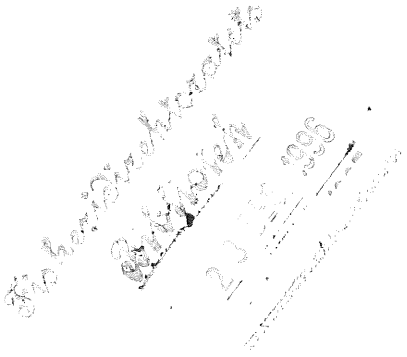

REPORT OF THE STUDY GROUP ON THE BIOLOGY AND ASSESSMENT OF DEEP-SEA FISHERIES RESOURCES

ICES Headquarters, Copenhagen, Denmark
15–21 February 1996

International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

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1. INTRODUCTION

1.1 Participants

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1.2 Terms of Reference

At the 1995 Annual Science Conference, ICES Resolution C.Res. 1995/2.13.13 decided that the Study Group on the Biology and Assessment of Deep-Sea Fisheries Resources under the Chairmanship of Dr J.D.M. Gordon (UK) would meet at ICES Headquarters from 15-21 February 1996 to:

a) compile and analyse available data on a number of deep-water species (namely argentines, orange roughy, roundnose grenadier, black scabbard fish, golden eye perch (*Beryx splendens*) and red (blackspot) seabream (*Pagellus bogaraveo*) in the ICES area and, if possible, provide assessments of the state of the stocks and the level of exploitation.

b) provide information on the stocks and state of exploitation of the stocks of blue ling, ling, and tusk in Sub-areas IIa, IVa, V, VI, VII and XIV and identify outstanding data requirements.

The above terms of reference are set up to provide the Advisory Committee on Fishery Management with the information required to respond to the request for advice from the North-East Atlantic Fisheries Commission.

In addition to these primary objectives it was recognised that the Study Group should attempt to update information given in the report of the first Study Group (C.M. 1995/Assess:4) on national fisheries, catch and effort statistics and biological data.

An additional request for information was received from NEAFC after the terms of reference were agreed.

g) update descriptions of deep-water fisheries in waters inside and beyond coastal state jurisdiction south of 63° N for species like grenadiers, scabbard fishes, orange roughy, forkbeards, sharks, angler fish and crabs, especially catch statistics by species, fleets and gear: and if possible indicate the biological status of the stocks.

2. BACKGROUND

The first Study Group on the Biology and Assessment of Deep-Sea Fisheries Resources was held in 1994 (CM 1995/Assess:4). In Section 4 of the report members described their national deep-water fisheries and when a country was not represented the group attempted to compile a description based on other sources. Later ACFM used this information to compile descriptions of the fishery by areas (Anon. 1995a). Unfortunately because some countries have deep-water fisheries which cover a broad geographical area some inaccuracies occurred.

Section 5 reviewed some of the problems encountered in compiling statistics on landings of deep-water species. The lack of provision for recording to species level was a major difficulty and recommendations were made to provide for more accurate recording. A number of changes to the STATLANT 27A Reporting Form were subsequently proposed at a meeting of the Statistics Committee Liaison Working Group (CM 1995/D:1). There was a lack of reported official landings for some countries. The Group prepared tables of landings for the main species based on the best available information from a variety of sources. Tables were prepared for each species, divided into areas and country. The ACFM Report used this data to produce two sets of tables; total landings by ICES Sub-areas and Divisions of each species and also total landings by species for sub-areas and divisions.

Section 6 reviewed the biological data on deep-water species under the sub-headings of biological surveys and available biological information. An attempt was made to make an inventory of all national biological surveys of deep-water resources. This was based on the best available information but is was recognised that it was incomplete. The basic biological information was compiled from data available to Group members. It was also recognised that this information was incomplete.

Section 7 attempted to summarise the available information on the biology of individual species under the sub-headings of geographical distribution, abundance, length frequency, length-weight relationship, age and growth, feeding, reproduction and catchability.

Sections 9, 10 and 11 considered possible assessment methods, the shortcomings of the data for assessment purposes and some preliminary observations on the state of exploitation of the stocks.
It was agreed that a second meeting of the Group should be held in early 1996 and a start should be made at compiling and analysing existing data for selected

species. The report also recommended collaborative research on deep-water species and to some extent this has been achieved through an EC FAIR contract (see section 15).

Following the first meeting of the Study Group, ACFM decided to transfer responsibility for ling, blue ling and tusk from the Northern Shelf Working Group to this Study Group. These species were not included in the previous report.

3. DESCRIPTIONS OF NATIONAL FISHERIES

3.1 Description by country

The information presented here updates and adds to the descriptions presented in the report of the first Study Group.

3.1.1 Denmark

No new information.

3.1.2 Faroe Islands

There have been some changes in the Faroese fishery. The main area of activity which was previously on the Hatton Bank (VIb and XII) has extended to the Mid-Atlantic Ridge (XII). There is now a targeted fishery for orange roughy.

3.1.3 France

Fishing areas: the French commercial fishery in deep water has been developed since about 1970. It consists mainly of trawling in ICES Sub-areas V, VI, VII. The target species was blue ling *(Molva dypterygia)*. Since 1989 the deep water trawling was also directed on roundnose grenadier (*Coryphaenoides rupestris*), orange roughy (*Hoplostethus atlanticus*), black scabbardfish (*Aphanopus carbo*) and deep water sharks (*Centrophorus squamosus* and *Centroscymnus ceololepis*).

Fishing fleet: the trawlers work on the continental slope off the west of Scotland and Ireland between 700 and 1700 m in depth. The fishing fleet consists of approximatly seventy trawlers with lengths varying from 24 to 60 meters total length (450 to 1600 kw).

The fleet is classified in 3 categories:

1) 50–60 m TL (1300 to 1600 kw) capable of working to 1700 m depth; about 30 deep trawlers; deep-water species are not their only activity.
2) 33–43 m TL (600 to 1580 kw), capable of working to 1300 m depth; about 40 trawlers that are also fishing on traditional species on the shelf.
3) 22–25 m TL (450 kw) maximun depth 1600 m; 3 or 4 since 1993.

Moreover there are 2 or 3 gillnetters which occasionally fish on deep-water species.

In 1994 and 1995 some of the large trawlers of the first category have temporarily ceased fishing while being refitted to improve their fishing capacities.

The most important deep-water species is roundnose grenadier (*Coryphaenoides rupestris*); landings increased from 2764 t in 1989 to a peak of 10,185 t in 1991 and then decreased to 8760 t in 1994. The bulk of catches were from ICES Sub-area VI.

