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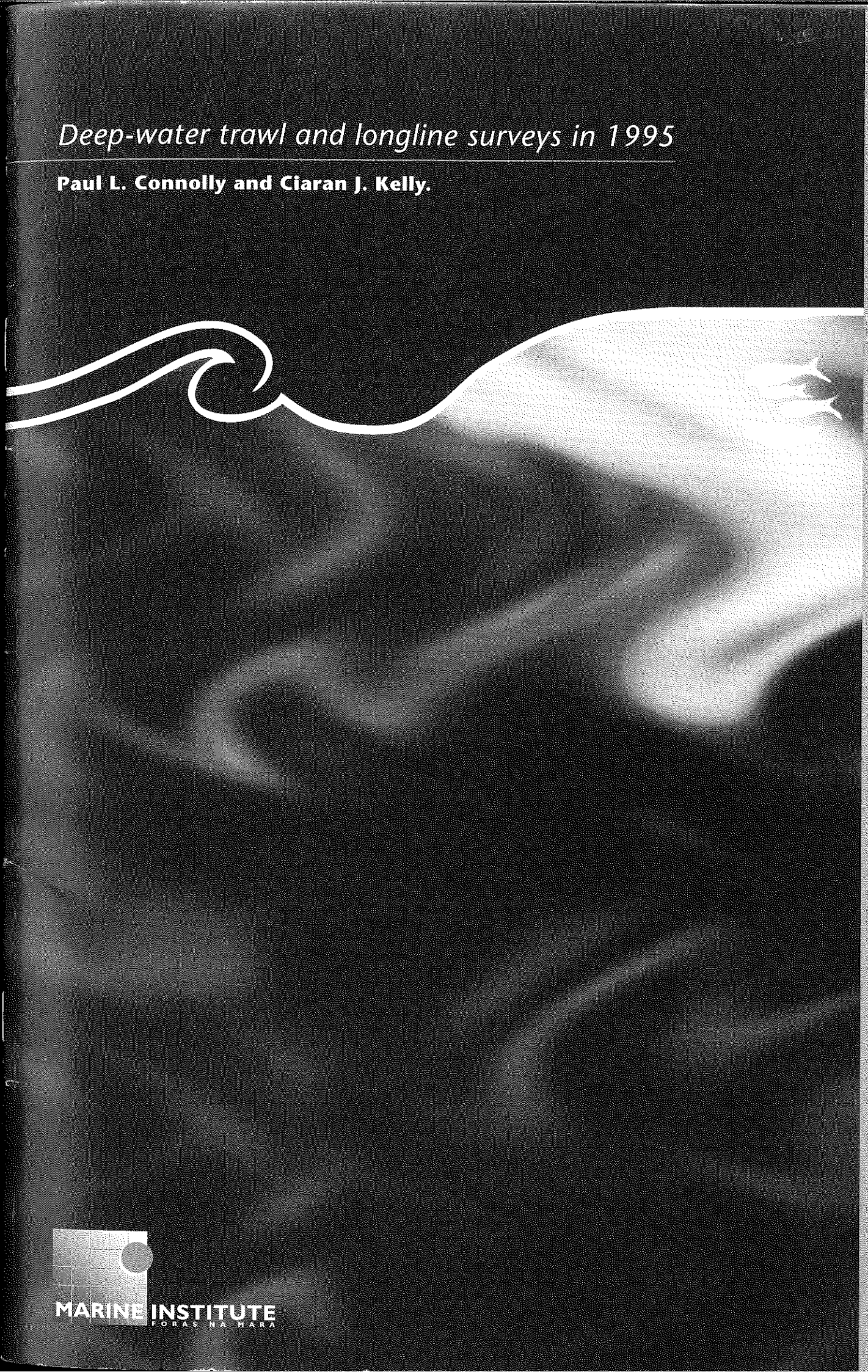

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DEEP WATER TRAWL AND LONGLINE SURVEYS IN 1995

by

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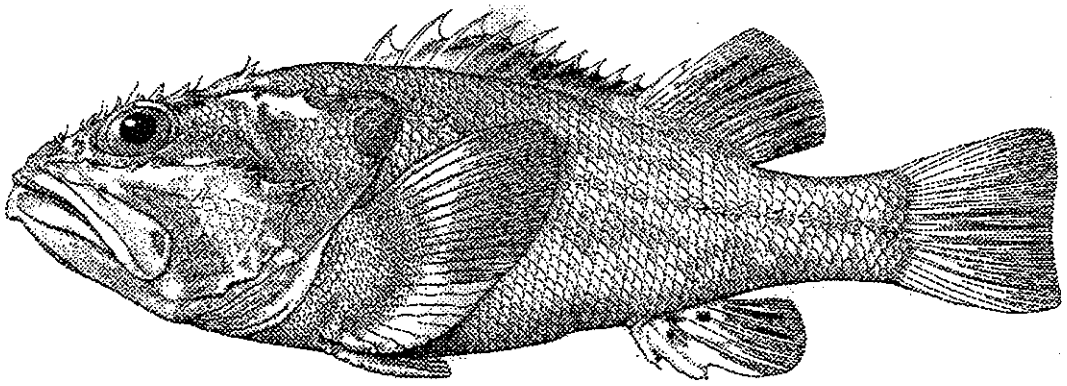
Summary

Two surveys were carried out in 1995 as part of the continuing deep water fish research programme at the Fisheries Research Centre. The trawl survey fished areas on the eastern slopes of the Rockall Trough and on two seamounts of the mid-Atlantic ridge approximately 300 miles north of the Azores. The deep water longline trip was the first such survey carried out by the Fisheries Research Centre and concentrated on previously fished grounds in the Rockall Trough and on new areas along the slope of the Porcupine Bank. Both surveys were carried out in conjunction with an Bord Iascaigh Mhara (BIM) and the objective was to locate commercial quantities of deep water fish and to obtain samples for biological analyses.

The trawl survey was conducted on a chartered fishing vessel using a commercial otter trawl, fitted with a small mesh cod-end liner. Twenty-six trawling operations were carried out in the depth range 750m-1,400m, of which 21 produced fish catches. Longlines were set between 542m and 1,521m and only one line was lost. Thirteen chondricthian and 38 species of teleost fish were recorded from the catches. The most abundant species in the catches were Portuguese shark, roundnose grenadier, black scabbard, Baird's smoothhead, blue ling and orange roughy.

Length, weight, sex, maturity and catch data together with samples of otoliths and gonads were collected. Discards were monitored from both fishing methods. In comparison with the trawl, longline catches produced larger specimens of fewer species which were more dominated by sharks. Overall catch rates for the longlines were similar to Norwegian data for the Rockall area. Trawl catch rates showed a decrease since the last Irish survey in this area in 1993.

