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The Deep-water Fisheries of the ICES Area

by

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Abstract

Some deep-water fisheries in the ICES area are long established and they tend to be artisanal in nature and utilise mainly static gears such as longlining. The advent of the factory trawler in the late 1960s and early 1970s led to the discovery and exploitation of deep-water fish species over a wide area. The development of the autoliner in the late 1970s also led to an expansion in deep-water fishing in the northern ICES areas.

Much of the information on these fisheries is in the 'grey literature'. This paper aims to gather together these sources of information and provides an overview of the development of the deep-water fisheries of the ICES area.

Introduction

Deep-water fisheries are not always clearly defined. In this paper we consider fisheries carried out mainly in slope waters deeper than about 400 m. Mainly to facilitate a necessary division of labour amongst its working groups that provide basic information for the management advice, ICES has implemented an operational definition of deep-sea fisheries resources. The Working Group on the Biology and Assessment of Deep-sea Fish Resources (WGDEEP) is responsible for providing information on a long list of species (Anon., 2001a), including some such as ling (*Molva molva*) which is also fished in shelf and coastal waters. On the other hand, some of the main deep-water target species are not treated by this group, e.g. redfish (*Sebastes* spp.), Greenland halibut (*Reinhardtius hippoglossoides*), anglerfish (*Lophius* spp.) and hake (*Merluccius merluccius*), but are for various reasons (including tradition) allocated to other groups.

In this paper we emphasise fisheries that are most relevant to the work of WGDEEP but also include some information on others. We summarise historical developments, describe current fisheries, and highlight present trends. Much of the information given is based on sources that are not easily accessible, i.e. working documents and reports submitted to ICES, or reports from ICES study and working groups. In addition, some recent international projects have provided significant accounts of several fisheries, e.g. an EC FAIR Deep-fisheries Project (Gordon, 1999a), and a Nordic project on ling and tusk (Bergstad and Hareide 1996; Magnusson et al. 1997). Several papers read at the NATO Advanced Research Workshop on deep-water fisheries in Hull, UK, in 1994 (Hopper, 1995) contained much valuable background information. Many reports from a deep-sea fisheries resources theme session during the ICES Annual Science Conference in Cascais, Portugal in 1998 also described historical trends and new developments (a selection of the papers were recently published in *Fisheries Research*, vol. 51, May 2001).

Major historical patterns

Most current deep-sea fisheries originated as artisanal fisheries, and especially in southern areas where the continental shelf is narrow and the deep water is close to the ports, e.g. in the Azores, mainland Portugal and southern Spain. Most of the deep-water fish landings in these areas are still caught by small vessels using traditional gears (handline, longline). However, most deep-sea fish landings today stem from highly mechanised longline or trawl fisheries. There has been a steady improvement of vessels and gear technology and dedicated exploration of new grounds, often subsidised by national governments. The major expansion and industrialisation of these fisheries started after World War II.

The present mechanised longline technology was mainly developed in the Nordic countries (Bergstad and Hareide, 1996). Longlining for ling, tusk (*Brosme brosme*) and halibut (*Hippoglossus hippoglossus*) in deep-water started in the Skagerrak and off the coast of Norway, and Swedish fishermen transformed the method from coastal to a high-seas activity in the 1860s. Soon Norwegians started using bigger vessels and around 1900 steam ships began exploring new grounds off Shetland and the Faroe Islands. After World War II the vessel size increased to 60-90 feet and the fishing areas expanded to comprise the banks and slopes to the west of British Isles and around Rockall. From the 1960s onwards substantial efforts were made to explore new grounds and enhance the efficiency of the operation and gear. The vessel size increased further, and a modern longliner is essentially a factory ship of 100 feet or more, equipped with automatic baiting systems (autoline), and storage facilities permitting 6-8 week trips or more. Norway alone operates 50-60 such vessels, and the same technology has been adopted by many other nations, e.g. the Faroe Islands, Iceland, Russia, Spain, and Ireland. Autoline systems are now also available for small vessels. Longlining is carried out in all slope areas of the ICES area, and also on the continental shelves.

