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Results from Bottom Trawl Survey of Flemish Cap in July 1991

by

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The survey of Flemish Cap was carried out in 1991 on board R/V Cornide de Saavedra. This was the fourth survey of the series (Vazquez, 1989, 1990, 1991); their dates were:

year	vessel	valid tows	dates
1988	Cornide de Saavedra	115	8-22/7
1989	Cryos	116	12/7 - 1/7
1990	Ignat Paviyuchenkov	113	12/7 - 1/8
1991	Cornide de Saavedra	117	24/6 -11/7

Total biomass of all species was calculated by swept area method and is presented in Table 2, where some species are grouped to balance possible identification errors. Species were clustered according to a common tendency as observed before last year's survey (Vazquez, 1991) but the tendency was not continued. In this four year series only eelpouts (Zoarcidae) shows a continuous increasing tendency; two species, redfish and American plaice decreased; Most species reached minima in 1989 or 1990, as opposed to cod and squid (Illex) which had maxima. The possible shapes of a four point series are, of course, quite reduced; in our results the expected random shape, with up and down values, is not observed. The highest abundance of cod in 1989 and 1990 seems to be coherent with the decrease of most other stocks due to competition, as these result suggest.

Dimensions of the gear during trawling was analyzed on two occasions by SCANMAR equipment, in different depths, with the following result:

depth (m)	476	280	
speed (knots)	3,7	3,7	
mouth height (m)	2,4	2,4	
side opening (m)	22,0	20,6	
time to reach the bottom	7	5,5	minutes
time to get off the bottom	13	7,5	"
time the gear touched the bottom	41	36	"

In this table "time to reach the bottom" is the time elapsed between the moment all trawling wire is released and the moment the gear touches the bottom; "time to get off the bottom" is the time elapsed between the start of recovering the wire and the moment the gear separates from the bottom; "time the gear touched the bottom" is the real time that the gear was trawling on the bottom in a standard 30 minutes set. Differences in gear performance with depth are clear but its effect on catch was not analyzed; no correction was introduced to take into account the longer trawling time at greater depths.

RESULTS

Weighted (by stratum area) mean catches in half-an-hour tow of main species on the bank were:

	1988	1989	1990	1991
cod	46.74	146.04	70.81	47.06
American plaice	15.01	14.25	11.64	9.69
Sebastes spp.	188.22	161.15	93.23	71.01 *
Sebastes (juvenile)			21.23	5.13
Sebastes marinus	19.28	33.25	18.80	5.32
shrimp	2.50	2.71	2.74	10.17

Kg

\*) 87% Sebastes mentella and 13% S. fasciatus.

Cod

Mean catch by strata and whole bank data and their standard error are presented in Table 3. Cod stock biomass, estimated by swept area method, decreased since 1989, and in comparison to USSR's survey the results are:

year	CEE (1)	URSS: (2)	(3)
1983		23,000	
1984		31,100	
1985		28,100	
1986		26,100	
1987		12,300	(21,600)
1988	37,127	7,700	(34,200)
1989	103,644	36,500	(78,300)
1990	55,360	3,920	(17,300)
1991	36,597		

(tons)

- 1) Biomass estimated from bottom trawl survey
- 2) Biomass estimates from bottom trawl survey (Chumakov, 1989).
- 3) USSR's estimates of bottom trawlable plus pelagic biomass (Kuzmin, 1990, 1991).

The abundances by age-groups were calculated as follows:

age	year:			
	1988	1989	1990	1991
1 -	458	2085	237	13780
2 -	7196	1100	1179	2560
3 -	4037	8422	467	1548
4 -	1085	4922	1588	192
5 -	128	1858	1453	622
6 -	22	127	394	173
7 -	28	15	32	25
8 -	11	12	13	1
9 -			8	4
10 -		1	3	
11 -				1
12 -				

(x 10E4)

biomass	37127	103644	55360	36597	t
SOP *)	33474	100217	51388	37231	t

\*) SOP = Sum of products; back calculation of biomass as sum of products of frequencies and mean weight at age.

