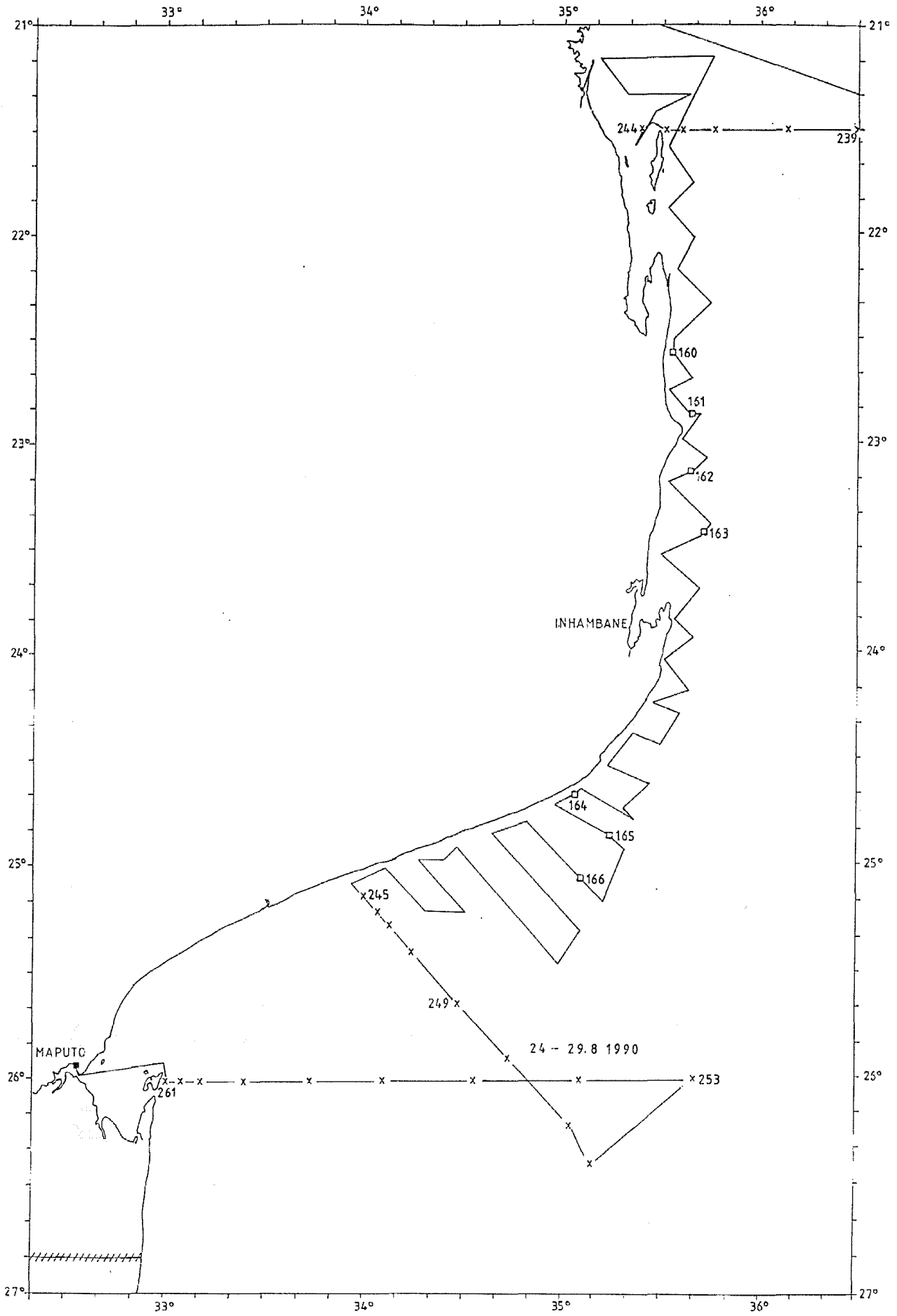


Figure 1b. Bazaruto-Maputo. Course tracks, fishing and hydrographical stations

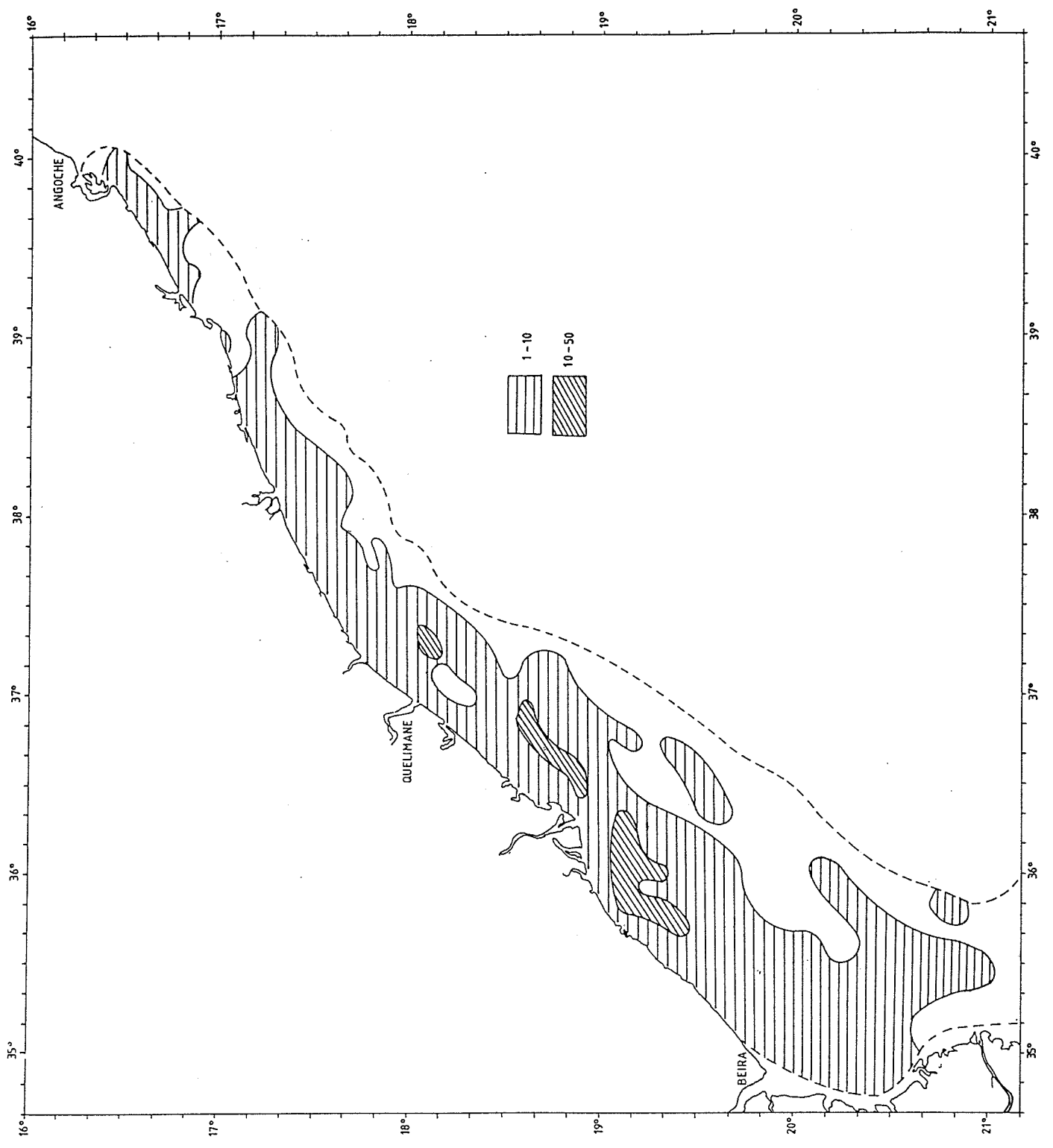


Figure 2a. Sofala Bank. Distribution of fish from observations by the acoustic system

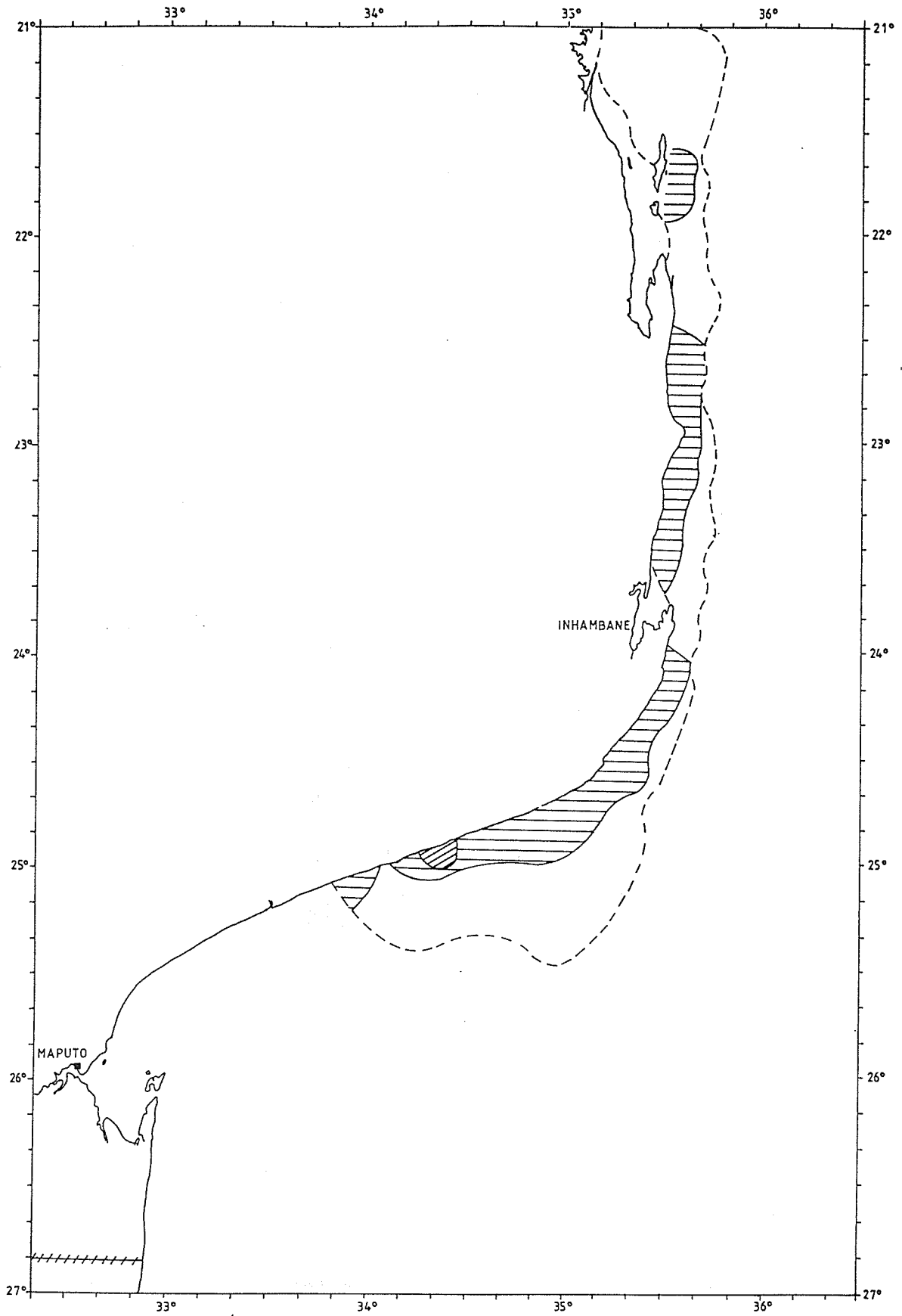


Figure 2b. Bazaruto-Maputo. Distribution of fish from observations by the acoustic system