INTRODUCTION



Spiny scorpionfish from Holt and Byrne (1908)

Restrictive quotas and declining traditional inshore fish stocks have led to the exploitation of deep water fish species. This fishery developed in the late 1980s and the main countries currently exploiting the north-east Atlantic deep water fishery are Iceland, Faeroes, France Netherlands and Norway. There have been increasing numbers of Faeroes, French, Icelandic and Norwegian vessels actively engaged in commercial deep water trawling and longlining (Anon 1996a). Markets have been developed in France, Spain and the US and considerable potential exists for the fishery. In 1994, an estimated 24,000 tonnes (incomplete statistics) of deep-water fish were landed from the Rockall Trough (Anon 1996b). This indicates that deep-sea species may be relatively heavily exploited with no management measures in place with little known about their basic biology. Ireland has almost 31,000 km^2 of deep water (500-1,500m) in its 200 mile Exclusive Economic Zone and there is considerable potential for the development of an Irish deep water trawl and longline fishery (Connolly and Kelly 1994).

It is already established that the ecosystem in which these fish live is different to that of the continental shelf (0-200m) and many scientists believe deep-water species to be long-lived and slow to mature. These characteristics make them especially vulnerable to over-fishing and with increasing exploitation there are serious concerns within the scientific community regarding the status of the stocks. It is against this background that Ireland commenced a deep-water fisheries programme in 1988. An Bord Iascaigh Mhara (BIM) began the first deep water fishing trials in 1988 under the EU Exploratory Fishing Voyage Scheme and targeted blue whiting and argentines. Fisheries Research Centre (FRC) supported these trials by providing a complementary biological dimension to the work. During 1991-1993 the BIM exploratory fishing programme shifted to demersal trawling with a wider range of species being caught including roundnose grenadier black scabbard and Portuguese shark.

The at-sea discarding of fish harvested from the oceans and its associated mortalities have been recognised and noted as inherent problems in fisheries management since early in the

20th century. However, in the last decade there has been an explosive interest in the documentation and search for solutions to by-catch and discard problems. This interest has followed the phenomenal growth of world conservation and environmental groups in recent years and their interest in the consequences of fishing activities on populations of marine mammals, birds and turtles. Discards have been defined as the portion of the catch returned to the sea as a result of economic, legal or personal considerations while the term by-catch refers to the discarded catch plus incidental catch (non target species) (Alverson *et al.* 1994). This distinction is subtle and for the purposes of this paper the term discards will refer to the portion of the catch which is not landed. Thus discards refer to both 'small specimens of commercial species' and 'non-commercial species of all sizes' which are not landed. In 1992, global discarding in commercial fisheries was estimated at 27 million tonnes (Alverson, *et al.* 1994). To date, no discard estimates have been published on any of the various deep-water fisheries in the north-east Atlantic.

This leaflet describes the surveys undertaken and gives an outline of the results. The data from these surveys will be fully analysed at the FRC and the results will be presented in thesis, reports and the scientific literature.

PERSONNEL

Personnel are members of the Demersal section of the Marine Institute's Fisheries Research Centre except where indicated:

Trawl Survey (1 - 15 November 1995)

Paul Connolly	Chief scientist
Ciaran Kelly	
Joe Wall	

Longline Survey (27 November - 11 December 1995)

Ciaran Kelly	Chief scientist (Part one)
Frances Birmingham	(Part one)
Ciaran. Crummey	BIM Fleet Development Section (Part one)
Paul Connolly	Chief scientist (Part two)

MATERIALS and METHODS

The initial sampling design was to tow for 1 hour at each station selected for trawling. However, during the survey, it became apparent that this would not be feasible and the trawl duration evolved on a tow by tow basis. Consequently, the trawl durations ranged from approximately one hour to four hours. At each station, the position shot and hauled and the depth shot and hauled were noted. The ground trawled was monitored during each tow on the colour sounder, together with the warp lengths and tensions.

The catch was lowered into the stern fish deck and a note was made of the main species. Fish were identified using Whitehead *et al* (1984, 1986A, 1986b) and Compagno (1984). Species that could not be identified on board ship were frozen for later identification at the FRC. All large fish were removed and boxed while the smaller specimens were placed on a conveyor belt and sorted by species or family groups. The total number of boxes from the haul was then recorded by species, and a selection of boxed fish was weighed to estimate the catch weight of each species. A number of specimens at each station were measured, weighed, sexed and staged for maturity. Otoliths were stored dry while stomachs and gonads were preserved in 10% saline formalin for histology samples and Gilson's fluid for fecundity estimates.

Pre-anus length (not pre-anal fin length) was used to record the length of fish without a normal tail fin (i.e. rabbitfish and grenadiers)

A selection of fillets was frozen from roundnose grenadier, greater forkbeard, orange roughy, black scabbard and Baird's smoothhead for food properties analyses by the National Food Centre. The results of the food analyses have been published in the National Food Centre Research Report of 1996.

SURVEY AREA AND FISHING POSITIONS

During the trawl survey fishing was carried out in Areas 1-8 (50°N to 58°N) covered in April 1993 (Connolly & Kelly 1994) and an area to the north of the Azores (Figure 1). Haul locations were based on previous hauls carried out by the *Mary M.* The survey was not divided in half as before to make up for steaming time. The species targeted were roundnose grenadier black scabbard orange roughy greater forkbeard, and deep-water sharks; principally Portuguese shark.

During the longline survey fishing was carried out in areas 1-8 (50°N to 58°N) which were covered in during a survey in April 1993 (Connolly & Kelly 1994). However due to bad weather the vessel was not able to fish south of 52°N. The survey was divided in half to allow for a change of fishing and scientific crew. The main species targeted were tusk and blue ling and Squaloid sharks, principally Portuguese shark and gulper shark .

RESULTS

TRAWL SURVEY

Steam, November 1, 1995 Arrive Killybegs load gear and depart for Area 1 at 5pm. Meeting held with skipper to discuss cruise plan for the next few days.

Area 1, November 2 Four hauls carried out over the depths 700-1000m. Catches mainly composed of roundnose grenadier and black scabbard with some Greenland halibut.

French boats in the area reporting fair catches of roundnose grenadier and black scabbard. Steam to Area 2.

Area 2, November 3 Ten hour steam to this area through some rough weather. Two hauls carried out at 860m and 1200m. Catches very poor. Steam south to Area 3

Area 3, November 4 Five hauls carried out over the depth range 850m-1170m. Catches again very poor and mainly comprised of roundnose grenadier. Short steam south to Area 4.

Area 4, November 5 Four hauls carried out between 790m and 1,230m catches still poor and mainly comprised of roundnose grenadiers. Steam south to Area 5.