With 35 mm mesh size used in the cod end, recruitment is believed to be completed before age 2.

The abundant 1986 year-class was still noticeable in 1991 as 5 years old cod. The 1990 year class appears as 1-year old class and its abundance seems to indicate a very abundant recruitment.

Tables 4, 5 and 6 show length frequency, age-length key and estimated age composition of the stock respectively.

American plaice

Mean catch by strata and whole bank data and its standard error are presented in Table 7.

Total biomass calculated by swept area method was:

1988 - 11,868  
 1989 - 10,533  
 1990 - 9,101  
 1991 - 7,565 tons

The abundances by age-groups were calculated as follows:

age	year:			
	1988	1989	1990	1991
2 -	2284	454	359	309
3 -	625	6847	775	911
4 -	3034	1500	7083	1877
5 -	1975	3238	897	4461
6 -	3020	3006	2475	1836
7 -	4154	2868	1717	2009
8 -	4258	1691	1657	1566
9 -	1492	587	1030	675
10 -	207	261	485	232
11 -	109	34	90	8
12 -	61	14	15	48
13 -	-	-	31	-
14 -	-	-	17	-
(x 10E3)				
biomass	11868	10533	9101	7565
SOP		9726	8827	7682
N 6+	13301	8461	7517	6374

Tables 8, 9 and 10 show length frequency, age-length key and estimated age composition of the stock respectively.

Redfish

Redfish catches were classified into Sebaste marinus and Sebastes spp. As in the 1990 survey, all individuals of less than 15 cm length or those of species difficult to classify were separated in an independent group name "juvenile". Sebastes spp catch was sampled to calculate the proportion of S. mentella and S. fasciatus based on gasbladder musculature analysis.

Mean catch by strata and whole bank data and its standard error are presented in Tables 11 and 15. It is summarized in the next table:

Stock biomass estimated in:	1988	1989	1990	1991
<u>Sebastes marinus</u>	15.289	22.958	14.699	4.093
<u>Sebastes spp.</u>	142.933	113.675	72.893	
<u>S. mentella</u>				48.554
<u>S. fasciatus</u>				7.198
juveniles			16.601	4.001
total ....	158.222	136.633	104.193	63.846

Tables 12, 13 and 14 show length frequency, age-length key and age composition of the population respectively for S. marinus. Table 16 shows length frequency for Sebastes spp. Tables 17 and 18 present age-length keys for S. mentella and S. fasciatus respectively.

Greenland halibut (Reinhardtius hippoglossoides)

Total biomass calculated by swept area method was:

1988 -	6,818
1989 -	4,391
1990 -	5,649
1991 -	8,038 tons

Mean catch by strata and whole bank estimates are presented in table 19. Tables 20 and 21 show length composition of the population.

Shrimp (Pandalus borealis)

In Table 22 mean catch by strata and whole bank data are presented. Estimated length composition of the population is presented in Tables 23 and 24.

Swept area method total biomass estimations in these four years were

1988 -	2,164
1989 -	1,865
1990 -	2,140
1991 -	8,203 tons

Squid (Illex illecebrosus)

Squid appeared in this survey in a noticeable amount, as in the past year. Sampling length frequency are shown in Table 25.

REFERENCES

- Chumakov, A.K.-1989. PINRO Investigations in NAFO Convention Area in 1988. NAFO SCS Doc. 89/08 (part I and II).
- Kuzmin, S.A.- 1990. Stock assessment, age-length composition and maturity stages of the Flemish Cap cod. NAFO SCR Doc. 90/53, 15 p
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- Vazquez, A.- 1989. Results from bottom-trawl survey of Flemish Cap in July 1988. NAFO SCR Doc. 89/60, 15 pp.
- Vazquez, A.- 1990. Results from bottom-trawl survey of Flemish Cap in July 1989. NAFO SCR Doc. 90/68, 25 pp.
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Table 1 - Technical data of the survey.