Information on the relative abundance of pelagic and semi-pelagic species can be drawn from the bottom trawl stations:

Pellona ditchela	55%
Thryssa vitirostris	18%
Trichiurus lepturus	10%
Scomberomorus commersoni	6%
Secutor insidiator	4%
Leiognathus equulus	4%
Rastrelliger kanagurta	3%

This represents catches mainly between 10 and 50 m bottom depth, and its striking that scad and other carangids are missing in the catches. They have however a more offshore distribution as was observed during the May survey.

In May the pelagic stocks of the Sofala Bank were estimated to 200 000 tonnes, about 60% higher than the present estimate. The difference may be ascribed the low densities, which, as already mentioned, may result in a lower precision of the estimates.

On the shelf between Bazaruto and the Boa Paz Bank only very scattered distributed pelagic resources were recorded. The pelagic estimate for this region is 24 000 tonnes.

Figure 3a shows the distributions of 5-mile integrator values by size classes (density classes) for the two acoustic surveys in 1990. The figure shows that most of the registrations are from scattered distributions less than 10 mm/nm^2 . 61 readings (10% of all readings) were in the range 11-30 mm/nm^2 , and only 14 readings (2%) were greater than 30 mm/nm^2 during the survey in May. In August these frequency counts were reduced to 31 (5%) and 1 (0.2%) respectively.

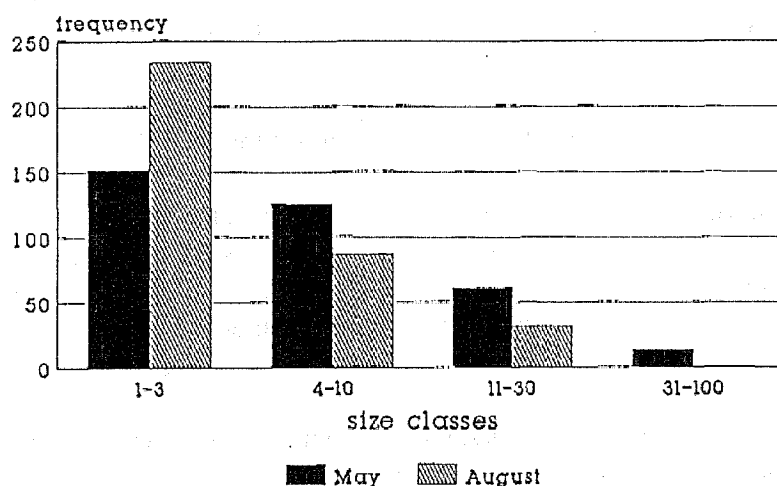
As the survey grid is fairly evenly distributed a rough picture of the distribution of the biomass can be obtained by multiplying the above frequencies with the mean integrator density in each class. Figure 3b shows the result. It is shown that 40% of the biomass is found in densities giving readings less than 10 mm/nm^2 in May, while in August this is increased to 60%. The density class 10-30 mm/nm^2 holds 36% of the biomass in May and 35% in August. The more dense aggregations (30 mm/nm^2) stands for 25% of the biomass in May, but only 3% in August. The second survey thus demonstrates a more scattered distribution with almost total absence of any dense schools.

CHAPTER 4 RESULTS OF THE TRAWL SURVEY, CATCH COMPOSITIONS

All catches were sampled for composition in weight and numbers by species, and size sampling was made for important species, using total length. Pooled histograms are presented in ANNEX II while the complete records of fishing stations are shown in ANNEX III.

Generally, hauls were of 30 minutes duration, but the catch data are presented standardized to kg/hour. All swept area hauls were made at daylight. The length of the haul over the bottom was recorded using a GPS satellite navigator with an accuracy of ± 0.03 nm (50 m).

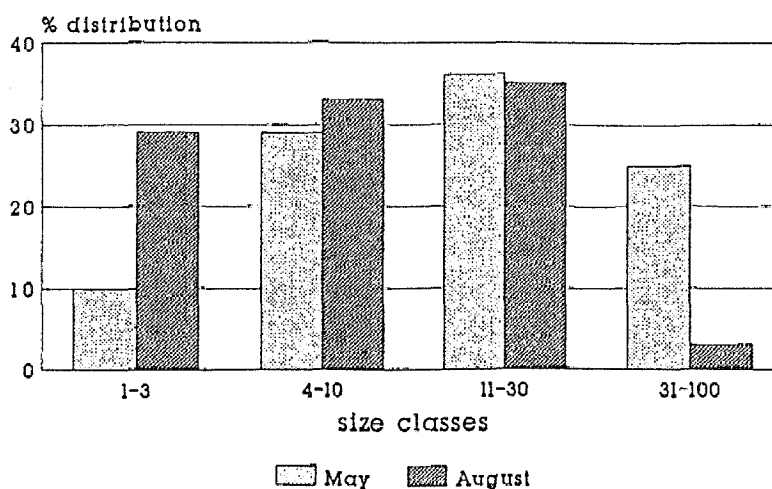
Distribution 5-mile integrator values Mozambique 1990



Raw data

Figure 3a,b. Grouped frequency distribution of integrator data classified as fish (a), and biomass distribution based on the same data (b).

Biomass distribution by density levels Mozambique 1990



Raw data

The data will be fully processed and interpreted by the scientists of IIP, Maputo who are responsible for the planning of this particular programme. A preliminary analysis on the data collected is given below.

4.1 THE SOFALA BANK (ANGOCHE TO BAZARUTO ISLAND)

The research programme in this area included 45 swept area hauls, 29 of which were at depths less than 20 m and 16 in the bottom depth range 20-50 m. Table 1 shows the standardized catch rates for main groups in the random hauls split by 20m bottom depth.

A rough first estimate gives an average density of penaeid shrimp of 140 kg/nm in the 0-20 m bottom depth range, and 90 kg/nm in the 20-50m range, applying a catchability coefficient of 1.0. Table 2 shows the density estimates by dominating species and two bottom depth strata for the Sofala Bank.

CATCH BY STATIONS SORTED BY GROUPS (in kg/hour):

Sofala Bank 0-20 m

ST.NO.	DEP.	Penaeids	Other shr.	Pelagic	Demersal	Squid	Other
113	18			76.22	0.80	0.20	10.60
114	13			46.72	1.42	0.20	13.14
115	19	0.32		346.58	53.40		173.60
116	12	15.20	1.00	34.00	19.80		105.40
117	9	13.64	14.80	39.40	20.80	7.40	131.10
118	18	16.74	50.00	20.50	11.30	1.80	21.40
119	13	6.07	22.50	14.51	9.18	1.11	10.54
122	14	3.26	35.00	58.26	63.82	1.88	32.04
123	11	6.24	24.88	52.36	23.06	1.24	28.38
124	17	4.24	30.26	56.52	72.92	2.24	19.26
125	14	3.88	50.90	37.82	34.88	0.48	39.16
126	12	4.64	19.86	38.28	24.22	0.66	33.40
127	9	10.62	5.60	9.64	6.04	0.48	28.80
128	11	3.26	28.00	36.60	25.00	0.40	53.20
132	11	7.24	20.00	25.47	63.11	0.73	24.16
134	16	4.77	8.23	55.35	86.66	1.31	17.45
137	13	8.22	9.80	28.70	68.60	1.60	41.30
140	20	6.43		67.43	2.68	4.24	22.04
142	11	3.06	3.40	49.80	101.20	3.20	44.00
143	16	14.36	2.42	41.94	93.28	1.32	37.32
145	10	0.46		265.22	0.78	1.70	78.60
146	13	1.71		301.45	6.38	2.12	39.66
150	12	9.32		1151.00	21.20		29.00
151	9	0.66		516.42	26.10		90.80
152	8	1.88		471.28	183.08	13.34	232.30
153	10	3.22		1140.84	205.20		693.70
154	17			11.63	0.08	0.26	1.64
155	16	1.18		24.00	41.26		41.36
156	17	3.60	1.20	37.70	67.80	1.20	47.90
157	12	0.24		82.52	0.30	0.20	15.44
MEAN		5.15	10.93	171.27	44.48	1.64	71.89

Total number of stations : 30

CATCH BY STATIONS SORTED BY GROUPS (in kg/hour):

Sofala Bank 20-50 m

ST.NO.	DEP.	Penaeids	Other shr.	Pelagic	Demersal	Squid	Other
120	40	11.08	0.56	113.14	29.60	0.68	114.28
121	27	5.00	0.12	65.68	11.88	0.14	12.42
129	36	9.02	0.08	7.68	4.56	0.40	23.12
130	37	8.14		204.82	32.09		144.63
131	22	0.76		13.88	1.30	0.20	15.38
135	41			43.10	99.90	1.84	33.14
136	39			90.50		3.49	23.56
138	24	0.46		419.10	28.80		32.20
139	21	1.38		40.68	0.10	0.42	16.89
140	20	6.43		67.43	2.68	4.24	22.04
141	25	7.12		75.06	0.50	1.76	143.50
144	22	0.18		71.24	0.80	1.46	13.36
147	24	1.44		71.50	1.90	1.80	15.60
148	24	0.16		32.50		2.20	3.00
149	31			65.34		15.00	26.74
158	27			85.24		22.32	6.88
159	30			31.72		18.62	4.42
MEAN		3.01	0.04	88.15	12.59	4.39	38.30

Total number of stations : 17

Table 1a,b. Sofala Bank. Catch rates by main categories of fish. 0-20 m upper table, and 20-50 lower table

A more detailed analysis done by the staff of IIP, using standard strata, gives a total estimate of penaeid shrimps of 893 tons which are split as follows:

Metapenaeus monoceros	407t
Penaeus indicus	218t
P. japonicus	191t
P. monodon	54t
P. semisulcatus	23t

In this analysis an effective width of the gear of 18m, and a catchability coefficient of 1.0 was applied. The results are preliminary and a final report will be made by IIP.