The second most important species is orange roughy (*Hoplostethus atlanticus*); landings have increased from 298 t in 1989 to 1956 t in 1994. The catches are mainly from ICES Sub-areas V, VI, VII.

Landings of black scabbard (*Aphanopus carbo*) have increased from 298 t in 1989 to 3917 t in 1994. Most of the catches are from ICES Division VIa.

Several species of deep-water sharks are recorded in catches but only two species (*Centrophorus squamosus* and *Centroscymnus coelolepis*) are present in useful commercially quantities. Statistics are only partialy available because there was no digit code before 1993; all species were classified as "various fish". In 1994 the landings of the two species amounted to about 1686 t.

3.1.4 Germany

No new information.

3.1.5 Greenland

At the present time the only deep-water fishery in ICES statistical area by Greenland or foreign vessels fishing on the Greenland quota is aimed at Greenland halibut and is taking place in Subarea XIVb. The fishery is almost exclusively prosecuted with longlines and is taking place both inshore and offshore. In both fisheries there is a small by catch of roughhead grenadier (*Macrourus berglax*) amounting to 18, 5, and 2 tons in 1993, 1994, and 1995, respectively.

3.1.6 Iceland

The Icelandic fisheries for deep-water species were briefly described in the first Study Group Report. The fishery for blue ling, ling and tusk is still basically a by-catch fishery although a few vessels may occasionally aim for one or another of these species. The very limited fishery on orange roughy is exclusively aimed. The fishery on the argentine (*Argentina silus*) is mainly aimed while that on the rabbit fish (*Chimaera monstrosa*) is only partly an aimed fishery. Other deep-water species such as roundnose and roughhead grenadier, smoothhead (*Alepocephalus* spp.), black dogfish (*Centroscyllium fabricii*) and various species of sharks are mainly taken as

a by-catch in the Greenland halibut and in the redfish fisheries.

3.1.7 Ireland

There was a limited fishery for roundnose grenadier and other deep-water species in 1994.

3.1.8 Norway

Longline fisheries

The most important deep-water fishery in Norway is the longline fishey for ling (*Molva molva*) and tusk (*Brosme brosme*). This ranges among the most important commercial fisheries in Norway and the first-hand value of the catch in 1994 was approximately 370 million NOK. In 1994, 52 fishing vessels longer than 70 feet were engaged in these fisheries which is conducted in ICES Divisions and Sub-areas IIa, IVa, V, VI, VII, and XIV. Some data on the fisheries in the period 1974-1994, i.e. number of vessels, weeks at sea, distribution of effort by area and species, are given in Table 3.1. There has been a decline in the number of vessels taking part in the fishery and the number of weeks spent fishing. However, because of major technological advances in the late 1970s and 1980s, this did not constitute a decrease in the fishing effort. The introduction of the autoline system on most vessels in the early 1980s was the single most important factor leading to a sharp increase in efficiency. These trends are illustrated in Figure 3.1a drawn from a working paper by Hareide and Godø (1996) on catch per unit of effort analysis of the longliners.

Catch per unit of effort analyses of ling and tusk based on data from both official statistics and data from skipper's logbooks from 3 longliners show a rather clear downward trend since the early 1970s (Figure 3.1b, from Hareide and Godø, 1996). Since 1974–1975 the catch per thousand hooks has been reduced from 150–200 kg to around 50 kg in 1993. The same trend is seen when an area-specific analysis is run (Figure 3.2), but the variation is rather high. A problem in the CPUE analyses is splitting the catches by species. Given that tusk is normally a secondary species in the Norwegian fishery, the trends in the above analyses probably primarily reflect development in CPUE of ling.

Especially in the last two decades, there has been a rather clear inverse relationship between the effort devoted to ling and tusk, and the size of the cod and haddock quotas available to the longline fleet. This is also reflected in the catch statistics. Overall, there has been a transfer of effort from ling and tusk to cod and haddock in later years (Table 3.1), caused by diminishing returns from the former species and increasing quotas in the cod-haddock fishery in subarea IIa.

In the most recent years a longline fishery developed off southeastern Greenland at depths down to 1500 m. The target species is Greenland halibut (*Reinhardtius hippoglossoides*), but probably as much as 30% of the by-catch is roughhead grenadier (*Macrourus berglax*). In 1994–1995, 8 longliners took part in this fishery for about 1 month each.

Trawl fisheries

Argentina silus

Argentina silus has been targeted in trawl fisheries off mid-Norway (Subarea IIa) and the Skagerrak (IIIa) since the late 1970s. The mid-Norway fishery expanded in the 1980s from a spring fishery on spawning concentrations, to a fishery which was conducted in most months of the year with both bottom trawls and pelagic trawls. Licences were issued to 34 trawlers, and all landings should be used for human consumption. The landings reached almost 11,000 tonnes in the top years 1983 and 1988, but were reduced to almost half this level in 1994–1995.

The fishery in the Skagerrak is conducted by 1–3 trawlers and landings have dropped from 1,000–2,000 tonnes/year to 100–200 tonnes in 1994–1995 (Table 4.2). This may reflect a change of target species rather than a reduction in abundance of *Argentina*.

In some years, considerable by-catches of *Argentina silus* are made in the pelagic trawl fishery for blue whiting to the west of Scotland and Ireland (sub-areas VI and VII). In 1989 this catch was approx. 12,000 tonnes. No by-catches were however recorded after 1989 although some were probably made. The by-catch is restricted by a quota agreed between the EU and Norway.

Argentina silus is also a by-catch in industrial trawl fisheries in the North Sea (IVa) and off mid-Norway (IIa), and in the *Pandalus borealis* fishery in the Skagerrak (IIIa). By-catches in the industrial fisheries have been estimated based on sampling at the fish-meal plants. These estimates were included in the landings figures in Table 4.2. The by-catches were 200 tonnes or less in the years 1992–1995.

Coryphaenoides rupestris

The roundnosed grenadier is caught in a directed fjord fishery with bottom trawls in mid-Norway (IIa). The fleet consists of 3–5 vessels.

The species is also a by-catch in the shrimp and *Argentina silus* fisheries in the Skagerrak, but the by-catches which are not landed for human consumption have not been quantified. Interview-based estimates suggest a total catch of around 1000 tonnes/year.

3.1.9 Portugal

Mainland: No new information.

Azores: No new information.

3.1.10 Russia

Since 1971–1975 PINRO and AtlantNIRO, the Research Institutes of the former USSR Fisheries Ministry started to conduct investigations in the North Azores area out of 200-miles EEZ (ICES Sub-area X). Detailed information on oceanography and bottom geomorphology has been obtained and about 20 sea mounts with minimum depth less than 1000 m were revealed. As a result of investigations on ichthyophauna in the North Azores 233 fish species from 69 families have been revealed (Gushchin and Kukuev, 1981; Anon. 1993).