Area 5, November 6 Two hauls carried out at 1,100m and 1,230m. Haul 15 produced good catches of Portuguese shark but haul 16 was poor and mainly composed of smoothheads. Steam south to Area 6.

Area 6, November 7 Two hauls carried out at 1,270m and 1,380m. Haul 17 produced good catches of Portuguese shark but the net was not on the bottom during haul 18 and there was no catch. Steam south for north Azores.

Steam, November 8 Steaming for the Azores.

Steam, November 9 Steaming for the Azores.

Olympus Knoll, November 10 Arrive Olympus seamount at 0100 hours. Apparent good marks on either side of pinnacle. Simrad not working properly no catch Haul 19. Haul 20 net caught on bottom and badly damaged. Steam SW for hauls 21 and 22.

North Azores, November 11 Net badly damaged on Haul 23 but some orange roughy left in cod end. Haul 24 second net badly damaged, decide to steam for Porcupine.

Steam, November 12 Steaming for Porcupine.

Steam, November 13 Steaming for Porcupine, some gearbox damage causes delay.

Area 7, November 14 Two hauls at 830-900 m. Reasonable catches of Portuguese shark. Steam for Killybegs after Haul 26.

Steam, November 15 Arrive Killybegs at 1500 hours, unload gear and organise transport of frozen samples.

Details of the trawl positions, with depth, duration of haul and overall catch rate are given in Table 1.

LONGLINE SURVEY PART 1

Steam, November 27 Personnel arrive at Greencastle. Fresh bait and 9mm polypropylene lines loaded on *Seasparkle*. Steam for Area 1.

Area 1, November 28 Weather fair 3-4. Three sets shot at 700-900m, with.2,500 hooks per set baited with squid and mackerel. Catches mainly velvet belly shark with some blue ling.

Area 1, November 29 Weather good 2-3. Set lines 4 and 5. Catches mainly tusk and forkbeard. Trying to use more squid on lines, steam to Area 2.

Area 2, November 30 Weather freshening 6-7. Spent over 10 hours trying to haul set 6, sharks causing tangles in the line. Catches very similar to Area 1 with slightly more morid cod. Keeping fins and skinned carcass of Portuguese shark. Steam to Area 3.

Area 3, December 1 First set not spliced so hauled buoyline immediately. Line with less than 30 minutes soaktime yielded catch of 5 boxes of gulper shark and some Portuguese shark. Now using chain weights on the line to try to get it to sink evenly and avoid tangles. Seems to have worked well with much less tangles on hauling set 8. Catches of sets 8 and 9 mainly leafscale gulper shark and Portuguese shark. Short steam to Area 4.

Area 4, December 2 Weather moderate 5-6. Shot and hauled sets 10 and 11 in 531-1,085 m. Catches composed mainly of rabbitfish, forkbeard and tusk. Steamed for Killybegs at 2000 hours.

Killybegs, December 3 Arrive Killybegs, unload fish and samples and change scientific personnel.

LONGLINE SURVEY PART 2

Area 4, December 4 Load more frozen bait and steam for Area 4. Set 12 over coral ground at 909 m line broken during haul, catch mainly leafscale gulper shark and morid cod.

Area 4, 5(2), December 5 Weather freshening 6-7. Shot and hauled sets 13 and 14. Catches mainly Portuguese and leafscale gulper shark. Set 15 shot in Area 5(2) tried to haul during night but line was lost.

Area 5, December 6 Weather still freshening now giving 7-8. Shot and hauled set 16. Catch again mainly leafscale gulper and Portuguese shark. Steam for Area 6.

Area 6, December 7 Weather deteriorating 8-9. Shot set 17, took almost 12 hours to haul, catch mainly leafscale gulper shark. Decide to steam back to area 4 due to bad forecast for the Porcupine Area.

Steam, December 8 Steaming all day, weather slackening off. Arrive Area 4 shot set 18.

Area 4, December 9 Shot sets 19 and 20 and hauled all three. Catches again dominated by Portuguese and gulper sharks. Best day's fishing yet with 1,600kg of fish. Steamed for Area 3.

Area 3, December 10 Shot two vertical lines to try and catch black scabbard, soak time of 1 -2 hours, no catch on either line. Steamed for Greencastle at 17:00.

Greencastle, December 11 Arrive Greencastle 9:00 unload samples and gear.

A list of the longline positions, with depth, duration of haul and overall catch rates are given in Table 2.

DISCUSSION

The trawl landings were dominated by roundnose grenadier and Portuguese shark while discards were composed of a wide variety of teleost species. The longline landings were dominated by gulper shark and tusk while discards were confined to a total of five species. The length frequencies of commercial landings common to trawl and longline fishing are given in Figure 2. The longline catches produced larger individuals of forkbeard, morid cod and tusk .

The catch rates for commercial, non-commercial and discards from trawl and longline fishing are given in Table 3. The species compositions for the two methods were very different. Roundnose grenadier, black scabbard and Portuguese shark dominated the trawl catches while tusk, Portuguese shark and gulper shark dominated the longline catches. There was no discarding of teleosts from the longline catches (Table 4). The livers were taken from all Portuguese shark and approximately 50% of gulper shark. The carcass and fins of these shark species were also landed.

There was a wide and varied catch rate for the non-commercial species and discards. Catch rates were highest for birdbeak dogfish, smoothhead, gulper shark, longnose velvet dogfish and *Lepidion eques*. The catch rates for non commercial species and discards from longlining were high for birdbeak dogfish only (see Table 3).

The length distributions of male and female squaloid shark taken by longline are given in Figure 3. Female shark were larger than males.

Lists of all the species encountered during the trawl and longline surveys are given in Tables 5 and 6.

ACKNOWLEDGEMENTS

We would like to thank the skippers and crew of the *Mary M* and *Seasparkle* for all their co-operation and help during the two voyages. This survey programme was funded by BIM and the Marine Institute.

REFERENCES

Alverson, D. L., M. H. Freeberg, S. A. Murawski, and J. G. Pope (1994). A global assessment of fisheries by-catch and discards. *FAO Technical Paper* 339.

Anon (1996a). Report of the ICES Advisory Committee on Fisheries Management, 1994 *ICES Co-Operative Research Report* 210 (2): 69-72,117-128

Anon (1996b). Report of the study group on the biology and assessment of deep-sea fisheries resources. *ICES CM 1996/Assess*:8 145pp

Compagno, L.J.V. (1984). FAO Species Catalogue. Vol 4, Part 1. Sharks of the World. *FAO Fisheries Synopsis* 125, 4(1): 249pp.

Connolly, P.L. and C. J. Kelly (1994). Sampling surveys for deep water demersal fish in 1993. *Fishery leaflet* (Dublin)163, 20pp.