Procedure	specification
Vessel	R/V CORNIDE DE SAAVEDRA
GT	1,200 t
power	1,500 + 750 HP
Trawling speed	3.55 knots
Trawling time	30 minutes
Trawl gear	type "Lofoten"
footrope / handrope	31.20 / 17.70 m
footgear	27 steel bobbins of 35 cm
vertical opening	2.5 m (see text)
warps	100 meters
trawl doors	polivalent, 850 Kg
wire length	3 times the depth
mesh size in codend	35 mm
Type of survey	stratified sampling
Station selection procedure	random
Criterion to change position of a selected tow:	<ul style="list-style-type: none"> <li>- unsuitable bottom for trawling according to ecosounder register.</li> <li>- information on from previous surveys.</li> </ul>
Criterion to reject data from tow	<ul style="list-style-type: none"> <li>- severe tears</li> <li>- less than 20 minutes tow</li> <li>- bad behaviour of the gear</li> </ul>
Daily period for fishing	6.00 to 22.00 hours
Species for sampling	all fishes, squid and shrimp
Species for age determination	cod, American plaice and redfish ( <i>Sebastes</i> spp and <i>S. marinus</i> )

Table 2 - Total biomass swept area method estimates for several species or groups of species in 1988-1991 surveys.

species	surveys:			
	1988	1989	1990	1991
Rajidae	4495	1908	2824	4064
Synphobranchus sp.	219	88	42	77
Urophycis sp.	654	167	169	261
Antimora sp.	392	302	284	560
Macrouridae	3088	1438	1223	2249
Notacanthus sp.	501	408	65	478
Illex sp.	5	8	1647	1159
Anarhichadidae	7973	7478	8120	10097
witch flounder	909	335	420	769
Greenland halibut	6818	4391	5649	8038
Zoarcidae	559	923	1202	1978
cod	37127	103644	55360	36597
American plaice	11886	10533	9101	7565
Sebastes spp	158417	136658	104194	63845
shrimp	2164	1923	2139	8211
others	624	206	1138	664
Total	235833	270410	193575	146611

Table 3 - Cod catches (Kg) by strata.

stratum	area sq. miles	tow number	catch per tow		catch per mile towed	
			mean	s. deviat.	mean	s. deviat.
1 -	342	4	216.42	168.96	111.36	90.03
2 -	838	10	82.25	57.67	44.64	31.26
3 -	628	7	45.13	32.00	26.70	19.19
4 -	348	4	101.29	93.06	56.82	54.43
5 -	703	8	183.96	266.36	103.32	149.97
6 -	496	6	40.45	47.65	21.04	24.28
7 -	822	9	36.89	23.30	21.06	14.26
8 -	646	7	95.85	107.61	53.91	60.46
9 -	314	2	7.45	1.48	4.09	0.88
10 -	951	11	20.32	19.79	11.18	11.01
11 -	806	9	26.75	25.37	15.12	14.65
12 -	670	8	2.13	4.08	1.29	2.52
13 -	249	2	4.72	1.95	2.57	1.07
14 -	602	7	2.34	5.69	1.48	3.62
15 -	666	7	1.93	5.10	1.11	2.93
16 -	634	7	-	-	-	-
17 -	216	2	-	-	-	-
18 -	210	2	-	-	-	-
19 -	414	5	-	-	-	-
total	10555	117				

	catch per tow	catch per mile towed
mean	47.06	26.00
standard error	7.74	4.33

(Kg)

Table 4 - Cod length frequency by strata (x 10E-4).