SWEPT AREA ANALYSIS FROM STATION 113 THROUGH STATION 159

SPECIES NAME	CATCH DISTRIBUTION BY KG/NM GROUPS						% inci- dence	Mean dens. t/nm ²	Mean densities by bottom depth strata t/nm ²			
	<10	10-30	30-100	100-300	300-1000	>1000			- 20m	20- 50m	50-100m	100-200
Pellona ditchela	23	5	3		4		78	2.35	3.22	0.77		
Thryssa vitrirostris	23	11	1				78	0.77	1.03	0.30		
Trichiurus lepturus	30	1	2				73	0.44	0.55	0.24		
Pomadasyd maculatum	21	1	2				53	0.35	0.47	0.15		
Therapon theraps	21				1		49	0.32	0.45	0.07		
Upeneus vittatus	23	3	1				60	0.28	0.30	0.26		
Johnius dussumieri	15	5					44	0.26	0.40	0.01		
Scomberomorus commersoni	11	3					31	0.24	0.09	0.51		
Arius dussumierii	10		2				27	0.23	0.36			
CARIDEA	16	2					40	0.19	0.30			
Secutor insidiator	20	4					53	0.19	0.26	0.05		
Herklotsycthis quadrimaculatu	3		1				9	0.19		0.52		
Otolithes ruber	22	1					51	0.17	0.27			
Pomadasyd kaakan	16	1					38	0.16	0.23	0.03		
Leiognathus equulus	12	2					31	0.15	0.17	0.10		
Rastrelliger kanagurta	9		1				22	0.11	0.01	0.29		
Sphyræna flavicauda	11	1					27	0.10	0.11	0.07		
Scomberomorus plurilineatus	5		1				13	0.10	0.14	0.02		
Upeneus sulphureus	17	1					40	0.08	0.02	0.19		
Metapenaeus monoceros	32						71	0.06	0.06	0.05		
Loligo duvauceli	11						24	0.05		0.13		
Cynoglossus attenuatus	23						51	0.05	0.06	0.02		
Carangoides malabaricus	12						27	0.05	0.05	0.05		
Penaeus indicus	28						62	0.04	0.06	0.01		
Penaeus japonicus	27						60	0.02	0.01	0.03		
Penaeus monodon	11						24	0.01	0.01			
Solenocera choprai	1						2					
Metapenaeus stebbingi	13						29		0.01			
Penaeus latisulcatus	1						2					
Penaeus semisulcatus	9						20					
PENAEIDAE	13						29				0.01	
S H R I M P S	1						2					
Other fish								0.84	0.75	0.87		
Sum all species								7.80	9.39	4.75		
Sum Snappers								0.05		0.13		
Sum Groupers								0.01		0.03		
Sum Grunts								0.52	0.72	0.18		
Sum Croakers								0.45	0.69	0.02		
Sum Seabreams												
Sum Sharks								0.06	0.09			
Sum Rays								0.01	0.01			
Sum Squids								0.09	0.04	0.13		
Sum												
Sum shrimps (excl. SHRAA01)								0.32	0.45	0.10		
Number of stations included in analysis, total and by depth strata								45	29	16		

Table 2. Sofala Bank. Swept area analysis by two bottom depth strata.

Figure 4. shows observed depth distributions by the four most important penaeid shrimps found on the Sofala Bank. *Penaeus monodon* and *P. indicus* tend to have a more shallow distribution than *P. japonicus* and *Metapenaeus monoceros* which shows a wider depth distribution.

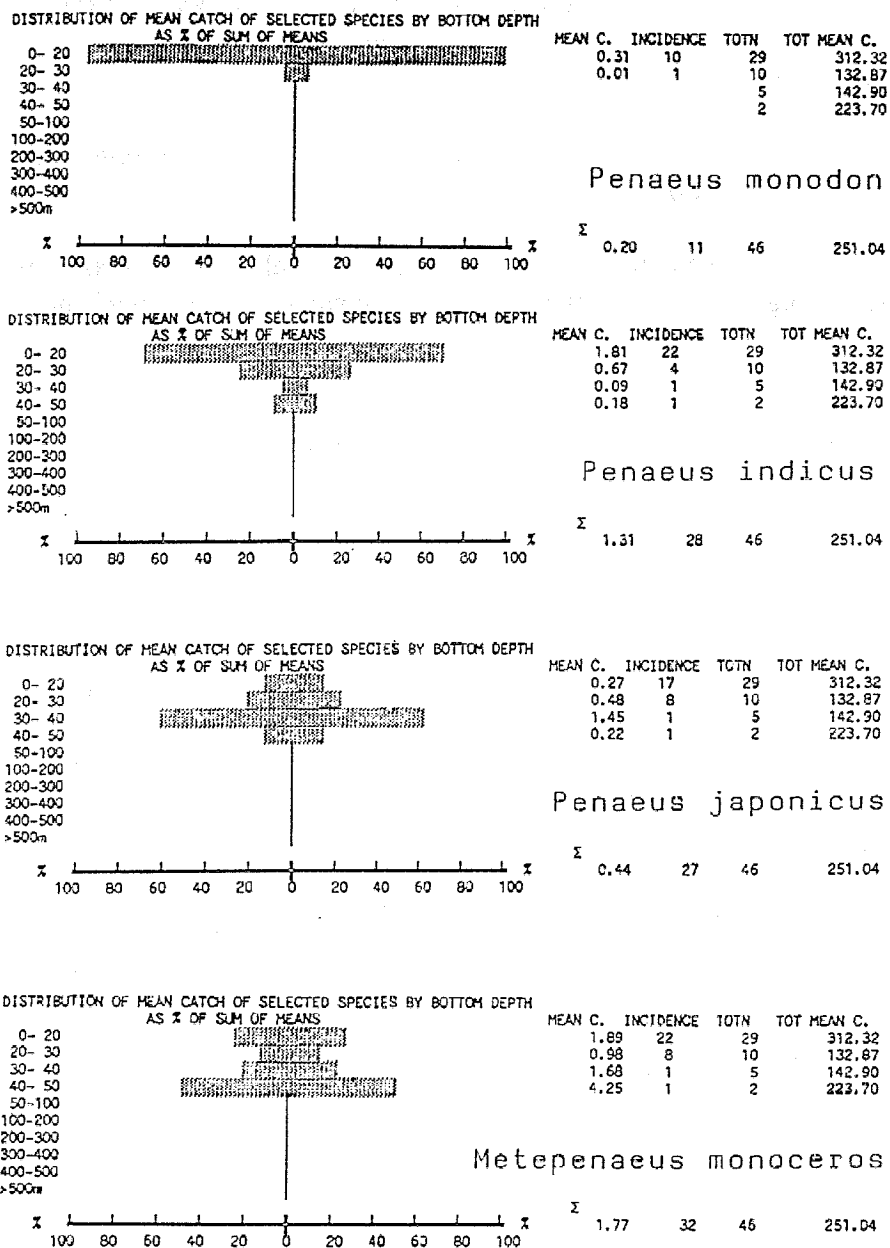


Figure 4. Sofala Bank. Depth distribution of four species of shrimp.

4.2 BAZARUTO TO BOA PAZ BANK

Seven bottom trawl hauls were carried out in this area, st.no. 160-166. The area shows a clear faunal change from the softbottom community of the Sofala Bank, where shrimps and ponyfish, are replaced with harder bottom types such as seabreams, groupers and cephalopods, including octopus. Corals were common in the trawl, and at several locations trawling operations were risky with respect to damaging the gear. Two good catches of seabreams were obtained, with 1800 kg/hour at st 166 and 525 kg/hour at st 161.

Mean catch of commercial demersal fish (seabreams, snappers, grunts, groupers and croakers) from 7 hauls was 444 kg/hour.

Hauls were too few to conclude anything about the level of the biomass, but catches contained high shares of big sized fish, indicating that these stocks are not overfished.

SUMMARY ON CATCHES BY SELECTED GROUPINGS
PROJECT CODE: M3 FROM ST.NO. 160 TO ST.NO. 166

Bazaruto-Boa Paz Bank
CATCH BY STATIONS SORTED BY GROUPS (in kg/hour):

ST.NO.	DEP.	Penaeids	Other shr.	Pelagic	Demersal	Cephalopod	Other
160	22			55.12		0.10	7.68
161	140				525.64	0.32	10.56
162	108				99.74	51.34	13.08
163	178						20.00
164	26			12.30			100.00
165	122				241.82	103.66	84.52
166	94				1800.00		200.00
MEAN				9.63	381.03	22.20	62.26

Total number of stations : 7

Table 3. Bazaruto to Bao Paz Bank. Catch rates by main categories of fish.

ANNEX I INSTRUMENTS AND FISHING GEAR USED.

ACOUSTIC INSTRUMENTS

Two SIMRAD scientific echo sounders, EK 400/38 kHz and EK 400/120kHz were used during the survey for estimation of fish density. The EK 400/38 was coupled to a digital integrator QD as well as to an analog integrator QM. The details of the instrument settings used are as follows:

	EK 400/38	EK 400/120
Range	0-100 or 0-250	0-100
Transmitter	High (5000 W Nom)	High (1250 W Nom)
Bandwith	3.3 kHz	3.3 kHz
Pulselength	0.5 ms	1 ms
TVG	20 log R	20 log R
Attenuator	20 dB	0
Rec. gain	7	5
Transducer	Split beam	Ceramic 10cm

QD settings: Threshold 10 to 24 mv. Gain: 35.9

QM settings: Gain 20 dB x 10. Threshold 7

An ES 400 color displayer was used for target strength observations.