Trawl fisheries developed mainly in the North Sea, but the expansion into deep-water oceanic areas happened after a major USSR exploratory effort took place in the 1960s and 1970s (Pechenik and Troyanovsky, 1970; Troyanovsky and Lisovsky, 1995). Western European fleets were stimulated to move into deeper water by the loss of opportunities in traditional shelf fisheries, and considerable exploratory deep-water trawling was initiated by Germany and the UK in the 1970s and early 1980s (Ehrich, 1983; Rätz, 1984; Bridger, 1978). It was however French trawlers that initiated major commercial operations in the mid-1980s, probably because of easy access to markets that readily accepted new species. Germany mainly concentrated on redfish, and the UK gradually developed a fishery for anglerfish. Current trawl fisheries are mainly carried out by French, Spanish, Faroese, Irish and Scottish vessels. Russian and Polish vessels are also active, especially on the Mid-Atlantic Ridge, at Rockall and the Hatton Bank.

Few longliners and trawlers have true deep-sea species as their year-round targets. In northern waters cod (*Gadus morhua*), redfish, and Greenland halibut are main other species, and similar patterns of seasonal changes between target resources on the shelf and slope are observed in more southern waters.

Fisheries by ICES Sub-area and Division

The following account summarises fisheries by ICES Sub-areas and Divisions (Fig. 1) and is mainly based on national reports submitted to ICES WGDEEP (or previously SGDEEP) or to the EC Deep-fisheries Project. Species-specific landings data by sub-area are given in Table 1, extracted from Anon. (2001b). Almost the same data but given by fishing nation can be found in Anon. (2000, 2001a).

ICES Sub-area II

Sub-area II comprises the slope waters of western and northern Norway and Svalbard, where there are directed longline fisheries for ling and tusk, and trawl, longline and gillnet fisheries for redfish and Greenland halibut. There is also a directed bottom and pelagic trawl fishery for greater silver smelt or argentine (*Argentina silus*) (Johannessen and Monstad, 2001). In some fjords there are minor trawl fisheries for roundnose grenadier (*Coryphaenoides rupestris*) (EC Deep-fisheries Project: Gordon, 1999a). Roughhead grenadier (*Macrourus berglax*) is taken as bycatch in the trawl, gillnet and longline fisheries for Greenland halibut. There is also a significant bycatch of ling and tusk in various trawl and gillnet fisheries on the shelf. A gillnet fishery off mid-Norway targets

ling and sometimes blue ling (*Molva dypterygia*), but the yield has declined to a very low level compared with the catches observed when this fishery developed in the early 1980s.

ICES Sub-area III

The deep-water fisheries of this Sub-area are essentially in the Skagerrak (Division IIIa) where there is a targeted trawl fishery for roundnose grenadier and greater silver smelt. These species are also taken as bycatch in the *Pandalus borealis* trawl fishery, and probably only a minor part of this bycatch is landed.

ICES Sub-area IV

The most significant target fishery in this Sub-area is the longline fishery in the Norwegian Deep and around Shetland and the Orkneys for tusk and ling with greater forkbeard (*Phycis blennoides*) as the major bycatch species. There is a bycatch of greater silver smelt from the industrial trawl fishery along the slope of the Norwegian Deep. In trawl fisheries targeting anglerfish (*Lophius piscatorius*) and Greenland halibut on the slope north and west of Shetland there is a bycatch of some deep-water species, including ling (Bullough et al., 1998; Gordon, 2001a). Greenland halibut and to some extent redfish is targeted at the upper slope front between the deep and cold Norwegian Sea water and overlying warmer Atlantic water and their distribution extends onto the Faroese slope (Division Vb) and across to Iceland (Division Va).

ICES Sub-area V

ICES Sub-area V is divided into two Divisions and there are significant differences between the fisheries of the two divisions. Division Va covers the waters around Iceland and the northern part of the Reykjanes Ridge to the point where it merges with Sub-area XII. Division Vb covers the waters around the Faroe Islands. Within both Divisions the deep-water areas have widely differing hydrographic regimes resulting from the separation of the warmer Atlantic waters from the colder Norwegian Sea waters by underwater ridges.

Division Va

Magnússon (1998) and Magnússon et al. (2000) have described the development and current status of the deep-water fisheries of Iceland in some detail and only a brief summary will be given here. Deep-water fishing was first documented around Iceland in the 1930s but it was not until the 1970s that the fisheries for deep-sea redfish (*Sebastes mentella*) and Greenland halibut became prominent. Other species that are targeted with varying intensity are blue ling, orange roughy (*Hoplostethus atlanticus*) and greater silver smelt. Incidental landings of other deep-water species include roundnose grenadier, roughhead grenadier and deep-water chimaerids and sharks.