The first commercial catches of Alfonsino (*Beryx splendens*) were taken by a pelagic trawl in the North Azores area (ICES Sub-area X) in October 1977 by research-scouting vessel "Volzhanin". In August 1978 dense aggregations of Alfonsino were found in that area by research-scouting vessel "Andrus Iohani". As a result of these scouting operations a commercial fishery developed. In August–October 1–3 trawlers operated on the banks and a total catch of over 700 t of Alfonsino was made.

In March 1979 availability of Alfonsino aggregations were found on the sea mounts by RV "Rzhev". In April–May 1–4 commercial trawlers also operated there and the total catch was about 1100 t.

In July 1979 the good catches of Alfonsino have been taken with pelagic trawl by RV "Kapitan Demidov". In September 1979 the same vessel demonstrated the possibility of a bottom trawl fishery.

No commercial fishery was carried out on the North Azores banks by Soviet commercial fleet in the 1980s. A total of 9 research-scouting and research cruises were conducted during the decade. Most of them demonstated the availability of Alfonsino aggregations on the mounts. Commercial catches of cardinal-fish (*Epigonus telescopus*) and Orange roughy were taken with a bottom trawl. Fish aggregations were registered on some new mounts. In total, about 1000 t of deep water fishes, mainly Alfonsino, were caught by research-scouting trawlers during the 1980s in the North Azores area.

A series of special investigations were also carried out on the sea mounts to elucidate the possibilities of long-line fishing of deep water fishes. (Zaferman and Shestopal, 1991).

In parallel with scouting and commercial works an essential portion of investigations has been performed on the area oceanography, biology, behaviour and distribution of deep water fish, conditions of their aggregations formation, as well as those using "Sever-2" autonomous underwater vehicle (Gushchin and Kukuev, 1981; Loctionov, 1981; Pshenichny *et al.*, 1986; Shibanov *et al.* 1989).

In September 1993 USSR research-scouting investigations in the area were continued within the framework of the joint Russian-Norwegian expedition carried out on board the Norwegian trawler "Ramoen". Availability of deep fish aggregations has been proved on the slopes of three mounts. Commercial catches were taken with a bottom trawl from two of them. The total catch has consisted of 280 t of Alfonsino and cardinal-fish (Vinnichenko *et al.*, 1994; Gorchinsky *et al.*, 1994).

In 1994, based on previous experience obtained, the Russian fishing industry together with PINRO have arranged a commercial cruise onboard "Petr Petrov" to the North Azores area. During June–August the vessel conducted fishery with pelagic and bottom trawls. The catch, mainly Alfonsino, was set at 864 t.

In June and October 1995 Russian commercial vessels operated in the area from time to time. In total above 100 t of Alfonsino has been caught by them.

Roundnose grenadier

There is currently no directed fishery by Russian trawlers for the Roundnose Grenadier in ICES Sub-Area X11. However, in 1973–1991 former USSR (nowadays - Russia) developed a large-scale trawl fishery in that area. In 1971–1972 USSR conducted many research expeditions to the Reykjanes Ridge area between 51°–57°. In May 1973 onboard of RV "Odissey" the dense fish echoregistrations were recorded on the slopes of a sea mount near 53° N. The first catch of 3 t of roundnose grenadier there was taken by the pelagic trawl. During May 1973 the sea mounts situated between 52°–59° N were observed by RV "Odissey". In June 1973 a scouting group of 3 research vessels was organised for that area. Two commercial trawlers joined the investigations later. Total catch of 840 t (mainly roundnose grenadier) was taken in July–December 1973).

In 1974–1975 the Russian fishery for the roundnose grenadier was well developed. A lot of commercial trawlers of different types (with engines of 2000–4500 hp) were used. BMRT-type freezer-trawlers (2,000 hp) were used as a standard for the effort data collection and recalculated to the one vessel type.

After the record level in 1974–1975 (29,000 t) the total annual catch reduced to 10,000 t in average. The trawl fishery expanded to the area between 48°–58° N. On the slopes of some sea mounts it was possible to carry out a bottom trawl fishery. Deep-sea squalid sharks (about 10 species), orange roughy, black scabbard fish, cardinal fish (*Epigonus telescopus*) and *Beryx* spp. were the main by-

catch of the roundnose grenadier in that area. In some catches (especially of bottom trawls) they comprised 10–50 % of total catch biomass.

In the 1980s Russian catches varied from year to year, from 700 t to 10,000 t Trawlers fished mainly from May to September. Numerous expeditions were conducted in the area 48°–58° N and a trawl-acoustic survey showed that the roundnose grenadier biomass varied between 400,000 and 500,000 t (Troyanovsky and Lisovsky, 1995).

In the early 1990s Russian catches in that area decreased rapidly because of national economic problems during that period.

3.1.11 Spain

Most of the Spanish deep water fisheries in the Northeast Atlantic must be considered as by-catches of other directed demersal fisheries, especially for hake. So they relate to very different sea areas (Sub-Areas VI–VII, Divisions VIIIa,b,d (Bay of Biscay) and VIIIc (Cantabrian Sea) and different gears (trawl, longliners and gillnets). Only in the last few years have new directed deep water fisheries been established. These are experimental and/or restricted to a part of the year, when licences or yields in relation to target species are depleted. In addition traditional artisanal fisheries have been relatively important along the Cantabrian Sea coast focused in some specific species. Due to the great variability of the scenarios and to the rather small importance of the most of these species in comparison to the target species, the information here presented must be considered as preliminary.

3.1.12 By-catches of deep-water species

Sub-areas VI–VII, Divisions VIIIa,b,d and Division VIIIc

Spanish trawlers and longliners fish deep-waters species mainly in Celtic Sea, Porcupine Bank, Rockall Bank, Bay of Biscay and Cantabrian Sea, when they are fishing for hake, megrim, anglerfish and nephrops. A variable proportion of these deep-water catches is discarded, depending on the market price, the facilities for processing on board and the duration of the trips. In some ports, landings of similar species are usually sold all together depending on the local appreciation of the fish in the market. For this reason it is difficult at present to have reliable information on exact landings by species. Thus, *Molva* sp., *Phycis* sp. and in some way with *Pagellus* sp. (mainly *P. bogaraveo*) are reported.

The main bycatches landed from these fisheries are:

Phycis sp. *(P. phycis* and *P. blennoides)*
Molva sp. *(M. molva* and *M. dipterygia)*
*Pagellus bogaraveo (*and *P. acarne)*
Conger conger
Helicolenus dactylopterus
Polyprion americanus
Beryx sp.
Sebastes sp. *(?)*

Data of Spanish landings of *Phycis* sp., *Molva* sp. and *Pagellus* sp. by area and gear from 1985 to 1994 are presented in Table 4.18.