A calibration experiment using a standard copper sphere performed in Bahia dos Tigres, Angola on 12/6 -90 gave the following results: 30x30 transducer: SL+VR 142.0, instr.constants 1ms 0.82, 0.5 ms 1.94; gain QD: 1ms 28.9, o.5 ms 32.7. ES transducer: SL+VR 135.4, instr.constant 3.89, gain QD 36.1.

HYDROGRAPHY

Use was made of a CTD sonde belonging to IIP. The instrument was calibrated against casts with Nansen bottles.

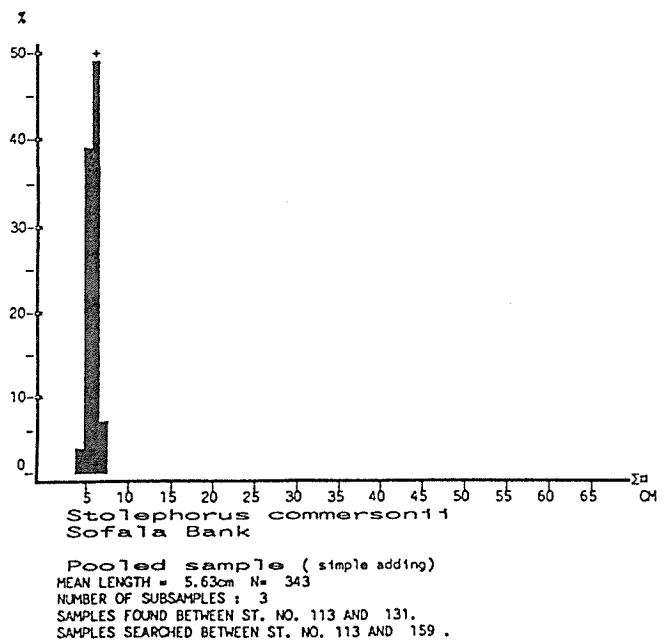
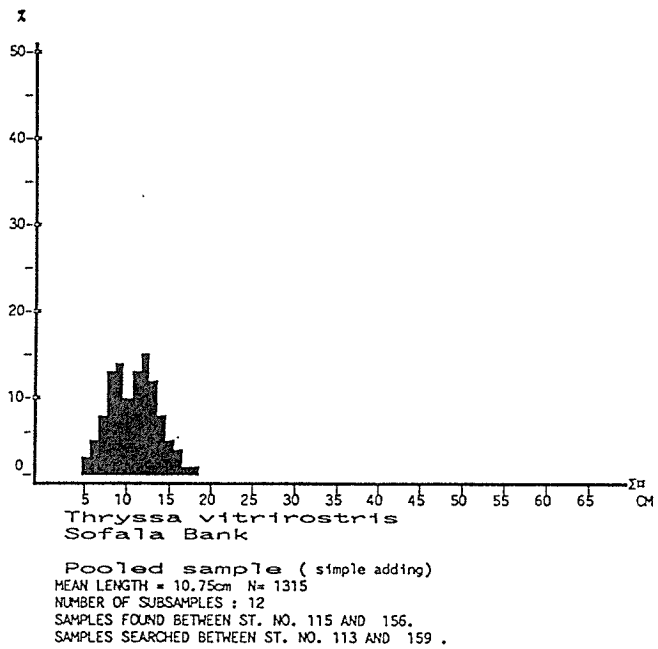
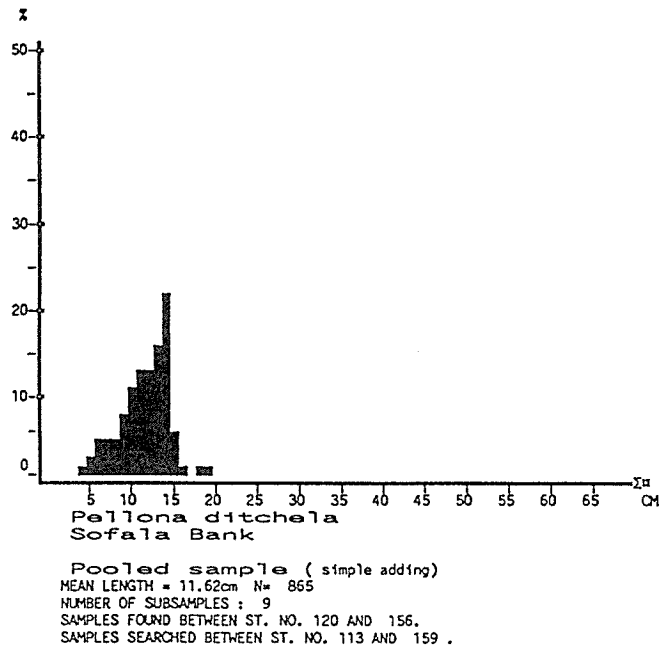
FISHING GEAR

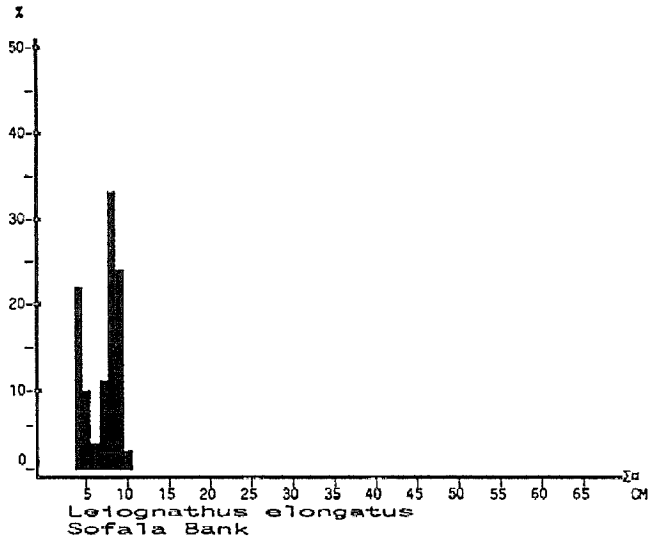
Bottom trawl: High opening shrimp and fish trawl with net headline 31m (floatline), foot-rope 47m, gear with 12 cm diameter roller disks, 40 m sweeps, estimated headline hight 6m and distance between wings during towing 18-20m.

Pelagic trawl: Bottom trawl was used with floats for surface tows in shallow water and in deeper water a modified "Harstadtrawl" with a vertical opening of 20-25m was used.

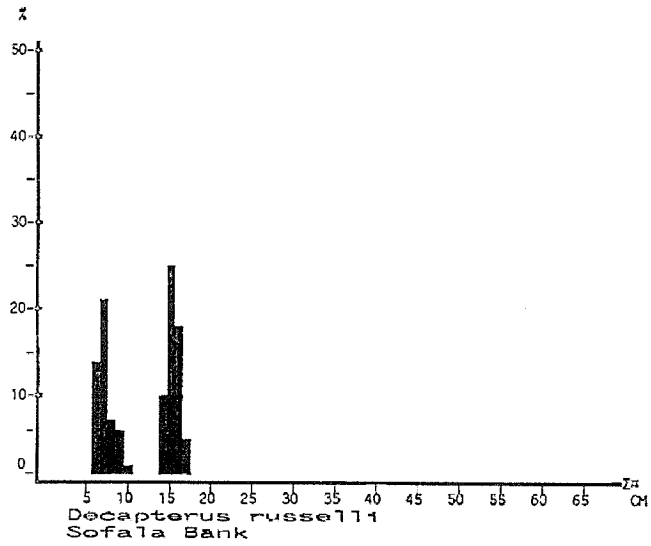
Cod ends of trawls with fine meshed inner lining.

ANNEX II LENGTH DISTRIBUTION OF COMMON SPECIES

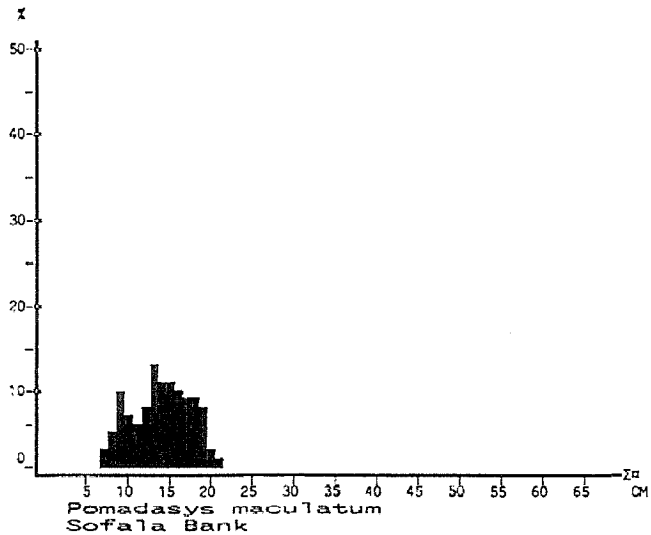




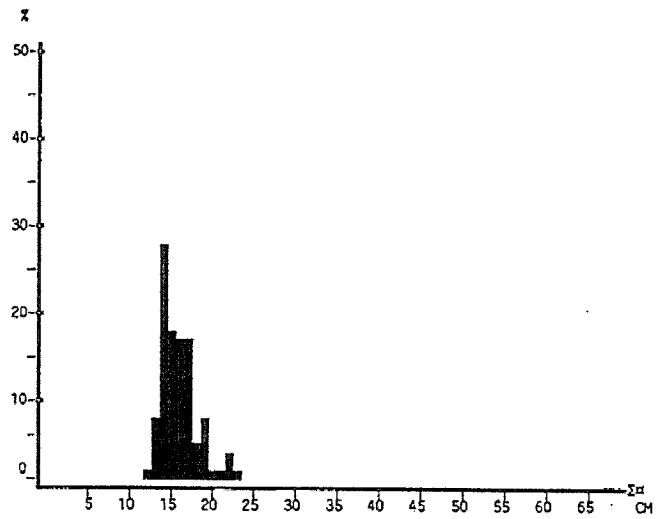
Pooled sample (simple adding)
 MEAN LENGTH = 6.97cm N= 164
 NUMBER OF SUBSAMPLES : 2
 SAMPLES FOUND BETWEEN ST. NO. 135 AND 158.
 SAMPLES SEARCHED BETWEEN ST. NO. 113 AND 159 .



Pooled sample (simple adding)
 MEAN LENGTH = 11.59cm N= 94
 NUMBER OF SUBSAMPLES : 2
 SAMPLES FOUND BETWEEN ST. NO. 136 AND 159.
 SAMPLES SEARCHED BETWEEN ST. NO. 113 AND 159 .