Deep-water redfish (*Sebastes mentella*) was not recognised as being distinct species from *S. marinus* until 1951. The landings of the two species are combined and it is only since 1978 that the proportions of the two species in the catch have been estimated for scientific purposes. The bottom trawl fishery for deep-sea redfish occurs on the slope at depths of 500 to 700 m and is mainly along the west, south and southeast of Iceland. Spawning aggregations are targeted by both bottom and midwater trawls on the Reykjanes Ridge and off the south coast during the autumn. Landings increased considerably from 1988 reaching a peak in 1994. This was accompanied by a decline in CPUE. Landings of deep-water redfish have continued to decline (Anon., 2001a)

The Greenland halibut bottom trawl fishery began in the 1960s mainly along the western slopes and was mainly prosecuted by foreign vessels. Iceland began a directed longline fishery off the north coast in 1969. The spring trawl fishery on aggregations to the west of Iceland continues but there are also landings from other areas throughout the year. Landings peaked in 1989 and since then there has been significant decline in landings and CPUE. The landings of blue ling are mainly a bycatch of the redfish fishery. In some years there have been directed fisheries on spawning aggregations. The landings of greater silver smelt are variable mainly because of technical and marketing problems. Landings of orange roughy are spasmodic and depend on fishing local aggregations that are difficult to locate.

Division Vb

The fishery for ling and tusk in Division Vb is mainly by Faroese and Norwegian longliners especially in the Vb2 sector. Anon. (1998) gives information on how the Faroese landings of ling and tusk are distributed amongst the different sectors of the fleet. There has been an increase in the landings of ling in recent years (Anon, 2000).

The main deep-water bottom trawl fisheries in Division Vb are associated with the warmer Atlantic waters and are closely linked with the deep-water fisheries of Sub-area VI (see below). The mixed bottom trawl fishery, mainly prosecuted by France and the Faroe Islands, lands species such as roundnose grenadier, black scabbardfish (*Aphanopus carbo*) and blue ling. There has been a steady decline in landings in recent years (Anon 2000). There are also targeted trawl and gillnet fisheries for Greenland halibut and anglerfish. The gillnets can yield a by-catch of for example deep-water red crab (*Chaecon* (formerly *Geryon*) *affinis*). There have also been trap fisheries for the deep-water red crab (Reinert, 1995). Exploratory fishing for orange roughy has also been carried out in this Division and over the wider ICES area (Thomsen, 1998).

ICES Sub-areas VI and VII

It has become customary to consider the deep-water fisheries of Sub-areas VI and VII as a unit because a significant proportion of the landings are from the continental slope that extends from the north of Scotland to the northern Bay of Biscay. Sub-area VI also includes the slopes of the Rockall Bank, some other banks that form the northern boundary of the Rockall Trough and a part of the Hatton Bank (Division VIb). Part of the Hatton Bank lies within Sub-area XII and this can cause reporting problems (see below). Prior to the UK claiming a 200 mile fishery limit around Rockall in 1976 there were undoubtedly deepwater trawl fisheries, mostly by the USSR, in the international waters around these offshore banks. The UK relinquished its claim to a 200 limit in 1997 and since then there has been an uncontrolled expansion of deep-water fisheries to the west of the Rockall Bank and at Hatton Bank.

The deep-water fisheries of these Sub-areas have been described in some detail by (Gordon 2001a) who subdivided them into, bottom trawl, semi-pelagic, longline and gillnet fisheries. The bottom trawl fisheries are for mixed demersal species with blue ling and roundnose grenadier as the main target species and black scabbardfish and deep-water sharks are the main bycatch. On the upper slopes anglerfish is an important species, and in deeper waters, usually on steeper slopes, there is a targeted fishery for orange roughy. The semi-pelagic fisheries are for blue whiting (*Micromesistius potassou*) and greater silver smelt. There are two separate longline fisheries, one for hake and the other for ling and tusk. There are reports of gillnet fisheries for anglerfish in international waters with a by catch of deep-water red crab.