A study of discards of the deep-water species by the Spanish commercial fleets carried out in 1994, under EC Project "Spanish Discards of the Spanish Fleet in ICES Divisions" (Study Contract DGXIV Ref. n. PEM/93/005), showed that the main species discarded in Sub-areas VI and VII were deep-water species (and *Micromesistius poutassou)* and by order of importance in quantity they were:

Argentina silus
Molva dipterigya
Chimaera monstrosa
Phycis blennoides
Helicolenus dactylopterus
Molva molva
Beryx decadactylus
Conger conger
Sharks such as *Galeus melastomus, Etmopterus spinax, Deania calceus*
Crustacea such as *Geryon longipes.*
(Perez, N., Piñeiro, C. and Paz, X., in preparation).

3.1.13 Directed fisheries on deep-water species

In Sub-areas VI–VII and Divisions VIIIa,b,d a new fishery has emerged in recent years directed at species other than hake, megrim and anglerfish. Their main targets are deep-water sharks (see below), but also some catches of *Phycis* sp. and *Molva* sp. are obtained. In addition, an experimental longline fishery in deep waters directed to *Mora moro* has begun in Divisions VIIIa,b,d during the second part of 1995 The landings amounted for 79 t (Lucio, WD 1996). In Division VIIIc (Cantabrian Sea), the number of small longliners devote a part of their activity in some periods of the year to fish in deep waters, it is increasing in the last years. The main catches are *Phycis* sp. (above all *P. blennoides*), *Mora moro*, and *Molva* sp. (mainly *M. dipterygia*) and sharks (see below).

3.1.14 Traditional artisanal deep-water fisheries

Traditionally these deep water fisheries were the artisanal longliners and rod liners that in the Southern Division VIIIb and along all the Division VIIIc (Cantabrian Sea) fish for *Pagellus bogaraveo* at the end of the autumn and in the winter. This fishery was very important in the past but at the present time the catches are at a very low level. So, for instance, the landings of *P. bogaraveo* in the Basque Country from this area were

about 1,000 t per annum, at the beginning of this century until the early 1970s and 1980s, but from 1983 the catches have decreased drastically; in 1995 they amounted to only 14 tonnes (Lucio, WD 1996). The fishery on *Conger conger* may be considered as a traditional deep water fishery, although their catches have never been very important.

3.1.15 Deep-water sharks fishery

a) Sub-areas VI–VII

A fishery for some deep-water sharks started in 1991 in ICES Sub-areas VI-VII. A number of longliners which had traditionally fished for hake in this area, following problems in maintaining profitability and with the advent of a market for the livers of these sharks for the production of oils, began to fish for sharks in waters of depths greater than 1,000 metres (Iglesias, S. and Paz, J., 1995).

In Galicia (Northwest of Spain) the landings are made principally in the port of La Coruña. In 1991 there were 43 landings by 10 vessels while in 1992 there were 80 landings from 12 vessels. In 1993, 11 vessels made landings from 38 trips. In 1994 9 vessels made landings from 13 trips. Almost all of the vessels involved operate under the flag of Ireland or United Kingdom and only one or two vessels can be strictly referred to as Spanish.

The sharks captured are a mixture of the species *Somniosus rostratus, Deania calcea, Centrophorus granulosus, Centroscymnus coelolepis* and others. Their livers (one third to one fifth of the total body weight and of which approximately 70 to 80% of the liver weight can be extracted as oil) are the major commercial reason for the fishery. On occasions only the liver is retained and the remainder of the fish is discarded.

In 1991 the quantity of all deep-water sharks landed (skinned and gutted) in north Galicia was 168 t while the corresponding quantity for 1992 was 331 t. In 1993 and 1994 the catches were 234 t and 46 t of sharks respectively.

b) Divisions VIIIa,b,d (Bay of Biscay)

A very new fishery for deep-water sharks started in the second part of 1995 in ICES Divisions VIIIa,b,d. One longliner from the Basque Country which traditionally focused on hake in this area, has begun to fish for sharks in waters of depths from 700 to 1,600 m along the slope of the continental shelf. Livers (for oil), skinned and gutted fish and fins (for human consumption) are utilised from the sharks. The catches of skinned and gutted sharks landed were 32 t. Some of the most frequent species have been indentified as *Centroscymnus coelolepis* (the more abundant), *Centrophorus squamosus* and *Deania calcea* (the less abundant). The catchability of each of these species is related with the depth. Occasional catches of other sharks such as *Prionace glauca, Scyliorhinus* sp *(?)* and *Lamna nasus (?)* also take place and are landed, but the catches of *Somniosus microcephalus* are always discarded. By-catches of *Mora moro, Phycis* sp and *Conger conger* are also obtained and landed (Lucio, WD 1996).

c) Division VIIIc (Cantabrian Sea)

A fishery for sharks has developed to a limited degree on the continental slope off Cantabrian Sea, in the north and north-east of Spain (Division VIIIc). Fishing for sharks occurs, mainly in winter, when the traditional target species, hake and red sea bream, are lacking (Iglesias, S. and Paz, J., 1995).

This fishery is conducted by long liners of 20 to 75 m. The bigger vessels tend to target *Mora moro and Phycis blennoides* when fishing for deep-water species but sharks are also caught. The gear consists of a single longline with about 4,000 large hooks which is fished at depths of 400 to 700 metres.

In 1992, 17 vessels from Asturian and Cantabrian ports took part in this fishery and they landed 340 tonnes of skinned and gutted sharks composed of the species *Scyliorhinus canicula, Galeus melastomus, Centrophorus* spp., *Etmopterus* spp., *Dalatias licha* and *Deania calcea.* In 1993, 10 vessels discharged 452 t.

In both of the above-mentioned fisheries, the current practice of skinning those individuals that are landed and/or retaining on board only the livers and discarding the rest of the fish makes it difficult or impossible to obtain accurate statistics of landings or catch by species.

In the recent years one longliner from Basque Country began to fish for deep-water sharks on the slope of the continental shelf of the eastern Cantabrian Sea. In 1995, the landings of skinned and gutted sharks amounted to 73 t (Lucio, WD 1996). Also at the end of 1995, a longliner from Finisterre (NW of Galicia), traditionally focused to the hake, has modified its gear to fish sharks in waters about 1000 m of depth. The species caught are *Deania calceus, Centrophorus* sp., *Etmopterus* sp., *Somniosus rostratus,* etc. (Piñeiro, C., WD 1996).