Holt, E. W. L. and L. W. Byrne, (1908). Second report on the fishes of the Irish Atlantic slope. *Fisheries Ireland Scientific Investigations*, **5**, 63pp.

Whitehead, P.J.P., M. L. Bauchot, J. C. Hureau, J. Nielsen and E. Tortonese (1984, 1986). *Fishes of the North-eastern Atlantic and the Mediterranean* Paris, UNESCO.

Fig. 1 Map of Areas fished during the 1995 trawl and longline surveys

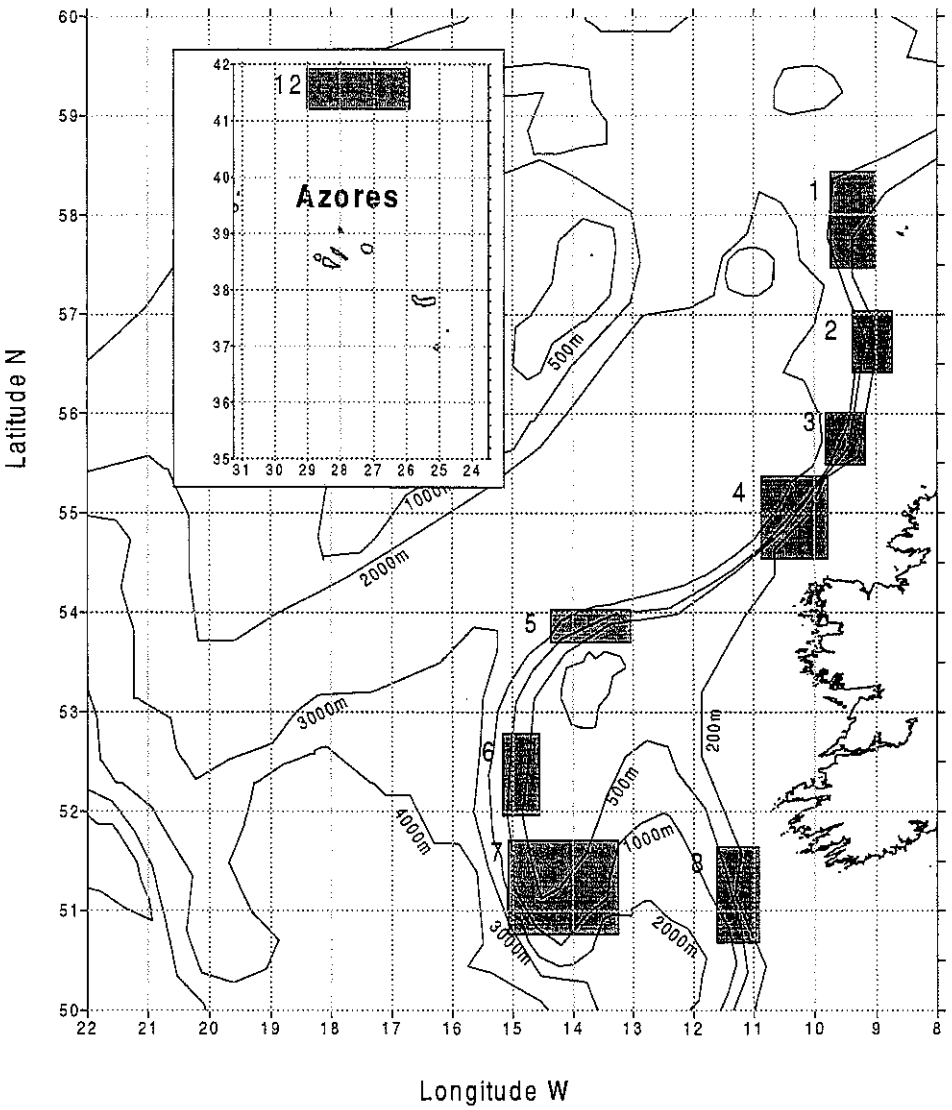


Fig. 2 Lengths (cm) of teleost fish common to trawl (bars) and longline (line) catches in the Rockall Trough during surveys in 1995