length (cm)	stratum															total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
9-11		2			1	1										3
12-14	3	61	28	89	328	28	1		1	8	2					548
15-17	39	476	362	1001	3290	204	13	3	6	77	13					9489
18-20	102	662	628	1659	3406	188	20	7	10	72	16					6772
21-23	31	240	146	288	603	54	18	3	2	34	17					1438
24-26	84	235	99	200	264	17	7	1		4	8					920
27-29	187	349	79	104	182	23	13	1		2	4					943
30-32	133	117	15	32	74	4	7	1	1		2					387
33-35	196	61	10	4	22	2	12	6	1	1	3					317
36-38	260	78	24	7	28	6	35	23	1	1	5					466
39-41	175	111	22	21	44	6	24	33		2	5					442
42-44	55	48	9	12	40	3	22	32			9					230
45-47	18	21	4	3	28	4	9	24	1		3	1				115
48-50	13	12	4	2	28	3	6	42		1	6					118
51-53	5	7	6	4	37	4	8	50		4	10			1		135
54-56	3	3	6	2	44	5	7	65		6	12					153
57-59	2	5	4	2	44	9	5	48	1	5	7					131
60-62	1	9	4	1	38	11	5	23	1	12	8					113
63-65	1	5	6		28	4	6	11	1	6	6	1				74
66-68		3	1	1	8	4	7	4	1	6	5		1			41
69-71		1			10	3	5	4	1	5	3	1				34
72-74		1	3		4	1	5	1		1	1		2			20
75-77		1	1		1	1	2			2		2				10
78-80		1			1		1				1					3
81-83										1						1
84-86						1	1									1
87-89		2					1				1					4
90-92	1									1						2
93-95																
96-98		1														1
99- 1																
102- 4			1				1									1
105- 7							1			1						1
108-10																
111-13											1				1	1
114-16													1			1
117-19																
120-22											1					1











Table 13 - Redfish (*Sebastes marinus*) age-length key.

MALE length (cm)	age													no id	n. tot				
	4	5	6	7	8	9	10	11	12	13	14	15	16+						
14																	2	2	
15																	3	3	
16																	14	19	
17		5															9	26	
18		15	2														10	24	
19		1	13														9	43	
20		5	29														7	35	
21		2	26														8	26	
22			12	5	1												4	19	
23			4	10	1												8	22	
24				11	3												12	20	
25			2	2	4												6	24	
26				5	10	3											13	18	
27					4	1											10	22	
28					1	5	4	2									12	22	
29						6	2	1		1							10	14	
30							1	2			1						12	21	
31								3	3	3							1	13	20
32								1	3		2					1	10	12	
33									1	1							7	14	
34									1	2	1	3					9	13	
35									1		2	1					7	12	
36											1	1	1	1	1		5	6	
37												1	2				2	4	8
38																	1	3	5
39																	2	5	7
40																	1	3	4
41																		3	4
42																		5	5
43														1	3	4	8	8	
44															3	3	6	6	
45															1	2	3	3	
46																			
47																1		1	1
48																			
49																	1	1	1
50																		1	1
total:	28	88	34	34	11	10	8	7	8	8	2	17	231	486					

FEMALE length (cm)	age													no id	n. tot				
	4	5	6	7	8	9	10	11	12	13	14	15	16+						
14																	2	2	
15		1															1	1	
16		1															1	3	
17		7	3														3	13	
18		1	11	1													12	25	
19		4	12														1	17	
20		5	16		1												3	25	
21		4	17														10	31	
22			7	3													10	20	
23			7	7													16	25	
24				7	1												9	17	
25				7	3												9	19	
26				3	7												4	14	
27				3	3												15	20	
28				2	5	2											10	17	
29					5	5											7	15	
30					3	1					2						15	18	
31						1											5	9	
32							1	2		3		1					9	15	
33										1							5	6	
34										1							4	5	
35													1				5	6	
36											1	1					5	7	
37												1				1	3	5	
38																2	2	4	
39																	1	2	
40																	1	1	
41														1	1	1	1	3	
42																	2	3	
43																	1	1	
44																	1	1	
45																	1	1	
46																			
47																			
48																	1	1	2
49																	1	1	1
50																			
51																		1	1
52																			
53																			
54																	1		1
total:	2	33	58	30	22	9	3	7	3	3	2	2	8	174	356				