3.1.16 Red crabs (*Geryon (Chaceon) affinis*) fishery in Division VIIIc

A limited fishery, during the second part of the year, directed to deep-water red crabs *(Geryon (Chaceon) affinis)* has developed at the end of the 1980s on the "Banco de Galicia", 130 miles east of Finisterre Cap (Division VIIIc), after the investigations conducted by the Instituto de Investigaciones Marinas, Vigo, at the beginning of that decade. Big traps are used for this purpose, baited with the remains of sharks processed. The landings from 1989 to 1993 increased from 0.9 to

11.5 t. In 1994 and 1995 no landings of this species were reported (Piñeiro, WD 1996).

3.1.17 United Kingdom

England and Wales

Sharks (all species)

A small directed fishery for deep-water sharks has developed in recent years, comprising around 6 vessels long-lining and gill neeting to the west of the British Isles. Shark livers and liver-oil are valuable by-products of the fishery. The main areas are VIIj and k and VIa and b and the majority of landings are to Spanish ports. The bulk of landings in England and Wales are made at Newlyn, and are a by-catch from gill and drift netters. Longliners and gillnetters also land at Milford Haven and Falmouth. There are modest landings in Ireland and France. The total value of all landings of shark in England and Wales remains steady at £0.3 million while landings abroad have increased from £0.4 million in 1992 to £1.8 million in 1995. Landings of livers and liver oils amounted to about £1.8 million in 1993, but the records show very few reported landings in 1994 and 1995.

Ling (*Molva molva*)

Ling are caught all round the British Isles with the bulk of the landings coming from VIIj, VIIh and VIa, most of which is caught as a by-catch by otter trawlers, long-liners and gill netters fishing for hake and landing in Spain. Newlyn is the main port in England and Wales for landings from westerly grounds, mostly by gill netters and beam trawlers. There are also modest landings in Ireland and France. The current value of UK (E+W) landings is around £1.6 million. The vaue of landings abroad by England and Wales vesssels has risen dramatically in recent years and is currently around £5 million.

Scotland

One or two Scottish vessels have been trawling for deep-water species in ICES Division VIa. There is little information on the depth of fishing but it is assumed, because of the size of the vessels, that it is confined to the upper slope and that *Lophius piscatorius* is an important species. By catch species such as *Coryphaenoides rupestris*, *Molva dypterygia* and *Aphanopus carbo* are landed and consigned to the French market.

A number of other Scottish vessels have been fishing on the slopes of the Faroe-Shetland Channel. Again the target species is probably *Lophius piscatorius* with a by-catch which includes *Reinhardtius hippoglossoides*, *Argentina silus* and *Sebastes* spp. Some vessels also land *Macrourus berglax* but there is only a limited market.

3.2 Deep-Water Fisheries by ICES Sub-Area (Table 3.2.1)

In ICES Sub-area II there is a directed bottom and pelagic trawl for *Argentina silus*. This species is also caught as a by catch of the *Pandalus borealis* fishery and of industrial trawl fisheries. There is also a directed fjord fishery for roundnose grenadier. There are directed longline fisheries for ling and tusk. Roughhead grenadier are taken in the gillnet fishery for Greenland halibut.

In ICES Sub-area III there is a targeted trawl fishery for *Argentina silus* and this species is also by-catch of the *Pandalus* fishery. Roundnose grenadier is caught as a by catch of both these fisheries.

In ICES Sub-area IV there is a by-catch of *Argentina silus* from the industrial trawl fishery. There is a longline fishery for tusk and ling with roughhead grenadier as a by -catch.

In ICES Sub-area V there are trawl fisheries which target blue ling, redfish and occasionally orange roughy. By-catch species are typically roundnose grenadier (*Coryphaenoides rupestris*), roughhead grenadier (*Macrourus berglax*), black scabbard fish (*Aphanopus carbo*), anglerfish (*Lophius piscatorius*), bluemouth (*Helicolenus dactylopterus*), Mora (*Mora moro*), greater forkbeard (*Phycis blennoides*), argentine (*Argentina silus*), deep-water cardinal fish (*Epigonus telescopus*) and rabbit fish (*Chimaera monstrosa*). The traditional longline fisheries are for ling, tusk and blue ling. Roughhead grenadier is a by-catch of the Greenland halibut fisheries. There have been trap fisheries for the deep-water red crab (*Chaceon* (formerly *Geryon*) *affinis*).

In ICES Sub-areas VI and VII there are directed trawl fisheries for blue ling, roundnose grenadier, orange roughy, black scabbard fish and the deepwater sharks *Centroscymnus coelolepis* and *Centrophorus squamosus*. By catch species include bluemouth (*Helicolenus dactylopterus*), Mora (*Mora moro*), greater forkbeard (*Phycis blennoides*), argentine (*Argentina silus*), deep-water cardinal fish (*Epigonus telescopus*) and rabbit fish (*Chimaera monstrosa*). In some years there are considerable by-catches of *Argentina silus* in the blue whiting fishery and *A.silus* has been targeted in some years. There are directed longline fisheries for ling and tusk and also for hake. Deep-water sharks are a by-catch of the longline fisheries. There are targeted fisheries for sharks in Sub-area VII.

In ICES Sub-area VIII there is a longline fishery which mainly targets deep-water sharks but is occasionally directed to Mora (*Mora moro*) and greater forkbeard (*Phycis blennoides*). There are also some trawl fisheries targeting species such as hake, megrim , angler fish and nephrops which have a by catch of deep-water species.

These include *Molva* spp., *Phycis phycis*, *Phycis blennoides*, *Pagellus bogaraveo*, *Conger conger*, *Helicolenus dactylopterus*, *Polyprion americanus* and *Beryx* spp.

In ICES Sub-area IX most deep-water species are a by-catch of the trawl fisheries for crustaceans. Typical species are bluemouth (*Helicolenus dactylopterus*), greater forkbeard (*Phycis blennoides*) conger eel (*Conger conger*), blackmouth dogfish (*Galeus melastomus*), kitefin shark (*Dalatias licha*) and gulper shark (*Centrophorus squamosus*). There is a directed longline fishery for black scabbard fish with a bycatch of the gulper shark.

In ICES Sub-area X the main fisheries are by handline and longline and the main species landed are Red (=Blackspot) seabream (*Pagellus bogaraveo*), wreckfish (*Polyprion americanus*), conger eel (*Conger conger*), bluemouth (*Helicolenus dactylopterus*), golden eye perch (*Beryx splendens*) and alfonsino (*Beryx decadactylus*). There is also a directed fishery for kitefin shark (*Dalatias licha*) by hand line and gillnet.