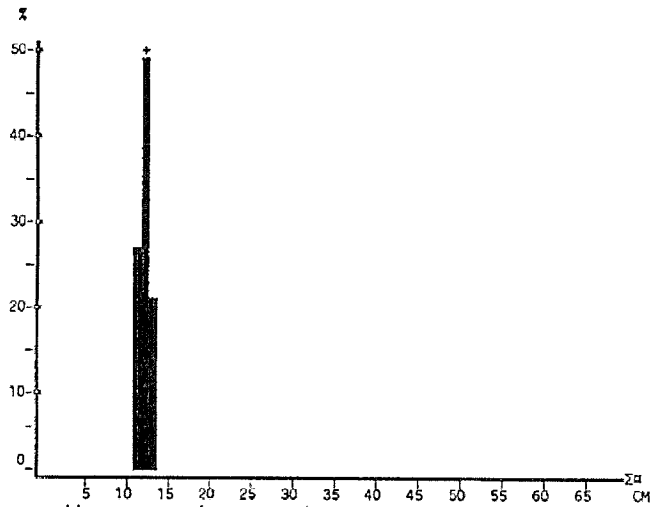


Pooled sample (simple adding)
 MEAN LENGTH = 13.87cm N= 165
 NUMBER OF SUBSAMPLES : 3
 SAMPLES FOUND BETWEEN ST. NO. 115 AND 155.
 SAMPLES SEARCHED BETWEEN ST. NO. 113 AND 159 .



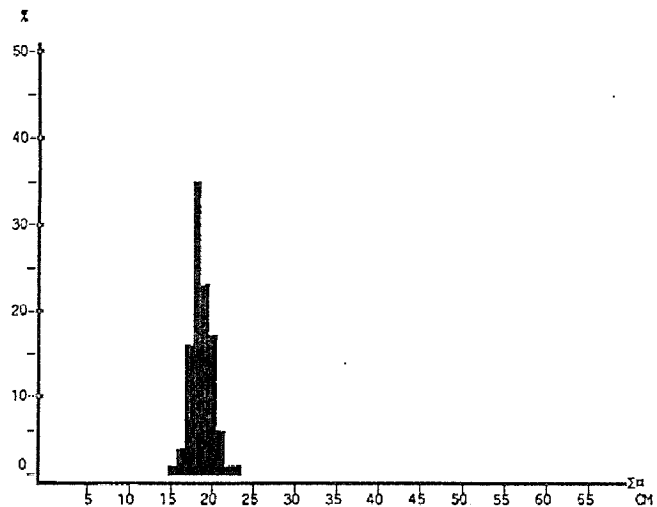
Carangoides malabaricus
Sofala Bank

Pooled sample (simple adding)
MEAN LENGTH = 15.88cm N= 90
NUMBER OF SUBSAMPLES : 2
SAMPLES FOUND BETWEEN ST. NO. 114 AND 148.
SAMPLES SEARCHED BETWEEN ST. NO. 113 AND 159 .



Upeneus bensasi
Sofala Bank

Pooled sample (simple adding)
MEAN LENGTH = 11.94cm N= 50
NUMBER OF SUBSAMPLES : 1
SAMPLES FOUND BETWEEN ST. NO. 136 AND 136.
SAMPLES SEARCHED BETWEEN ST. NO. 113 AND 159 .



Rastrelliger kanagurta
Sofala Bank

Pooled sample (simple adding)
MEAN LENGTH = 18.59cm N= 73
NUMBER OF SUBSAMPLES : 1
SAMPLES FOUND BETWEEN ST. NO. 138 AND 138.
SAMPLES SEARCHED BETWEEN ST. NO. 113 AND 159 .

ANNEX III RECORDS OF FISHING STATIONS

PROJECT STATION: 113										PROJECT STATION: 117																																		
DATE: 11/ 8/90					GEAR TYPE: BT No:1					POSITION: Lat S 1714					DATE: 11/ 8/90					GEAR TYPE: BT No:1					POSITION: Lat S 1706																			
start stop duration					Purpose code: 3					Area code: 1					start stop duration					Purpose code: 3					Area code: 1																			
TIME : 09:00:00 09:30:00 30 (min)					Long E 3843					LONG : 6459.70 6461.10 1.40					TIME : 14:29:00 14:59:00 30 (min)					LONG : 6459.70 6461.10 1.40					TIME : 14:29:00 14:59:00 30 (min)					Purpose code: 3														
LOG : 16183.60 6185.40 1.80					GearCond.code: 1					Validity code: 1					LOG : 6459.70 6461.10 1.40					GearCond.code: 1					Validity code: 1																			
FDEPTH: 18 18					Wire out: 150 m					Speed: 36 kn*10					FDEPTH: 8 9					Wire out: 160 m					Speed: 28 kn*10																			
BDEPTH: 18 18					Towing dir: 62°					Sorted: 19 Kg					Towing dir: 60°					Sorted: 7 Kg					Total catch: 113.50					CATCH/HOUR: 227.00														
Sorted: 19 Kg					Total catch: 43.90					CATCH/HOUR: 87.80					Sorted: 7 Kg					Total catch: 113.50					CATCH/HOUR: 227.00																			
SPECIES										SPECIES																																		
weight					CATCH/HOUR					% OF TOT. C					SAMP.NO.					weight					CATCH/HOUR					% OF TOT. C					SAMP.NO.									
Secutor insidiator					41.00					2698					46.70					Trichiurus lepturus					124.60					3152					54.89									
Dussuieria acuta					10.60					356					12.07					Thryssa vitrirostris					32.80					5592					14.45									
Sardinella melanura					8.80					294					10.02					CARIDEA					14.80					652					6.52									
Scomberoides commersonianus					8.02					2					9.13					Otolithes ruber					13.40					296					5.90									
Upeneus vittatus					5.00					148					5.69					SEPIIDAE					7.40					832					3.26									
Trichiurus lepturus					4.40					28					4.40					Johnius dussumieri					6.00					238					2.64									
Stolephorus commersonii					2.80					1166					3.19					Parastromateus niger					6.00					30					2.64									
Parastromateus niger					2.00					4					2.28					Metapenaeus monoceros					5.34					412					2.35									
Therapon jarbua					1.20					8					1.37					Penaeus indicus					4.98					146					2.19									
Carangoides malabaricus					1.20					4					1.37					Arius polyastaphylodon					3.50					2					1.54									
Pellona ditcheila					1.00					140					1.14					Cynoglossus attenuatus					3.00					386					1.32									
Megalopis cordyla					0.80					8					0.91					Penaeus monodon					1.64					12					0.72									
Pomadourus maculatus					0.80					4					0.51					Metapenaeus stebbingi					1.52					1					0.67									
Sepia prashadi					0.20					4					0.23					Pomadourus maculatus					1.40					238					0.62									
PENAEIDAE					0.00					4										Pellona ditcheila					0.60					208					0.26									
Total										87.82					100.02					PENAEIDAE					0.16										0.07									
Total										Total										Total										Total														
Total										Total										Total										Total														
PROJECT STATION: 114										PROJECT STATION: 118																																		
DATE: 11/ 8/90					GEAR TYPE: BT No:1					POSITION: Lat S 1643					DATE: 14/ 8/90					GEAR TYPE: BT No:1					POSITION: Lat S 1713																			
start stop duration					Purpose code: 3					Area code: 1					start stop duration					Purpose code: 2					Area code: 1																			
TIME : 11:00:00 11:36:00 30 (min)					Long E 3933					LONG : 6243.60 6245.20 1.60					TIME : 09:31:00 10:01:00 30 (min)					LONG : 6503.70 6505.00 1.30					Area code: 1																			
LOG : 6243.60 6245.20 1.60					GearCond.code: 1					Validity code: 1					FDEPTH: 18 17					GearCond.code: 1					Validity code: 1																			
FDEPTH: 12 13					Wire out: 100 m					Speed: 32 kn*10					BDEPTH: 18 17					Wire out: 150 m					Speed: 26 kn*10																			
BDEPTH: 12 13					Towing dir: 50°					Sorted: 30 Kg					Towing dir: 350°					Sorted: 10 Kg					Total catch: 60.00					CATCH/HOUR: 120.00														
Sorted: 30 Kg					Total catch: 30.70					CATCH/HOUR: 61.40					Sorted: 10 Kg					Total catch: 60.00					CATCH/HOUR: 120.00																			
SPECIES										SPECIES																																		
weight					CATCH/HOUR					% OF TOT. C					SAMP.NO.					weight					CATCH/HOUR					% OF TOT. C					SAMP.NO.									
Dussuieria acuta					13.36					352					21.76					CARIDEA					50.00					25000					41.67									
Scomberomorus commersoni					10.86					10					17.49					275					Thryssa vitrirostris					14.90					2260					12.42				
Secutor insidiator					7.00					492					11.40					273					Penaeus monodon					6.38					68					5.32				
Carangoides malabaricus					6.50					78					10.59					274					Otolithes ruber					5.00					90					4.17				
Chirocentrus dorab					4.00					4					6.51					4					Metapenaeus monoceros					4.68					344					3.90				
Polynemus sextarius					3.72					72					6.06					5					Upeneus sulphureus					4.40					230					3.67				
Alepes djedaba					3.68					30					5.99					6					Johnius dussumieri					4.40					370					3.67				
Sphyraena putnami					3.64					6					2.67					6					Cynoglossus attenuatus					4.10					370					3.42				
Gazza minuta					1.60					40					2.61					2					Penaeus indicus					3.88					142					3.23				
Upeneus vittatus					1.58					28					2.57					2					Upeneus vittatus					3.50					120					2.93				
Pomadourus maculatus					1.42					14					2.31					2					Trichiurus lepturus					3.10					100					2.58				
Leiognathus equulus					1.32					20					2.15					2					Sardinella sp.					2.60					310					2.17				
Pellona ditcheila					1.18					28					1.92					2					Pellona ditcheila					2.50					540					2.08				
Trichiurus lepturus					1.06					2					1.73					2					CRUSTACEANS					1.60					170					1.50				
Gerres filamentosus					1.04					12					1.69					2					ANGUILIFORMES					1.80					-					1.50				
Stolephorus indicus					0.92					22					1.50					2					Penaeus japonicus					1.70					68					1.42				
LOLIGINIDAE					0.20					8					0.33					2					Johnius amblycephalus					1.50					120					1.25				
Selar crumenophthalmus					0.20					4					0.33					2					Therapon theraps					0.50					20					0.42				
Arius macleay					0.10					2					0.16					2					PLATYCEPHALIDAE					0.50					30					0.42				
Sphyraena flavicauda					0.10					2					0.16					2					Apogon sp					0.30					60					0.42				
Chilomycterus reticulatus					0.10					2					0.16					2					Thryssa setirostris					0.50					10					0.42				
Total										61.48					100.13					Total										121.74					101.50									
Total										Total										Total										Total														