Table 14 - Redfish (*Sebastes marinus*) age composition (x 10E-3).

age	stratum												total	mean weight (gr)		
	1	2	3	4	5	6	7	8	9	10	11	12				
1																
2																
3																
4	78	3	45		3	53	10	5		3		6			206	89
5	605	164	378	20	160	607	112	54	13	172	149				2434	112
6	603	270	539	54	242	865	170	104	28	355	219				3449	163
7	272	147	126	16	150	310	40	27	24	437	121				1670	257
8	198	123	96	10	195	230	40	61	25	586	226				1790	344
9	33	43	35	3	68	82	19	45	10	264	104				706	410
10	7	13	28	5	36	51	24	19	4	167	81				435	497
11	4	8	20	8	51	81	33	41	7	227	147	5			632	571
12	3	12	6	5	24	47	21	29	4	120	29	2			302	567
13	3	4	15	7	36	47	38	21	2	155	61	5			394	681
14			17		42	29	48	16	5	129	50	3			339	776
15			4		9	2	10	4		33	4				66	947
16+	1	1	8	2	65	50	60	16	11	181	80	7			482	910

Table 15 - Redfish (*Sebastes* spp.) catch (Kg) by strata.

stratum	area aqua. miles	tow number	catch per tow		catch per mile towed	
			mean	s. deviat.	mean	s. deviat.
1 -	342	4				
2 -	838	10	0.05	0.17	0.03	0.09
3 -	628	7	0.85	2.14	0.47	1.17
4 -	348	4	2.06	3.45	1.14	1.90
5 -	703	8	2.73	4.36	1.54	2.50
6 -	496	6	3.25	6.21	1.78	3.39
7 -	822	9	189.70	260.99	99.55	131.06
8 -	646	7	40.97	45.28	23.88	26.56
9 -	314	2	52.05	58.76	28.28	31.77
10 -	951	11	196.14	222.80	107.85	123.31
11 -	806	9	95.54	102.74	53.89	58.00
12 -	670	8	102.15	67.75	59.89	37.80
13 -	249	2	76.50	8.49	41.55	4.50
14 -	602	7	91.13	62.83	54.98	37.48
15 -	666	7	85.29	30.88	47.72	17.62
16 -	634	7	38.12	24.49	22.83	15.03
17 -	216	2	154.35	59.18	83.91	35.66
18 -	210	2	49.90	53.60	30.05	32.44
19 -	414	5	36.79	33.20	21.88	19.83
total	10555	117				
			catch per tow		catch per mile towed	
			mean	71.01	39.62	
			standard error	9.93	5.30	

(Kg)

Table 16 - Redfish (*Sebastes* spp) length frequency by strata (x 10E-4).