ICES Sub-area VIII

The status of Spanish deep-water fisheries in 1998 was reviewed by Pineiro et al.(2001) The Spanish longline fisheries in Division VIIIc are varied. On the northern coast of Spain the target species is often greater forkbeard, while the fishery based on the northwestern ports of Spain can target alfonsino (*Beryx splendens*), greater forkbeard or red (blackspot) seabream (*Pagellus bogaraveo*). The fishery is seasonal occurring in winter and spring. Bycatch species are deep-sea cardinal fish (*Epigonus telescopus*) and black scabbardfish. There is also a directed fishery for deep-water sharks in Divisions VIIIa,b,c and d and in IXa. These fisheries, some of which take place throughout the year, are at depths between 900 and 1300 m and are prosecuted by vessels which formerly fished for hake. An important factor in determining the viability of the fishery is the value of the shark livers. Another longline fishery that lands a variety of species began in 1996 in the Bay of Biscay (Divisions VIII a,b and d). In Division VIIIc there is a specialised gillnet ('rasco') fishery for anglerfish.

There are also some trawl fisheries targeting species such as hake, megrim (*Lepidorhombus whiffiagonis*), anglerfish and Norway lobster (*Nephrops norvegicus*) that have a bycatch of deep-water species. These include ling, forkbeard (*Phycis phycis*), greater forkbeard, red (blackspot) seabream, conger eel (*Conger conger*), bluemouth (*Helicolenus dactylopterus*), wreckfish (*Polyprion americanus*) and alfonsinos.

The offshore Galician Bank lies partly in Division VIIIc and partly in Division XIb and has supported a small, but decreasing fishery for the deep-water red crab.

ICES Sub-area IX

The Portuguese longline fishery for black scabbardfish is almost entirely centred on the port of Sesimbra and a detailed description is to be found in the reports of EC Deep-fisheries project (Gordon, 1999a). The fishery, which began in 1983, takes place on hard bottoms along the slopes of canyons at depths ranging from 800 to 1200 m. In 2000 there were 15 vessels engaged in the fishery and the landings have decreased since 1995. The bycatch of the Portuguese dogfish (*Centroscyrnus coelolepis*) has tended to increase in recent years. This probably reflects the trend for targeting squalid sharks because of their increasing commercial value (Figueiredo et al. 2001a).

A description of the deep-water crustacean bottom trawl fishery is given in the reports of the EC Deep-fisheries Project (Gordon 1999a). It targets the rose shrimp (*Parapenaeus longirostris*) and the Norway lobster and is mainly carried out off the south and southwest coasts of mainland Portugal at depths between 200 and 700 m. The deepest grounds (400 to 700 m) are only fished when Norway lobster is the target species. Landings of additional bycatch species can be important for profitability, especially when the catches of the target species are lower. Bycatch species from the deeper fishing grounds include, blue and red shrimp (*Aristeus antennatus*), giant red shrimp (*Aristeomorpha foliacea*), conger eel, bluemouth, greater fork-beard and blackmouth catshark (*Galeus melastomus*). However, because of the over exploitation of *Nephrops* and the better yields of the shallower living rose shrimp, deep-water trawling does not occupy a major part of the effort of the fleet. The potential for the exploitation of other deeper-living shrimps, *A. antennatus*, *A. foliacea* and *Aristaeopsis edwardsiana* has been discussed by Figueiredo et al. (2001b).

There is a detailed description of the directed longline fishery for deep-water sharks in northern Portugal in the EC Deep-fisheries project. The bulk of the captures are comprised of only one species, the gulper shark (*Centrophorus granulosus*) but other deep-water species landed include the leafscale gulper shark (*Centrophorus squamosus*), Portuguese dogfish, blackspot seabream, greater fork-beard and conger eel. Since 1992, the catch rates have steadily decreased and the fishery is now almost finished. In Portugal the three species of scorpaenid fishes, red scorpionfish (*Scorpaena scrofa*), bluemouth and offshore rockfish (*Pontinus kuhlii*) are not always separated in the landings. An investigation carried out under the auspices of the EC Deep-fisheries Project found that in most landings the deep-water bluemouth were a bycatch of a longline fishery for conger eel.