PROJECT STATION: 137
DATE: 18/ 8/90 GEAR TYPE: BT No:1 POSITION: Lat S 1812 Long E 3658
start stop duration
TIME :06:40:00 07:10:00 30 (min) Purpose code: 3
LOG :7242.60 7244.40 1.70 Area code : 1
FDEPTH: 11 15 GearCond.code:
BDEPTH: 11 15 Validity code:
Towing dir: 180° Wire out: 100 m Speed: 36 kn*10
Sorted: 9 Kg Total catch: 79.00 CATCH/HOUR: 158.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP.NO.
Johnius dussumieri	36.90	3032	23.25	
Thryssa vitrirostris	26.40	3028	16.71	259
Trichurus lepturus	24.60	296	15.57	
Otolithes ruber	19.40	312	12.20	
Arius dussumieri	12.30	82	7.78	
Pomadasy kaakan	9.80	11572	6.20	
CARIDEA	4.20	286	2.66	
Metapenaeus monoceros	3.30	32	2.09	
Therapon thersops	2.86	90	1.68	
Penaeus indicus	1.50	278	1.01	
Sepia faronisi	1.30	18	0.82	
Penaeus monodon	1.30	16	0.63	
Leiognathus elongatus	0.80	32	0.51	
Pellona ditchela	0.80	50	0.32	
Cynoglossus attenuatus	0.50	32	0.32	
Gazza minuta	0.30	16	0.15	
Upeneus sulphureus	0.06	2	0.04	
Penaeus japonicus	0.06	2	0.04	
Total	158.22	100.13		

PROJECT STATION: 141
DATE: 18/ 8/90 GEAR TYPE: BT No:1 POSITION: Lat S 1852 Long E 3634
start stop duration
TIME :14:25:00 14:55:00 30 (min) Purpose code: 3
LOG :7302.10 7303.90 1.80 Area code : 1
FDEPTH: 25 25 GearCond.code:
BDEPTH: 25 25 Validity code:
Towing dir: 210° Wire out: 150 m Speed: 36 kn*10
Sorted: 10 Kg Total catch: 114.00 CATCH/HOUR: 228.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP.NO.
Trichurus lepturus	76.00	1880	33.33	
Pellona ditchela	50.60	4400	22.19	
Upeneus sulphureus	28.90	1302	12.60	
Siganus sutor	11.30	50	4.96	
Polynemus sextarius	8.60	200	3.77	
Upeneus vittatus	8.10	352	3.55	
Thryssa vitrirostris	7.60	2884	3.33	
Thenus orientalis	7.50	26	3.29	
Tryssa setirostris	5.00	226	2.19	
Carangoides malabaricus	3.80	26	1.67	
Secutor insidiator	3.20	302	1.40	
Metapenaeus monoceros	2.72	114	1.19	
Stolephorus commersonii	2.60	930	1.14	
Penaeus japonicus	2.24	76	0.98	
Penaeus indicus	1.26	18	0.55	
Loligo duvauceli	1.26	26	0.55	
Dussumieria acuta	1.00	50	0.44	
Squilla sp.	0.80	100	0.35	
Saurida undosquamis	0.80	26	0.35	
PENAEIDAE	0.78	68	0.34	
Sepia faronisi	0.50	26	0.22	
Cynoglossus attenuatus	0.50	50	0.22	
Pomadasy maculatum	0.50	76	0.22	
Apistus carinatus	0.50	26	0.22	
Leiognathus elongatus	0.50	452	0.22	
Trachinocephalus myops	0.50	26	0.22	
Aliepes djeddaba	0.50	76	0.22	
Leiognathus squulus	0.26	26	0.11	
Penaeus semiculcatus	0.12	2	0.05	
Total	227.94	99.95		

PROJECT STATION: 138
DATE: 18/ 8/90 GEAR TYPE: BT No:1 POSITION: Lat S 1829 Long E 3659
start stop duration
TIME :08:51:00 09:21:00 30 (min) Purpose code: 3
LOG :7260.20 7261.90 1.60 Area code : 1
FDEPTH: 23 25 GearCond.code:
BDEPTH: 23 25 Validity code:
Towing dir: 228° Wire out: 150 m Speed: 34 kn*10
Sorted: 17 Kg Total catch: 240.30 CATCH/HOUR: 480.60

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP.NO.
Merklotsycthis quadrimaculata	265.30	7634	55.20	300
Rastrelliger kanagurta	138.20	1906	28.76	301
Pomadasy maculatum	28.80	28	5.99	
Sphyraena flavicauda	15.00	190	3.12	
Oscapteur rufipicis	8.40	190	1.75	
Saurida undosquamis	7.60	28	1.58	
Secutor insidiator	4.40	272	0.92	
Sphyraena novae hollandia	3.80	28	0.79	
Aliepes djeddaba	2.80	28	0.58	
Gertes filamentosus	2.20	28	0.46	
Hemipterus delagoae	2.20	38	0.46	
Upeneus vittatus	1.40	54	0.29	
Penaeus japonicus	0.46	8	0.10	
Total	480.56	100.00		

PROJECT STATION: 142
DATE: 18/ 8/90 GEAR TYPE: BT No:1 POSITION: Lat S 1854 Long E 3621
start stop duration
TIME :16:02:00 16:32:00 30 (min) Purpose code: 3
LOG :7315.10 7316.70 1.70 Area code : 1
FDEPTH: 9 12 GearCond.code:
BDEPTH: 9 12 Validity code:
Towing dir: 210° Wire out: 100 m Speed: 32 kn*10
Sorted: 9 Kg Total catch: 102.00 CATCH/HOUR: 204.00

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP.NO.
Johnius dussumieri	76.00	8444	37.25	
Thryssa vitrirostris	45.00	5000	22.06	
Otolithes ruber	20.00	1900	9.30	
Lobotes surinamensis	10.00	2	0.31	
Trichurus lepturus	10.60	120	5.20	
Cynoglossus attenuatus	6.00	480	2.94	
Pomadasy kaakan	5.20	2	2.55	
CARIDEA	3.40	220	1.67	
Sepia faronisi	3.20	220	1.57	
Thryssa setirostris	3.00	60	1.47	
Postunus sanguinolentus	2.00	40	0.98	
Squilla sp.	2.00	440	0.98	
Zehrfis zebra	2.00	40	0.98	
Arius dussumieri	1.60	20	0.78	
Penaeus indicus	1.38	62	0.68	
Metapenaeus monoceros	1.00	46	0.49	
Gazza minuta	1.00	180	0.49	
PLATYCEPHALIDAE	0.60	20	0.28	
Pellona ditchela	0.60	240	0.29	
Penaeus monodon	0.54	6	0.26	
Stolephorus commersonii	0.20	160	0.10	
Upeneus sulphureus	0.20	20	0.10	
Penaeus japonicus	0.14	4	0.07	
Total	204.66	100.31		

PROJECT STATION: 139
DATE: 18/ 8/90 GEAR TYPE: BT No:1 POSITION: Lat S 1849 Long E 3636
start stop duration
TIME :12:13:00 12:44:00 31 (min) Purpose code: 3
LOG :7290.50 7292.50 2.00 Area code : 1
FDEPTH: 21 21 GearCond.code:
BDEPTH: 21 21 Validity code:
Towing dir: 230° Wire out: 150 m Speed: 39 kn*10
Sorted: 16 Kg Total catch: 30.70 CATCH/HOUR: 59.42

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP.NO.
Pellona ditchela	33.00	2206	55.54	302
Trichurus lepturus	14.13	374	23.78	
Carangoides malabaricus	3.39	43	5.71	
Scomberomus commersonii	1.74	4	2.93	
Upeneus sulphureus	1.26	46	2.12	
Parastronotus niger	1.06	4	1.78	
Metapenaeus monoceros	0.66	23	1.11	
Ariomma indica	0.56	14	0.94	
Sphyraena flavicauda	0.56	8	0.94	
Thryssa vitrirostris	0.48	52	0.81	
Penaeus indicus	0.43	6	0.72	
Merklotsycthis quadrimaculata	0.39	26	0.66	
Penaeus japonicus	0.25	10	0.42	
Sepia faronisi	0.23	21	0.39	
Loligo duvauceli	0.19	25	0.32	
Therapon thersops	0.19	8	0.32	
Secutor insidiator	0.19	21	0.32	
Upeneus vittatus	0.19	17	0.32	
Aliepes djeddaba	0.19	4	0.32	
Tryssa setirostris	0.14	8	0.24	
Pomadasy maculatum	0.10	10	0.17	
Leiognathus elongatus	0.10	95	0.17	
PENAEIDAE	0.04	4	0.07	
Total	59.47	100.10		

PROJECT STATION: 143
DATE: 19/ 8/90 GEAR TYPE: BT No:1 POSITION: Lat S 1859 Long E 3614
start stop duration
TIME :06:59:00 07:29:00 30 (min) Purpose code: 3
LOG :7329.00 7330.50 1.50 Area code : 1
FDEPTH: 14 18 GearCond.code:
BDEPTH: 14 18 Validity code:
Towing dir: 220° Wire out: 100 m Speed: 30 kn*10
Sorted: 12 Kg Total catch: 95.10 CATCH/HOUR: 190.60

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP.NO.
Pomadasy kaakan	68.60	422	34.42	
Thryssa vitrirostris	19.30	2164	10.13	304
Johnius dussumieri	15.68	1340	8.23	
ARLIDAE	14.40	18	7.56	
Scomberomus commersonii	13.40	2	7.03	
Trichurus lepturus	13.28	278	6.97	
Otolithes ruber	12.00	688	6.30	
Penaeus indicus	11.98	318	6.29	
Pellona ditchela	4.82	206	2.53	
Sillago sihama	4.22	12	2.21	
CARIDEA	2.42	796	1.27	
PORTUNIDAE	1.82	24	0.95	
Sardinella gibbosa	1.82	48	0.95	
Tryssa setirostris	1.80	60	0.94	
Metapenaeus monoceros	1.64	94	0.86	
Sepia faronisi	1.32	108	0.69	
Cynoglossus attenuatus	1.20	84	0.63	
Polynemus sextarius	1.20	48	0.63	
Squilla sp.	0.60	36	0.31	
Parastronotus niger	0.60	12	0.31	
Penaeus japonicus	0.44	16	0.23	
PENAEIDAE	0.24	36	0.17	
Trachinocephalus sp.	0.20	12	0.10	
AFOGONIDAE	0.20	48	0.10	
Lagocephalus sp	0.20	72	0.10	
Secutor insidiator	0.20	48	0.10	
Metapenaeus stebbingi	0.06	6	0.03	
Total	190.64	100.00		