length (cm)	stratum																			total
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19		
11-																				8
12-				1		7														1
13-								1												1
14-				1				2		8	2									12
15-		1	1	1		7	4	3	43	4										64
16-		1	1	2		137	27	11	131	76			2							386
17-		1	1	8	2	656	66	31	415	278	3		2	5						1468
18-		1	2	17	2	1441	114	23	794	482	20	1	2	25						2923
19-		2	3	11	12	2422	138	41	1520	611	76	6	25	111						4978
20-		5	2	13	14	3011	105	56	1848	519	195	8	62	182	1				2	6020
21-		2	5	10	13	1338	58	60	1031	249	153	11	44	116	1	3				3095
22-		2	3	6	5	248	50	55	285	63	68	14	19	43	1					861
23-		1	1	5	2	90	23	26	59	15	41	44	25	24	3					323
24-			1	2	6	37	26	47	77	12	18	48	34	40	2					352
25-		1		4	2	73	35	30	234	39	29	29	140	88	1					710
26-		1	4	3	3	43	14	20	261	96	61	20	273	163	3	5				980
27-			3	3	1	53	20	25	270	65	121	29	272	144	7	8				1032
28-		2	1	1	1	77	21	13	276	78	114	62	159	102	13	16	2	8		945
29-			1		1	67	23	25	144	49	152	36	79	56	21	21	5	6		689
30-			2	1	2	27	30	17	120	35	123	49	71	43	26	34	3	12		598
31-	1	1				5	21	8	94	27	77	24	73	45	18	42	10	8		455
32-						38	17	19	46	33	66	19	59	40	20	37	7	9		411
33-				1	2	7	26	8	91	29	87	18	50	44	30	37	10	25		465
34-					2	3	17	6	101	35	82	11	49	61	33	53	12	20		484
35-				1		22	8	4	75	37	69	4	23	42	25	37	21	27		395
36-						47	9	5	78	34	46	7	27	35	21	30	12	17		368
37-						2	11	10	28	47	61	9	13	22	32	29	18	20		302
38-		1				17	9		23	21	35		17	26	36	40	16	18		258
39-						19	13	3	15	16	11	1	9	20	22	13	7	15		166
40-						2	6		9	17	14		7	8	9	16	10	6		103
41-			1			4	1		6	3	4	2	2	4	7	5	2	5		45
42-						2	2		1	7	2		1	5	5	3	3	4		35
43-											6		3	5	2		1	1		17
44-													1	2			1	2		5
45-														1	1		2			5
46-															1	3	1	1		5
47-																1		1		1

Table 17 - Redfish (*Sebastes mentella*) age-length key.

MALE													no	n.	
length	age												id	tot	
(cm)	4	5	6	7	8	9	10	11	12	13	14	15	16+		
14	1														1
15															
16	1													2	3
17		3												1	4
18		3												7	10
19		9	6											10	25
20		6	12	1										12	31
21		2	5		1									18	26
22			1											6	7
23			1	2										13	16
24				2	1									19	22
25				5	4									20	29
26				3	12	5								5	25
27				4	11	4	3							15	37
28					6	8								19	33
29					2	5	2							25	34
30						6	6	4						15	31
31						1	3	5	1	1				16	27
32							1	3	4	2	2			15	27
33								4	4	2	3			30	48
34									4	5				1	17
35										1	1	4	1	17	29
36										1	4	5	5	22	37
37										4	3	4	3	21	35
38										1	1	4	6	23	35
39											1	1	5	22	29
40												1	5	12	18
41													1	6	7
42													2	6	8
43													1	3	4
44														1	1
45														2	2
total:	2	23	25	17	37	29	19	17	14	12	15	19	29	383	641

FEMALE													no	n.	
length	age												id	tot	
(cm)	4	5	6	7	8	9	10	11	12	13	14	15	16+		
14															
15															
16															
17		2												3	5
18		3	1											5	9
19		9	5											5	19
20		9	7											7	23
21		1	11	1										7	20
22			5											7	12
23				2										14	16
24			1	3										9	13
25				2	1									16	19
26				2	4	1								15	22
27					9	5	2							19	35
28				1	5	6	4							15	31
29					1	5	4							17	27
30						3	7			1				13	24
31									1	1				18	20
32									2	2	1			21	26
33									5	6	6			15	35
34							2	1	6	6	4	3		21	43
35									1	5	8		3	9	26
36									1	3	3	1	3	25	36
37										1	3			9	18
38											2	4	6	20	32
39												1	11	19	31
40													6	16	22
41													4	19	23
42													6	10	16
43													2	8	10
44													2	4	6
45													3	1	4
46														2	2
47														1	1
total:		24	30	11	20	20	19	9	18	22	20	12	55	379	639

Table 18 - Redfish (*Sebastes fasciatus*), age-length key.