The hake is fished by trawl, gill net, trammel net and longline. More than 60% of the landings are by the artisanal fleet using static gear. A semi-pelagic (“pedra-bola”) longline fishery takes place on the continental slope of the southern coast of Portugal at depths between 200 and 700 m and has been described by Erzini et al., (2001). Hake accounted for 41% of the catch and most of the remaining diverse catch of 27 species of fish and invertebrates was discarded. Deep-water bycatch species landed include the larger blackmouth catsharks, Ray’s bream (*Brama brama*), conger eel, bluemouth and red (blackspot) seabream.

An artisanal hook and line fishery, known as ‘voracera’, targeting red (blackspot) seabream at depths at depths of about 400 to 800 m began in the Straits of Gibraltar in the early 1980s. The number of vessels, which are all small (6-9 m in length), increased from about 25 to over one hundred in 1999 (Gil et al. cited in Anon., 2000). There was a decline in the landings after 1997 and regulatory measures have now been introduced.

Three small Spanish bottom trawlers occasionally began fishing for deep-water species on the Galician slope (Division IXa) in 1997 (Pineiro et al., 2001).

ICES Sub-area X

The deep-water fisheries of this oceanic Sub-area are confined to the slopes and seamounts of the Azorean Archipelago and parts of the Mid-Atlantic Ridge. Within the Azorean EEZ the main fisheries are by handline and longline. The main species landed are red (blackspot) seabream, wreckfish, conger eel, bluemouth, yellow-orange scorpionfish (*Pontinus kuhlii*), greater forkbeard, golden eye perch (*Beryx splendens*) and alfonsino (*Beryx decadactylus*). Other species like mora (*Mora moro*) are increasing in their importance in the landings. Before the 1980s the fishery was mostly by handline and the major expansion took place in the early 1980s with the introduction of larger vessels and longlining technology, together with improved marketing opportunities and better preservation of the catch. The most traditional deep-water stocks of the Azores are now considered to be intensively exploited, and some local management actions have recently been implemented.

A deep water gillnet fishery for kitefin shark (*Dalatias licha*) expanded from the late 1970s until the early 1990s with landings of almost 1000 t in some years (Silva, 1987, Gordon, 1999b). Since then the landings have declined and are now considered to be accidental (Anon, 2000). In 2000 one or two vessels tried to restart the fishery but it was not successful because of marketing problems.

Since 1998 commercial longliners from Madeira have targeted black scabbardfish in this Sub-area. In 1998 and 1999 some commercial fishing experiments targeting deep-water crustaceans species (deep water crabs and shrimps), were also undertaken. During 2001 a major expansion of the black scabbardfish fishery in the Azores is anticipated. Exploratory fishing for orange roughy (*Hoplostethus atlanticus*) is also being carried out but no data are available.

Outside the Azorean EEZ there are trawl fisheries for alfonsino (*Beryx splendens*), orange roughy, cardinal fish, black scabbardfish and wreckfish. Russia is the main nation conducting this fishery and the main target species is alfonsino. This fishery has been carried out with varying intensity since the 1970s (Trojanovsky and Lisovsky 1995; Vinnichenko, 1998).

ICES Sub-area XII

This vast sub-area extends from 48 to 62° N and the areas relevant to deep-water fishing are the Mid-Atlantic Ridge, its northern extension the Reykjanes Ridge and parts of the Hatton Bank. The USSR/Russia began trawling on the Mid-Atlantic Ridge in the 1970s for species such as roundnose grenadier and alfonsino (*Beryx splendens*) (Vinnichenko, 1998; Vinnichenko and Khlivnoy, 2001(cited in Anon.2001b)). Russian and Icelandic vessels have occasionally reported catches of orange roughy from this area, but the most systematic search for orange roughy that eventually led to exploitation is by the Faroe Islands (Thomsen, 1998). Norwegian and Icelandic longliners began fishing for redfish (giant type) tusk and Greenland halibut in 1996 (Hareide and Garnes, 2001).

There is a multi-species trawl and longline fishery on Hatton Bank part of which lies in this Sub-area and part in Sub-area VI (see above). There is considerable exploratory fishing on the Hatton Bank, and effort seems to be increasing (see Anon. 2000, 2001b). The true scale of the Hatton Bank fishery is difficult to assess because with the current reporting system catches from that bank cannot be separated from either the Mid-Atlantic Ridge or the Rockall Trough.