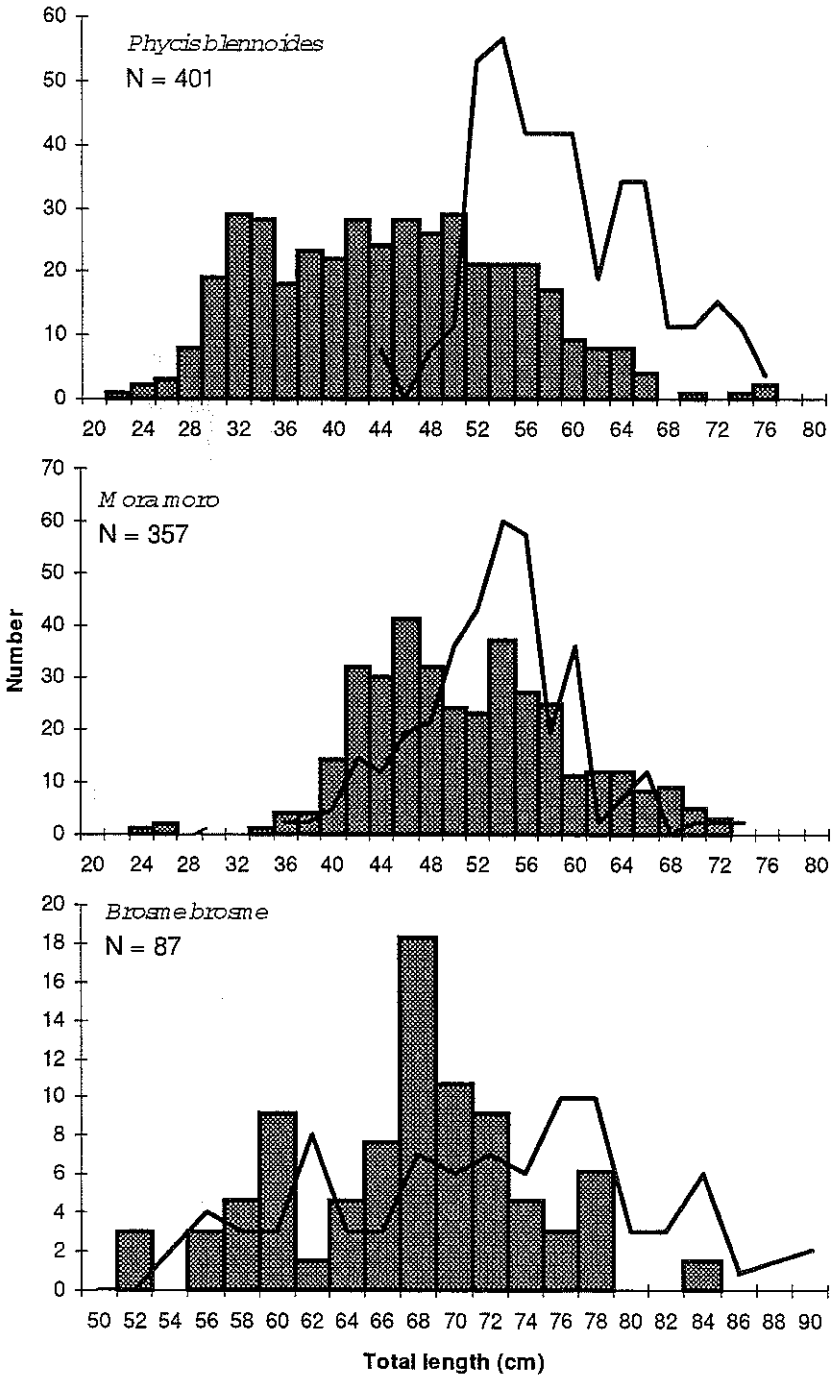


Fig. 3 Lengths (cm) of male and female Squalidae species taken on the 1995 longline survey