In ICES Sub-area XII there are new trawl fisheries on the Mid Atlantic Ridge for Golden eye perch (*Beryx splendens*), orange roughy (*Hoplostethus atlanticus*) cardinal fish (*Epigonus telescopus*), black scabbard fish (*Aphanopus carbo*) and wreckfish (*Polyprion americanus*).

In ICES Sub-area XIV roughhead grenadier is a by-catch, which is not usually landed, of the Greenland halibut and redfish fisheries.

4. CATCH STATISTICS (UPDATE AND CORRECTION)

Data of landings available to the Group included data from the database of statistics officially reported to ICES, national data supplied by study group members and some published data. All landings data for 1995 are provisional.

The tables of statistics given in the report of the first Study Group have been updated and amended. The landings given in Tables 4.1–4.18 represent the best estimate that the group could obtain from the sources mentioned above.

The following points should be noted:

1) There have been many corrections to the French data and the 1994 data are provisional.

2) The Spanish data on *Phycis* spp. (Table 4.18) include the two species *Phycis blennoides* and *Phycis phycis*. The landings for *Molva molva* and *Molva dypterygia* are also combined.

3) Table 5.10 in the report of the first Study Group gave landings of *Phycis blennoides* for Sub-area X. These landings were all *Phycis phycis*. Table 4.10 gives the correct landings for *Phycis blennoides* for this area.

4) The Spanish data on *Pagellus bogaraveo* (Table 4.9) was provided by gear and a distinction was made between Divisions VIIIa,b,d and Division VIIIc. The catches by longline and trawl for Sub-areas VI and VII were approximately equal. The more detailed information for Sub-area VIII is given in Table 4.18.

5) Landings data on *Molva molva*, *Molva dypterygia* and *Brosme brosme* are new to this Study Group having previously been considered by the Northern Shelf Working Group.

6) Sharks are seldom sorted to the species level and it is often that only the livers are landed.

5. BIOLOGICAL DATA

No data from France and Spain were available for, or forwarded to the 1994 Study Group Meeting. Both countries, however, have been carrying out regular commercial, as well as exploratory deep-water fisheries.

The Group reviewed availability of biological information following the same sub-headings used for the 1994 report. Information provided by the delegates of France and Spain will go back beyond 1993/1994, whereas updates will be given for the other countries that have already contributed to the 1994 report.

Intensified survey activities and thus new information, as well as retrieval of existing national laboratory data are to be expected during 1996–1998 due to EC and other projects directed to Deep-Water Fish and Fisheries (see section 15).

5.1 Research and Exploratory Surveys

5.1.1 Belgium

No information available.

5.1.2 Denmark

No information available.

5.1.3 Faroe Islands

Although most of the investigations are carried out in national waters (Vb) investigations have also been carried out in the Hatton Bank area, on the Reykjanes Ridge and on the Mid Atlantic Ridge. The R/V "Magnus Heinason" carried out further research in national and international (Hatton Bank, Reykjanes Ridge and the Mid Atlantic Ridge) waters in January and October 1995 and January 1996.

5.1.4 France

Official statistics were not available from 1989 to 1994. French has carried out between 1963 and 1976 twelve research cruises targeting on deep-water resources. Fishing areas and localisation of operations are indicated on the map (Figure 5.2.4.1). Catch rates (kg/hour) for most important species are given in three graphs (Figures 5.2.4.2, 5.2.4.3 and 5.2.4.4).

5.1.5 Germany

No new activities and information directed to deep-water resources in 1994/1995. Historical deep-water survey data, obtained during the 1970s and 1980s and mentioned in the 1994 Study Group report, will be reworked and analysed by the Institute for Sea Fisheries Hamburg in 1996/1998 for the EU FAIR 95-0655 Project.

5.1.6 Greenland

Overall results of the joint Greenland/Japan survey programme during 1987 to 1989, mentioned in the 1994 Study Group report, were recently published by Japan (Okamura *et al.*, 1995). The Greenland Institute of Natural Resources itself continued its bottom trawl surveys in area XIVb for the target species *Pandalus borealis* and recorded scarce by-catches of fish and invertebrates.

5.1.7 Iceland

A considerable amount of biological information has been collected since the last meeting of the Study Group in 1994 on a number of bathypelagic species, from Divisions Va and XIVa. These data have been obtained during surveys on oceanic redfish. During three surveys (in March and June/July 1995), some hauls were taken in depths greater than 500 m. Common species were diverse myctophids and species such as *Stomias boa ferox, Chauliodus sloani, Bathylagus euryops, Serrivomer beani*, besides several other species in minor quantities. These deep-sea species have - so far- not yet been of direct commercial value.

5.1.8 Ireland

An EC funded project (FAR CT-MA-2.605) on the biology of Greater Argentine off the west of Ireland and Scotland was carried out in 1992–1993 . A total of 14 cruises were involved, ten using Irish commercial trawlers and four using British, German and Norwegian research vessels.

Following on from the 1993 survey programme (Connolly and Kelly, 1994) two deep water surveys were carried out in November 1995.

The first of these surveys was an FRC trawl survey carried over a week period on a chartered commercial fishing vessel (FV "Mary M."). The areas fished included the eastern slope of the Rockall Trough and areas of the continental slope to the north, west and south of the Porcupine Bank. There was also an exploratory fishing component to the survey. The seamounts in an area 200 miles north of the Azores were fished to assess the Orange roughy fishery. The main purpose of this survey was to secure samples for the FRC programme on studies of the biology of deep water species (Connolly and Kelly, 1996a).

The second survey was a joint BIM (Irish Sea Fisheries Board) FRC longline survey carried our over a two week period on a chartered commercial fishing vessel (FV "Sea Sparkle"). Bad weather restricted the area fished to the eastern slopes of the Rockall Trough. The main purpose of this survey was to assess the distribution and abundance of shark species and secure biological material for the FRC programme on studies on the biology of deep water species (Connolly and Kelly, 1996b).

There were no surveys in 1994.

5.1.9 Netherlands

No information available.

5.1.10 Norway

Norwegian studies of *Argentina silus* started in the 1970s with sampling of industrial by-catches and shrimp trawl catches in the northeastern North Sea (Sub-area IVa) (Lahn-Johannessen and Radhakrishnan, 1970; Thomassen, 1974), and sampling from exploratory fishing in the Skagerrak (IIIa) and in deep shelf areas off mid-Norway (IIa) (Thorsen 1979). The data from these early studies include length frequency distributions and data on biological variables.

Extensive investigations were made in the period 1981–1993, including acoustic mapping of distribution, trawl sampling and recording of landings from directed fisheries and by-catches in industrial fisheries. The research effort in terms of surveys and sampling in different sub-areas is listed in Table 9.1. Many of the survey results and associated data on size and age distributions and biology have not been published. Exceptions are some preliminary data on the IIa concentrations (Johansen and Monstad, 1982) and analyses of the Skagerrak and the North Sea population (Bergstad, 1993) based on studies in 1984–1987.