ICES Sub-area XIV

There are trawl and longline fisheries for Greenland halibut and redfish that have bycatches of roundnose grenadier, roughhead grenadier and tusk. Again, there is a problem separating catches from the western part of the Mid-Atlantic Ridge (Reykjanes Ridge) from those taken e.g. on the slope off East Greenland.

The Canary and Madeira island groups

Although these island groups lie beyond the southern limit of the ICES area their fisheries have some affinities with those of the Azores. The deep-water fishery of Madeira is primarily for black scabbardfish and is long established (Merrett and Haedrich, 1997). The most important by catch is the Portuguese dogfish.

The deep-water fisheries of the Canary Islands are mainly prosecuted by either hand line or longlines from small boats. The fishery takes place throughout the year and targets a wide variety of species including alfonsinos, wreckfish, forkbeards and mora (Rico et al., 1999). A seasonal fishery for hake occurs in deep-water off Gran Canaria. There is a small trap fishery for the deep-water shrimp (*Plesionika edwardsi*) at depths between 150 and 300 m (Gonzalez et al., 1997).

Current trends

Exploratory fishing

Exploratory fishing in slope waters and on oceanic seamounts is still being carried out, either as relatively minor private enterprises or as partly government funded programmes. Spain has reported major such efforts with various

gear types on the Mid-Atlantic Ridge and the Hatton Bank (Duran Muñoz and Román 2000, Duran Muñoz et al. 2000), and Norway is exploring the Hatton bank, primarily with longlines (Langedal and Hareide 2000). The impression is that the interest and fishing effort in this particular area is increasing significantly. The activity on the Mid-Atlantic Ridge is not being sufficiently monitored, but from reports to WGDEEP, there does not seem to be an increase in effort in that area, rather the contrary. There was a surge in the longline effort in the latter half of the 1990s directed at redfish, tusk, and halibut but there was a marked decline in yields after about two seasons. Other developments which may or may not result in sustainable fisheries are the growing interest in greater silver smelt at Iceland and black scabbardfish at the Azores.

The need for regulation due to stock depletion

ICES has found that many deep-water stocks are heavily exploited and some are even severely depleted (Anon., 2000a). This has led to management advice for immediate substantial reduction in fishing effort, especially in the areas to the north and west of the British Isles. This is a serious situation, and questions have been raised as to the extent to which deep-sea fisheries can really be expected to be sustainable. This is a growing debate, especially with regard to the most vulnerable species such as orange roughy, roundnose grenadier etc. A full account of this issue is beyond the scope of this paper, but more information on this issue may be found in Anon. (2001a) and Large et al. (2001).

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Table 1. Estimated landings (tonnes) of deep-water species by ICES Sub-areas and Divisions, 1988-2000. Data for 1999 and 2000 are preliminary.

I+II	Species	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	ALFONSINOS (<i>Beryx</i> spp.)													
	ARGENTINES (<i>Argentina silus</i>)	11351	8390	9120	7741	8234	7913	6807	6775	6604	4463	7465	7075	6288
	BLUE LING (<i>Molva dypterygia</i>)	3537	2059	1413	1480	1039	1020	410	357	270	300	280	289	252
	BLACK SCABBARDFISH (<i>Aphanopus carbo</i>)													
	GREATER FORKBEARD (<i>Phycis blennoides</i>)	0	0	23	39	33	1	0	0	0	0	0		
	LING (<i>Molva molva</i>)	6119	7368	7628	7793	6521	7093	6309	5954	6219	5404	9195	7655	5951
	MORIDAE													
	ORANGE ROUGHY (<i>Hoplostethus atlanticus</i>)													
	RABBITFISHES (Chimaerids)													
	ROUGHHEAD GRENADIER (<i>Macrourus berglax</i>)	0	0	589	829	424	136	0	0	0	17	55		4
	ROUNDNOSE GRENADIER (<i>Coryphaenoides rupestris</i>)		22	49	72	52	15	15	7	2	106	100	56	4
	RED (=BLACKSPOT) SEABREAM (<i>Pagellus bogaraveo</i>)													
	SHARKS, VARIOUS	37	15	0	0	0	0	0	0	0	0	0		1
	SILVER SCABBARDFISH (<i>Lepidopus caudatus</i>)													
	SMOOTHHEADS (Alepocephalidae)													
	TUSK (<i>Brosme brosme</i>)	14403	19350	18628	18306	15974	17584	12566	11388	12634	9332	15280	17182	13945
	WRECKFISH (<i>Polyprion americanus</i>)													
III+IV	Species	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	ALFONSINOS (<i>Beryx</i> spp.)	0	0	1	0	2	0	0	0	0	0	0		
	ARGENTINES (<i>Argentina silus</i>)	2718	3786	2321	2554	4435	3275	1146	1082	2051	2721	1587	1590	113
	BLUE LING (<i>Molva dypterygia</i>)	385	481	514	642	592	436	434	503	194	290	289	252	129
	BLACK SCABBARDFISH (<i>Aphanopus carbo</i>)	2	0	57	0	0	0	16	2	4	2	9	5	3
	GREATER FORKBEARD (<i>Phycis blennoides</i>)	15	12	115	181	145	34	12	3	18	7	12	19	6
	LING (<i>Molva molva</i>)	11933	12486	11025	10943	11881	13985	12114	13960	13543	12322	14466	10418	9203
	MORIDAE													
	ORANGE ROUGHY (<i>Hoplostethus atlanticus</i>)													
	RABBITFISHES (Chimaerids)													
	ROUGHHEAD GRENADIER (<i>Macrourus berglax</i>)	0	0	0	0	7	0	0	0	0	36	30	24	
	ROUNDNOSE GRENADIER (<i>Coryphaenoides rupestris</i>)	618	1055	1439	2053	4247	1929	2139	2312	1238	2301	4793	2617	32
	RED (=BLACKSPOT) SEABREAM (<i>Pagellus bogaraveo</i>)													
	SHARKS, VARIOUS	5	16	20	17	139	63	99	39	56	91	64	54	10