PROJECT STATION: 140
DATE: 18/ 8/90 GEAR TYPE: BT No:1 POSITION: Lat S 1849 Long E 3632
start stop duration
TIME :13:17:00 13:46:00 29 (min) Purpose code: 3
LOG :7296.20 7297.90 1.70 Area code : 1
FDEPTH: 20 20 GearCond.code:
BDEPTH: 20 20 Validity code:
Towing dir: 200° Wire out: 150 m Speed: 34 kn*10
Sorted: 13 Kg Total catch: 49.70 CATCH/HOUR: 102.83

SPECIES	CATCH/HOUR weight	numbers	% OF TOT. C	SAMP.NO.
Pellona ditchela	54.62	4370	53.12	
Trichurus lepturus	20.07	511	19.52	
Thryssa vitrirostris	8.81	852	8.57	303
Metapenaeus monoceros	3.43	147	3.34	
Scomberomus plurilineatus	3.10	2	3.01	
Penaeus indicus	2.83	70	2.75	
Otolithes ruber	2.54	66	2.47	
Loligo duvauceli	2.38	387	2.31	
Sepia faronisi	1.86	52	1.81	
Thenus orientalis	0.72	8	0.70	
Upeneus sulphureus	0.37	14	0.36	
Polynemus sextarius	0.37	23	0.36	
Dussumieria acuta	0.37	14	0.36	
Squilla sp.	0.23	8	0.22	
Secutor insidiator	0.23	43	0.22	
Penaeus japonicus	0.17	6	0.17	
Cynoglossus attenuatus	0.14	8	0.14	
Ariomma indica	0.14	8	0.14	
Tryssa setirostris	0.14	14	0.14	
Johnius sp.	0.14	14	0.14	
Leiognathus elongatus	0.06	37	0.08	
Stolephorus commersonii	0.08	52	0.08	
Total	102.82	100.01		

PROJECT STATION: 144
 DATE: 20/ 8/90 GEAR TYPE: BT No:1 POSITION: Lat S 1923 Long E 3546
 start stop duration
 TIME : 05:50:00 06:20:00 30 (min) Purpose code: 3
 LOG : 7553.30 7555.20 2.00 Area code : 1
 FDEPTH: 22 22 GearCond.code: 1
 BDEPTH: 22 22 Validity code:
 Towing dir: 210° Wire out: 150 m Speed: 38 kn*10
 Sorted: 13 Kg Total catch: 43.50 CATCH/HOUR: 87.00

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP. NO.
weight	numbers		
Pellona ditchela	43.94	95.20	50.51
Secutor insidiator	11.96	30.2	12.71
Upeneus vittatus	7.14	32.4	8.21
Carangoides malabaricus	6.48	23.8	7.45
Scomberomorus commersoni	5.20	2	5.98
Psettodes erumei	1.98	6	2.28
Thryssa vitirostris	1.98	15.8	2.28
Ariomma indica	1.52	40	1.75
Trichurus lepturus	1.52	34	1.75
LOLIGINIDAE	1.46	46	1.68
Rastrelliger kanagurta	1.20	6	1.38
Saurida undosquama	1.20	20	1.38
Alepes djeddaba	1.00	14	1.15
Pomadoury maculatum	0.80	20	0.92
Sardinella gibbosa	0.48	6	0.39
Penaeus japonicus	0.12	6	0.14
Leiognathus elongatus	0.06	40	0.07
Stolephorus commersonii	0.06	20	0.07
Metapenaeus monoceros	0.04	2	0.05
PENAEIDAE	0.02	2	0.02
Total	87.04	100.08	

PROJECT STATION: 148
 DATE: 20/ 8/90 GEAR TYPE: BT No:1 POSITION: Lat S 1917 Long E 3558
 start stop duration
 TIME : 13:48:00 14:18:00 30 (min) Purpose code: 3
 LOG : 7611.30 7613.10 2.00 Area code : 1
 FDEPTH: 22 22 GearCond.code: 1
 BDEPTH: 22 22 Validity code:
 Towing dir: 210° Wire out: 150 m Speed: 36 kn*10
 Sorted: Kg Total catch: 10.93 CATCH/HOUR: 37.86

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP. NO.
weight	numbers		
Scomberomorus commersoni	13.00	4	34.34
Carangoides malabaricus	12.20	246	32.22
Secutor insidiator	3.84	152	10.14
Upeneus vittatus	3.00	126	7.92
Loligo duvauelli	2.20	198	5.81
Alepes djeddaba	1.72	12	4.54
Rastrelliger kanagurta	0.92	6	2.43
Atule mate	0.82	16	2.17
Metapenaeus monoceros	0.16	4	0.42
Total	37.86	99.99	

PROJECT STATION: 149
 DATE: 20/ 8/90 GEAR TYPE: BT No:1 POSITION: Lat S 1920 Long E 3686
 start stop duration
 TIME : 16:23:00 16:53:00 30 (min) Purpose code: 3
 LOG : 7629.20 7630.60 1.40 Area code : 1
 FDEPTH: 30 31 GearCond.code:
 BDEPTH: 30 31 Validity code:
 Towing dir: 240° Wire out: 150 m Speed: 28 kn*10
 Sorted: Kg Total catch: 52.54 CATCH/HOUR: 107.08

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP. NO.
weight	numbers		
Scomberomorus commersoni	63.80	22	59.58
Rastrelliger kanagurta	18.60	2	17.37
Loligo duvauelli	15.60	894	14.01
Metapterus bleekeri	6.80	60	6.35
Carangoides malabaricus	1.00	14	0.93
Saurida undosquama	0.60	8	0.56
Rastrelliger kanagurta	0.40	6	0.37
Psettodes erumei	0.38	2	0.35
Therapon theraps	0.20	2	0.19
Decapterus russelli	0.10	8	0.09
Upeneus vittatus	3.08	6	0.07
Upeneus bensasi	0.08	10	0.07
Atule mate	0.04	2	0.04
Total	107.08	99.98	

PROJECT STATION: 145
 DATE: 20/ 8/90 GEAR TYPE: BT No:1 POSITION: Lat S 1906 Long E 3552
 start stop duration
 TIME : 09:57:00 10:27:00 30 (min) Purpose code: 3
 LOG : 7590.00 7591.50 1.50 Area code : 1
 FDEPTH: 10 10 GearCond.code:
 BDEPTH: 10 10 Validity code:
 Towing dir: 200° Wire out: 100 m Speed: 30 kn*10
 Sorted: 9 Kg Total catch: 173.40 CATCH/HOUR: 346.80

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP. NO.
weight	numbers		
Pellona ditchela	229.40	10380	65.86
Garcharhinus limbatus	37.40	6	10.78
Trichurus lepturus	32.40	694	9.14
Secutor insidiator	14.20	858	4.09
Portunus sanguinolentus	8.30	66	2.39
Thryssa vitirostris	6.00	396	1.73
Scomberomorus pluxilineatus	2.30	6	0.95
Dussumieria acuta	2.30	106	6.55
Rastrelliger kanagurta	3.00	34	0.87
Parastromateus niger	2.90	10	0.84
Loligo duvauelli	1.70	34	0.49
Scomberoides tol	1.30	34	0.37
Alepes djeddaba	1.30	66	0.37
Thryssa vitirostris	1.30	34	0.37
Therapon jarbua	0.50	2	0.14
Otolithes ruber	0.40	2	0.14
Penaeus indicus	0.22	8	0.09
Pomadoury maculatum	0.30	34	0.09
Scomberomorus commersoni	0.12	2	0.03
Stolephorus commersonii	0.10	109	0.03
Metapenaeus monoceros	0.08	4	0.02
Metapenaeus stebbingi	0.06	6	0.02
Total	346.76	99.96	

PROJECT STATION: 150
 DATE: 22/ 8/90 GEAR TYPE: BT No:1 POSITION: Lat S 2027 Long E 3449
 start stop duration
 TIME : 06:24:00 06:54:00 30 (min) Purpose code: 3
 LOG : 7961.10 7963.00 1.90 Area code : 1
 FDEPTH: 10 13 GearCond.code:
 BDEPTH: 10 13 Validity code:
 Towing dir: 20° Wire out: 100 m Speed: 38 kn*10
 Sorted: 10 Kg Total catch: 605.00 CATCH/HOUR: 1210.00

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP. NO.
weight	numbers		
Pellona ditchela	1000.00	52106	82.64
Thryssa vitirostris	60.60	6068	5.01
Leiognathus equulus	48.20	3564	3.90
Pomadoury kaokan	21.20	192	1.75
Ariomma bandi	17.40	192	1.44
Secutor insidiator	14.40	1060	1.19
Metapenaeus monoceros	9.60	268	0.79
Alepes djeddaba	7.92	520	0.65
Upeneus sulphureus	4.80	482	0.40
Upeneus vittatus	4.80	578	0.40
Carangoides ferdau	2.80	96	0.23
Carangoides malabaricus	2.80	192	0.23
Alectis ciliaris	2.00	96	0.23
Scomberoides tol	2.00	96	0.17
Therapon theraps	2.00	192	0.17
Penaeus indicus	1.10	26	0.09
Penaeus japonicus	0.62	8	0.02
Metapenaeus stebbingi	0.04	8	
Penaeus semisulcatus	0.04	2	
Total	1210.52	100.03	

PROJECT STATION: 146
 DATE: 20/ 8/90 GEAR TYPE: BT No:1 POSITION: Lat S 1908 Long E 3554
 start stop duration
 TIME : 11:05:00 11:35:00 30 (min) Purpose code: 3
 LOG : 7696.00 7697.00 1.00 Area code : 1
 FDEPTH: 13 12 GearCond.code:
 BDEPTH: 13 12 Validity code:
 Towing dir: 21° Wire out: 100 m Speed: 3 kn*10
 Sorted: 13 Kg Total catch: 388.00 CATCH/HOUR: 352.50