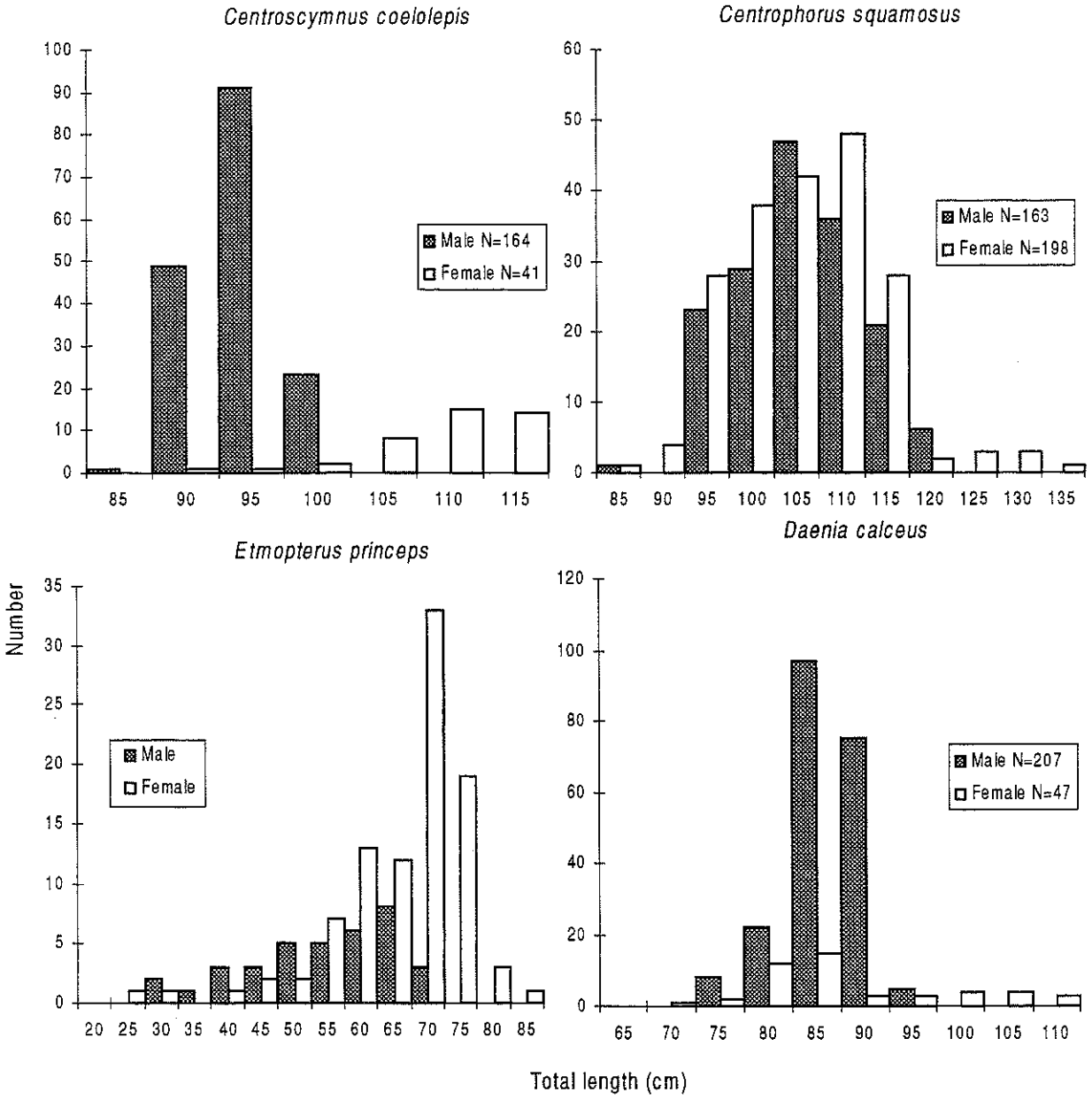


Table 1 Station positions for sampling survey of *Mary M* 01-14 November 1995

STATION	AREA	DEPTH	WARP	HAUL	POSITION SHOT		POSITION HAULED		CATCH	COMMENTS
		(m)	(m)	DURATION (hrs)	LAT. N	LONG. W	LAT. N	LONG. W	(kgs)	
1	1	1098	2330	3.25	57 14.79	9 39.58	57 24.85	9 37.70	572	grenadier & scabbard
2	1	800	1820	3.16	57 44.00	9 43.00	53 53.00	9 42.22	741	grenadier & scabbard
3	1	740	1432	2.92	57 55.30	9 41.02	57 55.05	9 44.05	860	Grn. halibut & grenadier
4	1	1172	2366	3.42	58 08.00	9 42.00	58 17.60	9 40.50	510	grenadier
5	2	1200	2184	1.00	56 46.03	9 09.60	56 39.63	9 14.14	296	poor catch
6	2	890	1911	3.00	56 37.00	9 16.35	56 30.00	9 13.60	458	grenadier
7	2	1050	2048	3.00	56 28.80	9 15.51	56 21.40	9 19.40	167	poor catch
8	3	1160	2366	4.25	55 55.00	9 24.20	55 47.00	9 27.40	206	grenadier
9	3	900	2048	3.00	55 46.82	9 28.63	55 39.63	9 23.14	167	poor catch
10	3	740	1684	3.08	55 41.65	9 29.10	55 34.80	9 34.30	387	hake & Gn. halibut
11	4	1170	2330	3.00	55 25.18	10 01.68	55 19.56	10 6.77	240	grenadier
12	4	790	1638	3.00	55 22.00	10 02.20	55 12.20	10 4.45	245	grenadier
13	4	900	1820	3.00	55 18.20	10 04.15	55 26.10	9 57.24	187	poor catch
14	4	1000	2184	3.33	55 26.70	9 59.00	55 20.10	10 05.20	217	coelolepis
15	5	1230	2330	3.25	54 04.80	12 57.00	54 03.13	13 08.40	676	coelolepis & roughy
16	5	1100	2330	3.00	54 02.65	13 12.44	53 58.70	13 26.80	190	smoothhead
17	6	1270	2402	3.33	52 18.86	15 03.19	52 10.21	15 02.53	663	coelolepis
18	6	1380	2366	3.17	52 09.44	14 56.00	52 10.03	15 10.63	0	no catch
19	Olmpus Knoll	1400	2366	1.42	45 37.00	27 17.00	45 35.81	27 21.53	0	no catch
20	Olmpus Knoll	1400	2366	1.50	45 37.00	27 17.00	45 35.81	27 21.53	45	roughy
21	North Azores	1088	2093	1.80	45 11.89	27 54.28	45 13.44	27 51.15	0	no catch
22	North Azores	975	2002	1.57	45 11.89	27 50.14	45 12.19	27 46.52	0	no catch
23	North Azores	1300	2002	0.83	45 35.19	27 19.92	45 34.64	27 20.72	35	roughy
24	North Azores	880	2184	1.16	45 34.46	27 17.40	45.35.36	27 18.11	0	no catch
25	7	901	2011	3.63	50 52.02	14 28.10	50 52.00	14 10.36	304	smoothhead
26	7	950	2011	3.25	50 52.74	14 08.29	50 55.73	13 53.09	282	coelolepis

Table 2 Station positions for longline survey of *SeaSparkle* 27 November to 12 December1995

STATION	AREA	DEPTH (m)		SOAK	HOOKS	POSITION SHOT		POSITION HAULED		CATCH	CPUE	COMMENTS
		Min.	Max.	TIME (hrs)		LAT	LONG	LAT	LONG	(kg)	kg/1000hooks/hr	
1	1	752	904	2.15	1,500	57 58.96	9 37.00	57 58.97	9 38.77	85.2	26	Poor catch
2	1	542	605	5.05	1,353	57 58.88	9 41.12	57 58.94	9 42.90	231.43	34	torsk & apristurus sp.
3	1	607	988	2.58	2,751	57 44.02	9 42.90	57 44.00	9 43.55	188.78	27	Poor catch
4	1	749	1073	5.66	2,795	57 38.94	9 43.70	57 38.95	9 39.48	284.55	18	squamosus
5	1	763	1073	9.95	2,876	57 28.47	9 39.38	57 28.54	9 35.41	1740	61	squamosus & torsk
6	2	542	1046	4.75	2,966	56 53.94	9 06.99	56 53.98	9 11.21	432.5	31	torsk
7	2	922	1064	5.00	2,768	56 43.97	9 07.41	56 43.98	9 11.15	490	35	squamosus
8	3	1071	1062	0.17	1,038	55 43.13	9 32.64	55 43.13	9 32.64	235	1332	squamosus
9	3	740	1098	3.06	3,353	55 30.28	9 40.10	55 32.74	9 39.87	590	58	coelolepis & squamosus
10	3	644	1085	4.25	3,353	55 29.38	9 42.15	55 31.70	9 42.10	1010	71	coelolepis & squamosus
11	4	531	697	3.02	3,202	54 59.54	10 12.34	55 02.09	10 12.29	375	39	rabbit fish & forkbeard
12	4	724	909	6.40	3,202	54 59.37	10 14.16	55 01.86	10 14.01	540	26	torsk
13	4	756	999	2.52	1,927	54 35.97	10 51.88	54 38.26	10 51.83	822	169	Squalidae & M. moro
14	4	727	1206	8.32	3,084	54 35.27	10 53.83	54 37.50	10 53.72	825.6	32	squamosus
15	5(2)	749	1042	6.03	3,131	54 04.67	12 04.07	54 06.99	12 04.09	0	0	Line lost
16	5	958	1172	3.00	3,096	54 00.16	13 10.91	54 02.34	13 10.90	900	97	squamosus & daenia
17	6	862	1064	4.52	3,051	52 58.38	14 52.13	52 58.42	14 55.95	450	33	squamosus & M. moro
18	4	1332	1521	7.22	3,051	55 06.96	10 20.40	55 08.86	10 25.45	1020	46	C. fabricii & E. pusillus
19	4	1168	1195	2.48	3,000	55 21.39	10 06.50	55 23.65	10 05.58	260	35	coelolepis
20	4	986	1004	7.22	3,000	55 21.27	10 04.55	55 23.69	10 03.45	378	17	squamosus
21	3	810		1.70	500	55 26.89	9 55.54	55 26.89	9 55.54	0	0	no catch
22	3	630		1.00	500	55 30.32	9 45.72	55 30.32	9 45.72	0	0	no catch

Table 3 Catch rates (kg/hr, kg/1000hooks/hr) for commercial, non-commercial and discards from trawl and longline fishing. Full names given in Table 4.

	TRAWL				LONGLINE			
Species	**Mean**	**Min**	**Max**	**N**	**Mean**	**Min**	**Max**	**N**
TOTAL CATCH	139.00	48.50	249.50	15	130.58	17.00	1331.70	17
COMMERCIAL SPECIES								
C. rupestris	48.80	0.00	100.00	15				
A.carbo	14.30	0.00	38.00	15				
P. blennoides	2.70	0.00	27.70	15	1.80	0.00	9.30	17
B. brosme					8.00	0.00	25.20	17
M. dypterygia	5.90	0.00	29.20	15	0.36	0.00	1.42	17
M. moro					3.20	0.00	32.30	17
H. atlanticius	2.60	0.00	41.50	15				
H. dactlyopterus	0.60	0.00	10.30	15	0.41	0.00	4.70	17
C. coelolepis	14.20	0.00	76.90	15	11.80	0.00	56.70	17
C. squamosus					98.20	0.00	1275.00	17
NON COMMERCIAL SPECIES AND DISCARDS								
A. silus	0.15	0.00	1.50	12				
C. monstrosa	0.54	0.00	4.80	12	0.65	0.00	10.30	17
H. mirablis	0.29	0.00	1.10	12				
A. carbo	0.90	0.00	7.01	12				
C. rupestris	6.90	0.11	231.10	12				
P. blennoides	0.05	0.50	0.60	12				
M. moro	0.94	0.00	9.50	12				
M. dypterygia	0.01	0.00	0.30	12				
M. poutassou	0.08	0.00	8.07	12				
H. dactylopterus	0.17	0.00	0.64	12				
G. cynoglossus	0.04	0.00	0.39	12				
A. bairdi	5.30	0.00	33.30	15				
E. telescopus	0.20	0.00	0.07	12				
T. murrayi	2.82	0.00	23.70	12				
T. cristulata echinata	1.00	0.00	10.00	12				
M. laevis	0.19	0.00	0.20	12				
N. aquaelis	0.36	0.77	1.32	12				
L. eques	4.63	1.19	10.23	12				
H. jonsoni	0.58	0.00	4.86	12				
C. crepidater	4.9	0.00	16.60	12	1.1	0 - 9.2		17
C. coelolepis	0.14	0.00	1.44	12				
C. squamosus	5.57	0.00	30.80	12				
D. calceus	7.23	0.00	50.00	12	4	0 - 33.9		17
E. spinax	0.56	0.00	5.60	12	0.14	0 - 1.03		17
G. melastomus	0.21	0.00	2.10	12	0.68	0 - 9.3		17