MALE length (cm)	age													no id	n. tot		
	4	5	6	7	8	9	10	11	12	13	14	15	16+				
14																1	1
15																3	3
16	2	1														7	10
17	1	7														8	16
18	1	11	2													10	24
19		11	12													11	34
20		6	20													8	34
21		2	9													14	25
22		1	7													14	22
23				1												4	5
24			1	1	1											17	20
25			1	3	1											18	23
26				2	4	1										22	29
27					2	1										14	17
28				1	3	1										8	13
29						2										3	5
30						1			3	1						3	8
31								1			2					2	5
32												1				3	4
33																	
34											1					1	2
35										1	1						2
36																	
37																	
38																	
39															1		1
total:	4	39	52	8	11	6	1	3	2	4	1				1	172	304

FEMALE length (cm)	age													no id	n. tot		
	4	5	6	7	8	9	10	11	12	13	14	15	16+				
14																2	2
15	1															1	2
16																5	5
17		1	2													10	13
18		8														10	18
19	1	5	11													6	23
20			13	1												9	23
21		1	9	1												11	22
22			9													12	21
23				1												9	10
24			2	1												6	9
25				1												11	12
26						1										6	7
27					1											12	13
28							3									9	12
29																7	7
30																5	5
31								1	2							2	5
32										1						1	2
33									1							2	3
34											1					3	4
35														1		1	2
36																2	2
37																2	2
38													1	1		1	3
39																	
40																	
41																1	1
42																1	1
total:	2	15	46	5	1	4	2	3	1				2	2	2	147	230



Table 21 - Greenland halibut (*Reinhardtius hippoglossoides*) length frequency ( $\times 10E-3$ ).

sex				sex				sex			
length	Ind	M	F	length	Ind	M	F	length	Ind	M	F
2-3				28-29	7	7		56-57		50	328
4-5				30-31	7	7		58-59		7	200
6-7	7			32-33	20	21		60-61	7	21	132
8-9	7			34-35		76	42	62-63		7	63
10-11				36-37		133	94	64-65			44
12-13	74			38-39	13	173	205	66-67			35
14-15	349			40-41	7	237	334	68-69			16
16-17	322			42-43		338	473	70-71			36
18-19	59			44-45		299	690	72-73			7
20-21				46-47		413	676	74-75			16
22-23	7		7	48-49		327	685	76-77			7
24-25	6		13	50-51		381	604	78-79			
26-27		20		52-53		284	451	80-81			
				54-55		160	385	82-83			8

Table 22 - Shrimp catch (Kg) by strata.

stratum	area squa. miles	tow number	catch per tow		catch per mile towed	
			mean	s. deviat.	mean	s. deviat.
1 -	342	4	-	-	-	-
2 -	838	10	-	-	-	-
3 -	628	7	0.10	0.24	0.06	0.14
4 -	348	4	-	-	-	-
5 -	703	8	0.08	0.17	0.05	0.10
6 -	496	6	0.53	0.47	0.28	0.26
7 -	822	9	12.13	10.61	6.51	5.37
8 -	646	7	3.10	4.20	1.83	2.53
9 -	314	2	6.61	8.89	3.59	4.82
10 -	951	11	21.59	23.26	11.82	12.68
11 -	806	9	12.22	13.42	6.82	7.53
12 -	670	8	32.37	16.32	19.39	10.64
13 -	249	2	3.50	4.95	1.90	2.69
14 -	602	7	16.70	14.36	10.14	8.62
15 -	666	7	28.91	18.96	16.73	11.04
16 -	634	7	3.32	5.88	2.03	3.65
17 -	216	2	-	-	-	-
18 -	210	2	-	-	-	-
19 -	414	5	20.93	38.79	12.02	22.14
total	10555	117				
			catch per tow		catch per mile towed	
			mean	10.18	mean	5.83
			standard error	1.25	standard error	0.71

Table 23 - Shrimp length frequency by strata ( $\times 10E-4$ ).