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP. NO.
weight	numbers		
Pellona ditchela	273.60	13613	77.62
Thryssa vitirostris	25.18	531	7.14
Thryssa vitirostris	13.26	876	3.76
Alepes djeddaba	8.21	133	2.33
Garcharhinus limbatus	6.38	2	1.81
Sphyrna lewini	5.72	2	1.62
Otolithes ruber	3.31	26	1.51
Sepia larsonis	2.12	107	0.60
Dussumieria acuta	1.59	53	0.45
Leiognathus elongatus	1.33	26	0.38
Secutor insidiator	1.33	133	0.38
Johnius dussumieri	1.07	53	0.30
Thryssa vitirostris	1.07	53	0.30
Metapenaeus monoceros	0.68	26	0.25
Penaeus indicus	0.81	13	0.23
Lisa macrolepis	0.79	26	0.22
Cozza minuta	0.53	26	0.15
Therapon theraps	0.53	26	0.15
Polynemus sextarius	0.53	26	0.15
Upeneus vittatus	0.53	26	0.15
Stolephorus commersonii	0.53	504	0.15
Metapenaeus stebbingi	0.02	2	0.01
Total	351.32	99.66	

PROJECT STATION: 151
 DATE: 22/ 8/90 GEAR TYPE: BT No:1 POSITION: Lat S 2019 Long E 3452
 start stop duration
 TIME : 07:54:00 08:24:00 30 (min) Purpose code: 3
 LOG : 7969.90 7971.50 1.60 Area code : 1
 FDEPTH: 11 7 GearCond.code:
 BDEPTH: 11 7 Validity code:
 Towing dir: 190° Wire out: 100 m Speed: 32 kn*10
 Sorted: 14 Kg Total catch: 317.60 CATCH/HOUR: 634.00

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP. NO.
weight	numbers		
Pellona ditchela	346.40	17146	54.64
Secutor insidiator	60.80	3296	9.59
Leiognathus equulus	58.30	60	9.20
Upeneus vittatus	50.30	2788	7.93
Scomberomorus commersoni	27.90	6	4.40
Gerres filamentosus	22.20	676	3.66
Pomadoury maculatum	22.80	676	3.80
Therapon theraps	19.50	170	1.67
Carangoides ferdau	8.90	126	1.40
Carangoides malabaricus	6.80	296	1.07
Sphyrna flavicauda	5.10	84	0.80
Epinephelus taeniops	3.30	2	0.52
Thryssa vitirostris	3.30	338	0.47
Scomberomorus pluxilineatus	2.20	2	0.35
Rastrelliger kanagurta	2.12	42	0.33
Upeneus sulphureus	0.80	84	0.13
Polynemus sextarius	0.80	42	0.13
Penaeus japonicus	0.42	24	0.07
Penaeus semisulcatus	0.08	2	0.01
Penaeus indicus	0.08	2	0.01
Metapenaeus stebbingi	0.06	10	0.01
Metapenaeus monoceros	0.02	4	
Total	633.98	99.99	

PROJECT STATION: 147
 DATE: 20/ 8/90 GEAR TYPE: BT No:1 POSITION: Lat S 1912 Long E 3559
 start stop duration
 TIME : 12:46:00 13:16:00 30 (min) Purpose code: 3
 LOG : 7605.50 7607.70 1.90 Area code : 1
 FDEPTH: 22 25 GearCond.code:
 BDEPTH: 22 25 Validity code:
 Towing dir: 210° Wire out: 150 m Speed: 36 kn*10
 Sorted: 8 Kg Total catch: 46.30 CATCH/HOUR: 92.60

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP. NO.
weight	numbers		
Pellona ditchela	64.40	12150	79.00
Sphyrna flavicauda	6.40	96	6.96
Upeneus vittatus	4.50	176	5.00
Carangoides malabaricus	3.80	88	4.13
Dussumieria acuta	2.80	120	3.04
Pomadoury maculatum	1.90	22	2.07
Loligo duvauelli	1.80	76	1.96
Polynemus sextarius	1.80	32	1.96
Gerres oyna	0.90	10	0.98
Ariomma indica	0.80	10	0.87
Penaeus japonicus	0.64	12	0.70
Rhynchobatus djeddenis	0.60	2	0.65
Metapenaeus monoceros	0.50	18	0.54
Therapon theraps	0.50	10	0.54
Penaeus semisulcatus	0.30	4	0.33
Herklotsycthis quadrimaculata	0.20	10	0.22
Secutor insidiator	0.20	22	0.22
Alepes djeddaba	0.20	10	0.17
Total	92.24	100.28	

PROJECT STATION: 161
 DATE: 27/ 8/90 GEAR TYPE: BT No:1 POSITION: Lat S 2253 Long E 3539
 start stop duration Purpose code: 3
 TIME :09:46:00 10:14:00 28 (min) Area code : 1
 LOG :8812.50 8814.90 1.20 GearCond.code:
 FDEPTH: 142 138 Validity code:
 BDEPTH: 142 138
 Towing dir: Wire out: 650 m Speed: 48 kn*10
 Sorted: Kg Total catch: 250.00 CATCH/HOUR: 535.71

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP.NO.
	weight numbers		
Polysteganus coeruleopunctatus	502.61 1506	93.82	331
Aphareus rutilans	14.57 34	2.72	
Argyrops spinifer	8.46 6	1.58	
Sphaeroides sp.	5.36 2	1.00	
Zeus faber	3.15 2	0.59	
Thaenoscopus fajardoi	1.07 9	0.20	
Scorpaenopsis venosa	0.62 2	0.12	
SEPIIDAE	0.32 4	0.06	
Histiogaster tyfus	0.21 4	0.04	
Parupeneus sp.	0.13 2	0.02	
Caesio sp.	0.02 1		
Total	536.52	100.15	

PROJECT STATION: 162
 DATE: 27/ 8/90 GEAR TYPE: BT No:1 POSITION: Lat S 2307 Long E 3539
 start stop duration Purpose code: 3
 TIME :13:07:00 13:37:00 30 (min) Area code : 1
 LOG :8840.60 8841.60 1.60 GearCond.code:
 FDEPTH: 111 104 Validity code:
 BDEPTH: 111 104
 Towing dir: 175 Wire out: 500 m Speed: 20 kn*10
 Sorted: 9 Kg Total catch: 82.00 CATCH/HOUR: 164.00

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP.NO.
	weight numbers		
LOLIGINIDAE	51.34 2920	31.30	
Cephalopellis albimarginatus	46.79 6	28.48	
Aphareus rutilans	30.93 8	18.84	
Polysteganus coeruleopunctatus	14.46 38	8.82	
Caesio sp.	5.62 218	3.43	
Epinephelus epistictus	4.32 2	2.63	
Scyllarides elisabethae	3.26 4	1.99	
Parupeneus rufescens	3.20 6	1.95	
Chelimerius nufar	2.36 2	1.44	
Argyrops filamentosus	1.00 6	0.61	
Priacanthus hamur	1.00 4	0.61	
Total	164.16	100.10	

PROJECT STATION: 163
 DATE: 27/ 8/90 GEAR TYPE: BT No:1 POSITION: Lat S 2325 Long E 3543
 start stop duration Purpose code: 3
 TIME :16:20:00 16:58:00 30 (min) Area code : 1
 LOG :8868.60 8870.80 1.40 GearCond.code:
 FDEPTH: 182 173 Validity code:
 BDEPTH: 182 173
 Towing dir: Wire out: 800 m Speed: 44 kn*10
 Sorted: Kg Total catch: 16.00 CATCH/HOUR: 20.00

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP.NO.
	weight numbers		
Deepwater fish mixture	20.00	100.00	
Total	20.00	100.00	

PROJECT STATION: 164
 DATE: 28/ 8/90 GEAR TYPE: BT No:1 POSITION: Lat S 2439 Long E 3505
 start stop duration Purpose code: 3
 TIME :09:38:00 10:08:00 30 (min) Area code : 1
 LOG :9037.00 9038.50 1.50 GearCond.code:
 FDEPTH: 26 25 Validity code:
 BDEPTH: 26 25
 Towing dir: 240 Wire out: 150 m Speed: 30 kn*10
 Sorted: Kg Total catch: 56.00 CATCH/HOUR: 112.00

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP.NO.
	weight numbers		
Sphyrna lewini	100.00 2	89.29	
Scorpaenomorus commersoni	12.30 2	10.98	
Total	112.30	100.27	

PROJECT STATION: 165
 DATE: 28/ 8/90 GEAR TYPE: BT No:1 POSITION: Lat S 2452 Long E 3516
 start stop duration Purpose code: 3
 TIME :13:25:00 13:55:00 30 (min) Area code : 1
 LOG :9066.10 9067.70 1.70 GearCond.code:
 FDEPTH: 121 123 Validity code:
 BDEPTH: 121 123
 Towing dir: 210 Wire out: 550 m Speed: 32 kn*10
 Sorted: 9 Kg Total catch: 215.00 CATCH/HOUR: 430.00

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP.NO.
	weight numbers		
Chelimerius nufar	148.50 162	34.53	332
LOLIGINIDAE	103.66 9014	24.11	
Rhizoprionodon acutus	66.80 10	15.53	
Polysteganus coeruleopunctatus	44.50 98	10.35	
Chysoblephus anglicus	21.20 6	4.93	
Epinephelus albimarginatus	14.30 2	3.33	
Petrus rupestris	10.60 2	2.47	
Scyllarides elisabethae	7.50 10	1.74	
Squalus acanthias	5.46 28	1.27	
Dactyloptena orientalis	2.72 14	0.63	
Pagellus natliensis	2.72 28	0.63	
Fistularia petimba	2.04 28	0.47	
Total	430.00	99.99	

PROJECT STATION: 166
 DATE: 28/ 8/90 GEAR TYPE: BT No:1 POSITION: Lat S 2504 Long E 3507
 start stop duration Purpose code: 2
 TIME :17:05:00 17:35:00 30 (min) Area code : 1
 LOG :9098.00 9099.30 1.90 GearCond.code:
 FDEPTH: 93 95 Validity code: 5
 BDEPTH: 93 95
 Towing dir: 214 Wire out: 450 m Speed: 38 kn*10
 Sorted: Kg Total catch: 1000.00 CATCH/HOUR: 2000.00

SPECIES	CATCH/HOUR	% OF TOT. C	SAMP.NO.
	weight numbers		
SPARIDAE	1800.00	90.00	
MISCELLANEOUS	200.00	10.00	
Total	2000.00	100.00	