Table 1. Continued.

	SILVER SCABBARDFISH (<i>Lepidopus caudatus</i>)	0	0	0	0	27	0	0	0	0	0	0		
	SMOOTHHEADS (Alepocephalidae)													
	TUSK (<i>Brosme brosme</i>)	4490	6515	4319	4623	5015	5221	3429	3405	3446	2289	3459	2452	3332
	WRECKFISH (<i>Polyprion americanus</i>)													
Va	Species	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	ALFONSINOS (<i>Beryx</i> spp.)	0	0	5	0	4	0	1	0	0	0	0		
	ARGENTINES (<i>Argentina silus</i>)	206	8	112	247	657	1255	613	492	808	3367	13387	7243	5608
	BLUE LING (<i>Molva dypterygia</i>)	2171	2533	3021	1824	2906	2233	1921	1634	1323	1344	1153	1903	1682
	BLACK SCABBARDFISH (<i>Aphanopus carbo</i>)	0	0	0	0	0	0	0	0	0	1	0		
	GREATER FORKBEARD (<i>Phycis blennoides</i>)													
	LING (<i>Molva molva</i>)	5861	5612	5598	5805	5116	4854	4604	4192	4060	3933	4302	4642	3682
	MORIDAE													
	ORANGE ROUGHY (<i>Hoplostethus atlanticus</i>)	0	0	0	65	382	717	158	64	40	79	28	0	68
	RABBITFISHES (Chimaerids)	0	0	0	499	106	3	60	106	21	15		37	
	ROUGHHEAD GRENADIER (<i>Macrourus berglax</i>)	0	0	0	0	0	0	0	0	15	4	0		
	ROUNDNOSE GRENADIER (<i>Coryphaenoides rupestris</i>)	2	4	7	48	210	276	210	398	140	198	120	129	0
	RED (=BLACKSPOT) SEABREAM (<i>Pagellus bogaraveo</i>)													
	SHARKS, VARIOUS	0	31	54	58	70	39	42	45	65	70	1	0	1
	SILVER SCABBARDFISH (<i>Lepidopus caudatus</i>)													
	SMOOTHHEADS (Alepocephalidae)	0	0	0	0	10	3	1	1	0	0	0		
	TUSK (<i>Brosme brosme</i>)	6855	7061	7291	8732	8009	6075	5824	6225	6102	5394	5171	7289	6315
	WRECKFISH (<i>Polyprion americanus</i>)													
Vb	Species	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	ALFONSINOS (<i>Beryx</i> spp.)	0	0	5	0	4	0	0	1	0	0	0		
	ARGENTINES (<i>Argentina silus</i>)	287	227	2888	60	1443	1063	960	12286	9498	8433	17570	8201	6911
	BLUE LING (<i>Molva dypterygia</i>)	9 528	5 266	4 799	2 962	4 702	2 836	1 637	2 440	1 602	2798	2584	4987	2558
	BLACK SCABBARDFISH (<i>Aphanopus carbo</i>)	0	166	419	152	33	287	160	424	186	68	180	169	263
	GREATER FORKBEARD (<i>Phycis blennoides</i>)	2	1	38	53	49	22	0	9	7	7	8	33	27
	LING (<i>Molva molva</i>)	4488	4652	3857	4512	3614	2856	3622	4070	4896	5657	5359	5200	3700
	MORIDAE	0	0	0	5	0	0	0	0	0	0	0		
	ORANGE ROUGHY (<i>Hoplostethus atlanticus</i>)	0	0	22	48	13	37	170	420	79	18	3	46	155