Results of studies off mid-Norway in 1981–1983 were compiled in a final project report by Johannessen and Monstad (1984).

In the period 1984–1995, annual bottom trawl surveys of the Norwegian Deep *Pandalus borealis* grounds were made (Sub-area IVa and IIIa). Catches and length distributions of *Argentina silus* are available from this series.

Experimental fishing with longlines for deep-water fish were carried out off North Norway in 1990 and on the Hatton bank in 1992 (Olsen, 1995). Off North Norway, the target species was roughhead grenadier, *Macrourus berglax*, and the best catches were made at Tromsøflaket at 650–900 m depth. At Hatton Bank, the more abundant species were mora (*Mora moro*) and sharks, and the abundance was highest in the depth range 800–950 m.

5.1.11 Portugal

5.1.11.1 Mainland

There were no participants from mainland Portugal but two Working Papers were provided for this meeting dealing with commercial landings of Black Scabbardfish (*A. carbo*) from Division IXa at Sesimbra and survey data obtained from 1990 to 1995 with R/V "Noruega" at two regions off the south and west coast of mainland Portugal. The latter paper providing information about some 15 fish and several shrimp species, which will be given under 5.3 etc. for the individual species.

5.1.11.2 Azores

During 1993 a series of surveys using longlines were initiated in the Azores to estimate the relative abundance of several demersal, including some deep-water species. The most important deep-water species targeted with these surveys were Red (Blackspot) Seabream (*P. bogaraveo*), Bluemouth (*H. dactylopterus*), Silver Scabbardfish (*L. caudatus*), Alfonsino (*Beryx decadactylus*), Golden Eye Perch (*B. splendens*), Mora (*M. moro*) and the Wreckfish (*P. americanus*). The first two cruises covered depths of 50–600 m and were preliminary surveys that served two main objectives: to analyse the changes in abundance of these species since the early 1980s, and to compare their catch rates for different areas, depths, day periods, seasons of the year, and hook sizes. These factors were analysed in an attempt to define the best design, that should be adopted in future surveys, as well as an aid to define the stratification scheme that should be used to minimise the variance of estimates of abundance. in 1995, a two months survey was conducted covering the coast of the islands and the offshore major banks and seamounts. This survey extended down to 1000 m and had a stratification based on depth and area. During 1996, another survey will be undertaken, extending down to 1200 m. All species mentioned above, and a few other deep-water species, have been measured (total catch) and samples for age reading been collected. Biological data samples have also included classification of sexual maturity stages. Stomachs will also be sampled from this year onward.

Another survey was conducted during 1995 on the seamount S. Jorge de Fora in order to make a depletion experiment, which might give some information on the absolute abundance and catchability by longlines for some deep-water species, including Red Seabream, Silver Scabbardfish, Golden Eye Perch and Bluemouth. Recruitment to the area was observed for some species after a two-months lag.

5.1.11.3 Madeira

Six cruise surveys were carried out between 1979 and 1982 on board R/V "Noruega" from IPIMAR of Lisbon. More recently (1995) a series of cruise surveys were initiated in the area by the University of the Azores on board R/V "Arquipelago". These surveys, which will last at least two more years, have the same general objectives and use the same cruise design as described above for the Azores. See also note under 12 for Black Scabbard Fish.

5.1.12 Russia

Commercial cruises, partly in cooperation with PINRO, were carried out in 1994/1995 to seamounts to the north of the Azores and directed to *Alfonsinos* (*Beryx* spp.) (see also 13). PINRO obtained some biological information on feeding habits, sexual maturity, vertical distribution and migration pattern from these cruises for four fish species other than *Alfonsinos*, which will be given under 5.3 for the indiviual species. See summary of national cruises under 3.1.10.

5.1.13 Spain

Spain has carried out research cruises at the times and in the areas indicated below:

Investigations to the north and northwest of Spain (Divisions VIIIc and IXa): Since 1983, the Instituto Espanol de Oceanografia (IEO), has carried out, annually, a series of demersal trawl surveys on board the R/V "Cornide de Saavedra".The depths prospected were between 30 to 650 m. Since 1995, some special hauls at deeper waters have been added in order to obtain more information about deep-water species. The biological information obtained in these surveys is: length composition, sex-ratio, maturity stages, weight-length relationships, age structures collections, etc. At the slope of the continental shelf and on muddy bottoms in depths greater than 400 m the major deep-water species of potential commercial interest are: greater forkbeard (*Phycis blennoides*), forkbeard (*Phycis phycis*), Blue ling (*Molva dypterigia*), rabbit fish (*Chimaera monstrosa*), Conger (*Conger conger*), Bluemouth (*Helicolenus dactylopterus*) and Roughnose

grenadier (*Trachyrhynchus trachyrhynchus*) sharks: *Galeus melastomus*, *Deania calcea* and *Etmopterus spinax*, and a number of the smaller grenadiers including *Malacocephalus laevis* and *Nezumia aequalis*.

Experimental surveys in Sub-areas VI, VII, XII: In 1994, during the period September–November an exploratory deep water series of three surveys was carried out by the commercial trawler "Mar de los Sargazos Dos" in the area mentioned above. The depth sampled was from 800 to 1200 m. and the main species obtained by order of abundance were: Baird'smoothhead *(Alepocephalus bairdii)*, Roundnose grenadier (*Coryphaenoides rupestris*), Portuguese dogfish (*Centroscymnus coelolepis*), Blue ling (*Molva dipterygia*) (N. Perez, C. Piñeiro and S. Iglesias, in preparation).

5.1.14 United Kingdom

The UK Sea Fish Industry Authority carried out gear trials on board commercial trawler, the "Maranatha III" (Greenwood *et al.*, 1995). No biological data was reported but some of the catches were used for studies on keeping quality and on processing. Highlands and Islands Enterprise supported some experimental deep-water trawling in the Faroe Shetland Channel and some experimental trapping for the deep-water red crab (*Chaceon affinis* or *Geryon affinis*). No reports are available.

The Scottish Association for Marine Science, in collaboration with the MAFF Fisheries Laboratory, is presently analysing all the data from the deep-water surveys carried out by the FRV "Cirolana" in the 1970s. This project is supported by the EC - DG XIV.