Table 4 List of commercial and discard species from the trawl and longline surveys in the Rockall Trough. Undersize specimens of the commercial species from the trawl catch were discarded, but there was no discarding based on size selection from the longline catches.

Trawl	Longline
Commercial species	
Aphanopus carbo	*Brosme brosme*
Argentina silus	*Centroscymnus coelolepis*
Brosme brosme	*Centrophorus squamosus*
Centroscymnus coelolepis	*Helicolenus dactlyopterus*
Coryphaenoides rupestris	*Mora moro*
Helicolenus dactlyopterus	*Molva dypterygia*
Hippoglossoides reinhardtius	*Phycis blennoides*
Hoplostethus atlanticius	
Molva dypterygia	
Phycis blennoides	
Lophius piscatorius	
Merluccius merluccius	
Commercial discards	
Aphanopus carbo	
Argentina silus	
Centroscymnus coelolepis	
Coryphaenoides rupestris	
Helicolenus dactylopterus	
Molva dypterygia	
Phycis blennoides	
Non-commercial discards	
Alepocephalus bairdi	*Centroscymnus crepidater*
Anarhichas denticulatus	*Chimaera monstrosa*
Centrophorus squamosus	*Daenia calceus*
Centroscymnus crepidater	*Etmopterus spinax*
Chimaera monstrosa	*Galeus melastomus*
Coelorhyncus coelorhyncus	
Cottunculus thompsoni	
Daenia calceus	
Epigonus telescopus	
Etmopterus spinax	
Gadiculus argentius	
Glyptocephalus cynoglossus	
Galeus melastomus	
Halagyreus jonsoni	
Hydrolagus mirablis	
Lepidion eques	
Malacocephalus laevis	
Micromesistius poutassou	
Mora moro	
Neocytes helgae	
Nezumia aquaelis	
Synaphobranchus kaupi	
Trachyrhyncus murrayi	
Trachyscorpia cristulata echinata	
Xenodermichthies copei	

Table 5. Species identified on the 1995 deep water longline survey. Classifications after Whitehead *et al.* (1986). The occurrence column refers to species during this survey only and is not any indication of actual abundance

SHARKS		
CATSHARKS	SCYLIORHINIDAE	
Blackmouth catshark	*Galeus melastomus*	common
Catshark	*Apristurus spp.*	locally common
DOGFISH SHARKS	SQUALIDAE	
Portuguese shark	*Centroscymnus coelolepis*	common
Leafscale gulper shark	*Centrophorus squamosus*	common
Birdbeak dogfish	*Deania calcea*	common
Longnose velvet dogfish	*Centroscymnus crepidater*	common
Velvet belly	*Etmopterus spinax*	common
Black dogfish	*Centroscyllium fabricii*	occasional
Greenland shark	*Somniosus microcephalus*	single specimen
Great Lanternshark	*Etmopterus princeps*	common below 1200
RABBITFISH	CHIMAEREA	
Rabbitfish	*Chimaera monstrosa*	common
Small-eyed rabbitfish	*Hydrolagus affinis*	not common
BONY FISHES	**PISCES**	
ARROWTOOTH EELS	SYNAPHOBRANCHIDAE	
Kaup's arrowtooth eel	*Synaphobranchus kaupi*	common
GRENADIERS	MACROURIDAE	
Roughsnout grenadier	*Trachyrincus scabrus*	common
Softhead grenadier	*Malacocephalus laevis*	common
COD LIKE FISHES	GADIDAE	
Tusk	*Brosme brosme*	common
Forkbeard	*Phycis blennoides*	common
Blue ling	*Molva dypterygia*	common
MORIDS	MORIDAE	
Morid cod	*Mora moro*	common
	Antimora rostrata	rare
SCORPIONFISHES	SCORPAENIDAE	
Bluemouth rockfish	*Helicolenus dactylopterus*	common

Table 6. Species identified on the 1995 deep water trawl survey. Classifications after Whitehead *et al.* (1986). The occurrence column refers to species during this survey only and is not any indication of actual abundance