Table 1. Continued.

VIII+IX	Species	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	ALFONSINOS (<i>Beryx</i> spp.)	0	0	1	0	1	0	2	82	88	135	269	198	49
	ARGENTINES (<i>Argentina silus</i>)													
	BLUE LING (<i>Molva dypterygia</i>)	0	0	0	0	0	0	0	0	0	14	33	29	0
	BLACK SCABBARDFISH (<i>Aphanopus carbo</i>)	2602	3473	3274	3979	4389	4513	3429	4272	3815	3556	3152	2749	2818
	GREATER FORKBEARD (<i>Phycis blennoides</i>)	81	145	234	130	179	395	320	384	456	361	665	372	232
	LING (<i>Molva molva</i>)	1028	1221	1372	1139	802	510	85	845	1041	1034	1799	801	167
	MORIDAE								83	52	88			5
	ORANGE ROUGHY (<i>Hoplostethus atlanticus</i>)	0	0	0	0	83	68	31	7	22	27	15	41	39
	RABBITFISHES (Chimaerids)													
	ROUGHHEAD GRENADIER (<i>Macrourus berglax</i>)													
	ROUNDNOSE GRENADIER (<i>Coryphaenoides rupestris</i>)	0	0	5	1	12	18	5	0	1	0	1	16	3
	RED (=BLACKSPOT) SEABREAM (<i>Pagellus bogaraveo</i>)	826	948	906	666	921	1175	1135	939	1001	1036	831	540	526
	SHARKS, VARIOUS	5270	3397	1555	3876	4883	934	807	1596	1354	2498	3183	1569	1344
	SILVER SCABBARDFISH (<i>Lepidopus caudatus</i>)	2666	1385	584	808	1374	2397	1054	5672	1237	1723	965	3058	15
	SMOOTHHEADS (Alepocephalidae)										7			
	TUSK (<i>Brosme brosme</i>)	1	0	0	0	0	0	0	0	0	0	1	0	0
	WRECKFISH (<i>Polyprion americanus</i>)	198	284	163	194	269	338	409	393	294	214	227	144	8
X	Species	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	ALFONSINOS (<i>Beryx</i> spp.)	225	260	338	371	450	728	1500	623	536	983	228	175	224
	ARGENTINES (<i>Argentina silus</i>)													
	BLUE LING (<i>Molva dypterygia</i>)	18	17	23	69	31	33	42	29	26	21	13	10	13
	BLACK SCABBARDFISH (<i>Aphanopus carbo</i>)	0	0	0	166	370	2	0	3	11	3	99	104	113
	GREATER FORKBEARD (<i>Phycis blennoides</i>)	29	42	50	68	81	115	135	71	45	30	38	41	91
	LING (<i>Molva molva</i>)													
	MORIDAE	0	0	50	0	0	0	0	0	0	0	0		0
	ORANGE ROUGHY (<i>Hoplostethus atlanticus</i>)	0	0	0	0	0	1	0	0	471	6	177	2	31
	RABBITFISHES (Chimaerids)													
	ROUGHHEAD GRENADIER (<i>Macrourus berglax</i>)													
	ROUNDNOSE GRENADIER (<i>Coryphaenoides rupestris</i>)	0	0	0	0	0	0	0	0	3	1	1	4	74
	RED (=BLACKSPOT) SEABREAM (<i>Pagellus bogaraveo</i>)	637	924	889	874	1110	829	983	1096	1036	1012	1114	1210	924