length (cm)	stratum												total
	3	6	7	8	10	11	12	13	14	15	16	19	
15.5-					4								4
16.0-			2	2	4	3							11
16.5-	3	3	68			3							77
17.0-	2	7	68	21	4	75							178
17.5-	1	7	110	42		45	159						368
18.0-	5	8	354	54	30	99				67			624
18.5-	8	12	440	113	37	146	79						845
19.0-	2	19	1137	102	30	138	266				202		1918
19.5-	1	18	1464	179	33	363	601	21	129	135			2979
20.0-	6	19	978	93	352	380	461	42	92	179			2633
20.5-	1	8	621	116	349	101	330	32	82	367			2029
21.0-		6	162	27	120	33	191	32	48	233			861
21.5-	1		47	9	33	39	81	32	34	88			368
22.0-	1			42		150			44				239
22.5-		1	2		735	79	318		34	169			1354
23.0-	1	3	177	51	1011	776	883		48	299	19	109	3417
23.5-	3	9	520	72	1087	1323	883	11	343	1162	38	28	5541
24.0-	2	16	693	271	2174	1002	2180	21	661	1413	38	28	8598
24.5-	8	24	433	116	2312	1008	1352	53	946	1168	94	465	8072
25.0-	6	28	397	171	2212	740	1498	64	678	1199	38	137	7249
25.5-	11	34	609	140	2097	899	1640	42	709	969	151	225	7613
26.0-	10	26	1138	179	1595	962	980	64	679	1520		225	7463
26.5-	8	19	677	170	1878	694	1373	74	661	1303	75	334	7351
27.0-	5	10	613	96	1259	282	1230	21	647	1206	39	334	5808
27.5-	2	5	321	93	589	355	862	74	869	757	31	14	4018
28.0-	1		77	21	217	303	507	32	245	678	57	443	2609
28.5-			45	21	125	50	240	11	494	682	44	341	2076
29.0-			72		88	25	563	32	378	779	50	225	2236
29.5-			30		4		621	32	86	805	63	785	2452
30.0-					4	8	876	11	153	485	174	443	2179
30.5-		1					605		174	242	117	785	1946
31.0-							394	32	69	281	99	327	1217
31.5-							337		9	300	57	457	1174
32.0-					3	176			44	58	15	137	439
32.5-						59			22	94	144	144	323
33.0-								11	16	4	19	28	79
33.5-										4	32	21	79
34.0-											8	21	51
34.5-											4		4
35.0-											3		3
35.5-													
36.0-											1		1
36.5-							38						38



Table 24 - Shrimp length frequency by sex (x 10E-4).

Sex	I	M	F
length			
15.5 -		4	
16.0 -		11	
16.5 -		77	
17.0 -		178	
17.5 -		368	
18.0 -		624	
18.5 -		845	
19.0 -		1918	
19.5 -		2979	
20.0 -		2629	4
20.5 -		2029	
21.0 -		859	2
21.5 -		367	1
22.0 -		218	21
22.5 -		1352	2
23.0 -		3180	237
23.5 -		5111	430
24.0 -		7537	1061
24.5 -		7055	1017
25.0 -		4114	3135
25.5 -		2129	5484
26.0 -		735	6728
26.5 -		182	7169
27.0 -		65	5743
27.5 -		145	3873
28.0 -		117	2492
28.5 -		14	2062
29.0 -		117	2119
29.5 -		7	2445
30.0 -		7	2172
30.5 -			1946
31.0 -			1217
31.5 -			1174
32.0 -			439
32.5 -			323
33.0 -			79
33.5 -			79
34.0 -			51
34.5 -			4
35.0 -			3
35.5 -			
36.0 -			1
36.5 -			38
37.0 -			
37.5 -			

Table 25 - Squid (*Illex illecebrosus*) sampling length frequency.

length	length
9.0 -	15.0 - 302
9.5 -	15.5 - 336
10.0 -	16.0 - 276
10.5 - 4	16.5 - 238
11.0 -	17.0 - 239
11.5 - 10	17.5 - 114
12.0 - 20	18.0 - 52
12.5 - 37	18.5 - 14
13.0 - 55	19.0 - 15
13.5 - 130	19.5 - 3
14.0 - 154	20.0 - 1
14.5 - 202	20.5 -