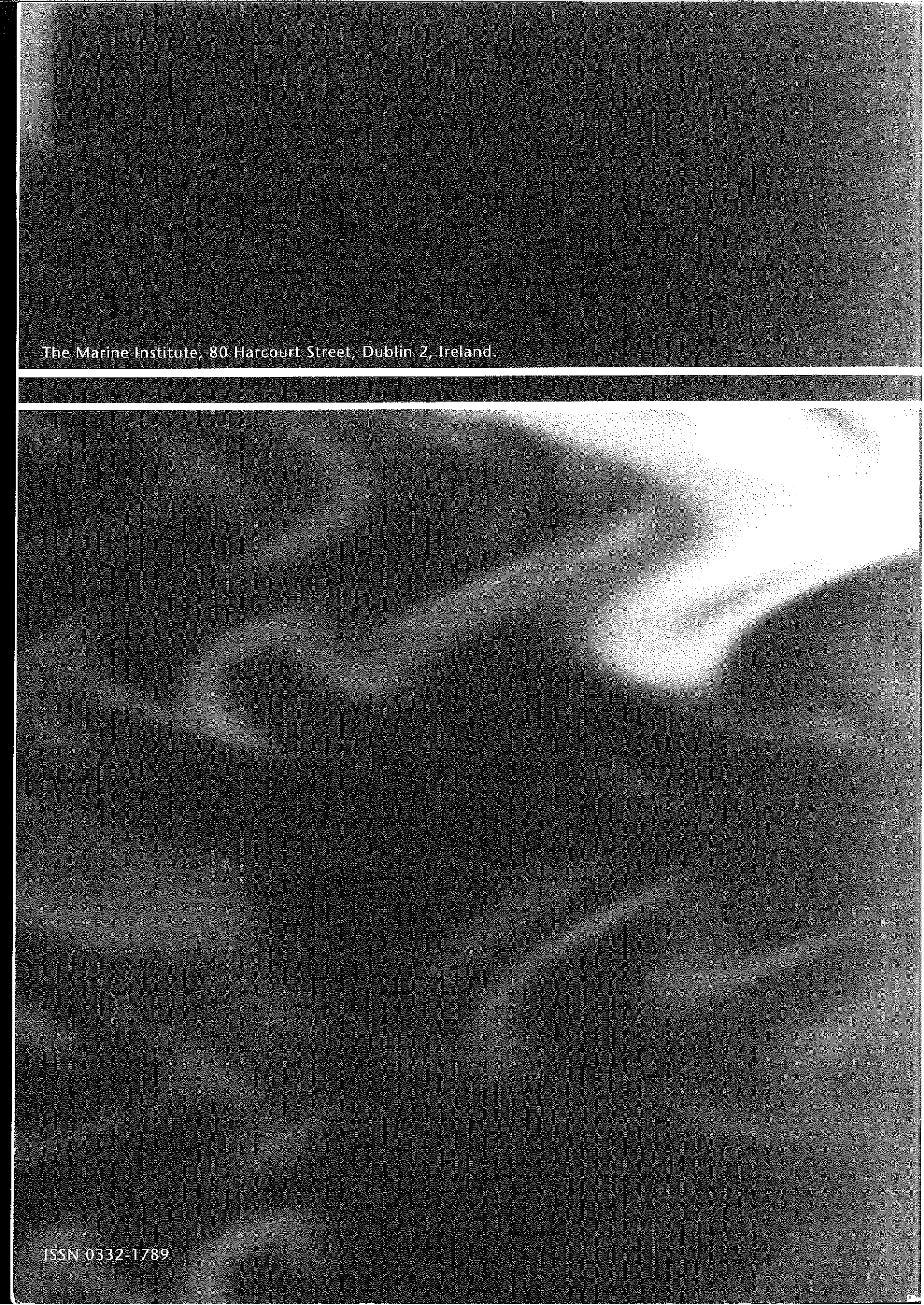
SHARKS		
	ALOPIIDAE	
Thresher shark	*Alopius vulpinus*	single specimen
CATSHARKS	SCYLORHINIDAE	
Catshark	*Apristurus spp.*	occasional
Catshark	*Galeus melastomus*	occasional
DOGFISH SHARKS	SQUALIDAE	
Black dogfish	*Centroscyllium fabricii*	occasional
Portuguese shark	*Centroscymnus coelolepis*	common
Longnose velvet dogfish	*Centroscymnus crepidater*	common
Leafscale gulper shark	*Centrophorus squamosus*	common
Birdbeak dogfish	*Deania calceus*	common
RAYS	RAJIDAE	
Round ray	*Raja fyllae*	common
RABBITFISHES	CHIMAEREA	
Rabbitfish	*Chimaera monstrosa*	common
Rabbitfish	*Hydrolagus miriablis*	common
	RHINOCHIMAERIDAE	
Straightnose rabbitfish	*Rhinochimaera atlantica*	occasional
BONY FISHES	**PISCES**	
SMOOTHHEADS	ALEPOCEPHALIDAE	
Smoothhead	*Alepocephalus bairdii*	common
Smoothhead	*Alepocephalus rostratus*	occasional
Bluntsnout smoothhead	*Xenodermichtyes copei*	common
	SEARSIIDAE	
	Searsid spp	occasional
ARGENTINES	ARGENTINIDAE	
Greater argentine	*Argentina silus*	common
SPIDERFISHES	CHLOROPHTHALMIDAE	
Spiderfish	*Brthypterios dubuis*	rare
SAWTOOTHED EELS	SERRIVOMERIDAE	
Bean's sawtoothed eel	*Serrivomer beani*	rare
CONGER EELS	CONGRIDAE	
Conger eel	*Conger conger*	rare

Table 6 (continued).

ARROWTOOTH EELS	SYNAPHOBRANCHIDAE	
Kaup's arrowtooth eel	*Synaphobranchus kaupi*	occasional
SPINY EELS	NOTACANTHIDAE	
Smallmouth spiny eel	*Polyacanthanotus rissoanus*	occasional
Snubnosed spiny eel	*Notacanthus cheminitzii*	occasional
GRENADIERS	MACROURIDAE	
Grenadier	*Coryphaenoides rupestris*	common
Grenadier	*Trachyrhyncus murrayi*	common
Grenadier	*Nezumia aequalis*	common
Grenadier	*Malacocephalus laevis*	occasional
HAKES	MERLUCCIDAE	
Hake	*Merluccius merluccius*	occasional
COD FISHES	GADIDAE	
Forkbeard	*Phycis blennoides*	common
Blue ling	*Molva dypterygia*	common
	Gadiculus argentius thori	occasional
	MORIDAE	
Morid cod	*Mora moro*	common
	Lepidion eques	common
	Halagyreus jonsoni	occasional
	TRACHICHTHYDIAE	
Mediterranean roughy	*Hoplostethus mediterraneus*	occasional
Orange roughy	*Hoplostethus atlanticus*	occasional
	APOGONIDAE	
Cardinal fish	*Epigonus telescopus*	occasional
SNAKE MACKERELS	GEMPYLIDAE	
	Nesiarchus nasutus	rare
	TRICHURIDAE	
Black scabbard	*Aphanopus carbo*	common
WOLF FISHES	ANARHICHADIDAE	
Spotted wolf-fish	*Anarhichas minor*	rare
	ZOARCIDAE	
	Lycodes spp	rare

Table 6 (continued).

SCORPIONFISHES	SCORPAENIDAE	
Bluemouth rockfish	*Helicolenus dactylopterus*	common
Spiny scorpionfish	*Trachyscorpia cristulata*	common
FATHEADS	PSYCHROLOTIDAE	
Pallid sculpin	*Cottunculus thomsoni*	occasional
SEA-SNAILS	LIPARIDIDAE	
	Liparis spp.	rare
FLATFISH	SCOPHTALMIDAE	
Megrim	*Lepidorhombus whiffiagonis*	occasional
	PLEURONECTIDAE	
Witch	*Glyptocephalus cynoglossus*	common
Halibut	*Hippoglossus hippoglossus*	rare
Greenland Halibut	*Reinhardtius Hippoglossoides*	rare
ANGLERFISH	LOPHIDAE	
Monkfish	*Lophius piscatorius*	occasional



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