5.2 Availability of Biological Data

Following a recommendation by the NATO Advanced Research Workshop on Deep-Water Fishes, held in Hull in March 1994, Connolly *et al.* (1995) distributed a questionnaire to 38 European Marine Research Institutes. The object was to determine the availability of otolith collections and work on ageing currently being carried out for 18 fish species classified by ICES as "primary deep-water species". The result of this review indicated the existence of otolith samples for a variety of deep-water species, most of that material, however, is either not yet worked up, or yet unpublished. Hence, the basis of information even for the six most commonly fished species (see text table below) was relatively poor and is even more patchy and uncertain for several other species among the 18 listed by the ICES.

List of the institutes grouped according to available otolith and age reading data for primary deep water species (Connolly *et al.*, 1995, Table 1).

C. rupestris	*Mora moro*	*Aphanopus carbo*	*H. atlanticus*	*P. blennoides*	*H. dactylopterus*
Germany	Germany	Germany	Germany	Ireland	Ireland
Faroes	Faroes	Faroes	France (IFR)	Portugal (IPIM)	Portugal (IPIM)
France (IFR)	Ireland	France (IFR)	UK (MAFF)	Spain (ICM)	Spain (CISC)
Ireland	Spain (COC)	Ireland		UK (SAMS)	UK (MAFF)
Norway	Spain (CISC)	UK (SAMS)			
Russian Fed.	Spain (ICM)	UK (MAFF)			
Spain (CISC)	UK (SAMS)				
UK (MAFF)					
UK (SAMS)					
UK (SOAFD)					

Another Deep Water Fish Workshop focusing on the use of otoliths and other hard parts in estimating age and growth of deep-water fishes was held in January 1995 at the University of South Florida with support of the New Zealand Exploratory Fishing Company which is involved in deep-water fisheries. Besides participants from New Zealand and the U.S., there were also three from Spain and the U.K. A report (Anon., 1995) summarised several general issues which were discussed in some detail, namely:

i) The general perception of longevity,
ii) The criteria for validating an age estimation method,
iii) The relation between age and growth and general biology,
iv) The relation between age, growth, recruitment and the environment.

In the course of the discussions which focused on the species of major interest to New Zealand, the orange roughy, various desirable experiments or procedures were noted, namely, e.g. a review of orange roughy ages in the context of the ages of other deep water fishes; more detailed experiments on the distribution in otoliths of radionuclides, ^{14}C and other elements in otoliths should include investigation of biological uptake mechanisms; further exploitation of short-interval catch and validation of daily microincrement following the method of Gartner (which was introduced at the meeting); longer interval sampling to validate

zone and check ages; studies of general biology and biochemistry in relation to food ingestation and metabolic rate; reassessment of both the biomass estimation and length mode stabilty in orange roughy.

5.2.1 Belgium

No information available.

5.2.2 Denmark

No information available.

5.2.3 Faroe Islands

See biology of individual species under 5.3 etc.

5.2.4 France

Data from commercial fisheries. Sampling of landings of deep-water species has been included in the general sampling programme of landings by the French Fisheries Laboratories. Species regularly sampled are ling, blue ling, roundnose grenadier and orange roughy. Available data were collected during 1990 to 1993 for ling, blue ling, roundnose grenadier from Sub-area VI and 1991 to 1994 for orange roughy from Sub-area V, VI and VII combined. Data collected are catch weights, effort and catch-rates by species, length frequency, otoliths (all species), stages of maturity (roundnose grenadier and orange roughy).

5.2.5 Germany

Existing biological data will be made available during 1996–1998 in the course of the EEC deep-water fish project FAIR 95-0655.

5.2.6 Greenland

No specific information available.

5.2.7 Iceland

Existing biological data will be made available during 1996–1998 in the course of the EEC deep-water fish project FAIR 95-0655. See further under individual species, 5.3 and 6 to 14.

5.2.8 Ireland

During the cruises mentioned under 5.1.8, Argentines were caught most frequently at depths between 400 and 500 m, but were regularly taken in the 200 to 600 m zone. A total of 6,967 argentines were measured and average length was found to increase with depth. Otoliths were taken from 4,713 fish and ages ranged from 0 years to 36 years. Otoliths from older fish were difficult to interpret because of the presence of accessory rings.

A combination of morphometric and meristic measurements were taken in an attempt to identify if more than one stock exists over the wide area to the west of Ireland and Scotland in which Argentines are found. Morphological differences were identified between the northern and southern populations and it is possible that these populations form either end of a shape-cline, with fish in intermediary populations exhibiting a mixture of northern and southern characteristics. More extensive sampling is required to test these hypotheses.

Work continued on aspects of the biology of roundnose grenadier (*C. rupestris*), the greater forkbeard (*P. blennoides*) and bluemouth (*H. dactylopterus*). Age estimates have been produced and growth curves constructed (Kelly *et al.*, 1996a, 1996b). Work has commenced on the reproductive biology of these species and this will include fecundity estimates, histological examination of maturity stages and oocyte dynamics.

The National Food Centre and the FRC co-operated in a joint project on the evaluation of deep water fish for food products. Tests for proximate analyses, water holding capacity, gel strength and colour were carried out on Baird's smoothhead (*A. bairdii*), blue ling (*M. dipterygia*), black scabbardfish (*A. carbo*), rabbitfish (*C. monstrosa*), roundnose grenadier (*C. rupestris*) and greater forkbeard (*P. blennoides*) (Gormley *et al.*, 1994). Following the 1995 deep water surveys, a further selection of deep water species are under analyses.

An inventory of otolith collections and ageing work on north east Alantic deep water fish species was completed and the results of a questionnaire sent to 38 institutes indicated a broad range of unpublished data exist for many deep water species in the north east Atlantic (Connolly *et al.*, 1995).

5.2.9 Netherlands

No information available.

5.2.10 Norway

The biological data available in Norway was indicated in the report from 1994. This information has been reviewed and the rather extensive research effort on *Argentina silus* (See 5.1) should be added as new information. Also, in the period 1984–1995, data on catch rates and size-distributions in shimp trawl surveys in IVa and IIIa (Norwegian Deeps) are available for a number of species, including *Coryphaenoides rupestris, Etmopterus spinax* and *Chimaera monstrosa* and skates. Comprehensive studies of the population biology of *Coryphaenoides rupestris* in the Skagerrak were conducted in 1987 (Bergstad, 1990).

Norwegian surveys and sampling targetting *Argentina silus* stocks in Sub-area IIa and Division IIIa have not been conducted since1992, and the last survey of areas VI and VII was made in the spring of 1993. Some data from the latter areas will continue to be collected on the acoustic surveys of blue whiting on the spawning grounds. Data on argentine from the shrimp surveys in IVa and IIIa will become available, but these comprise length frequency distributions and catch rates only.

5.2.11 Portugal

5.2.11.1 Mainland

Working Paper provided: Relevant information for individual species summarised and incorporated under 5.3 etc.

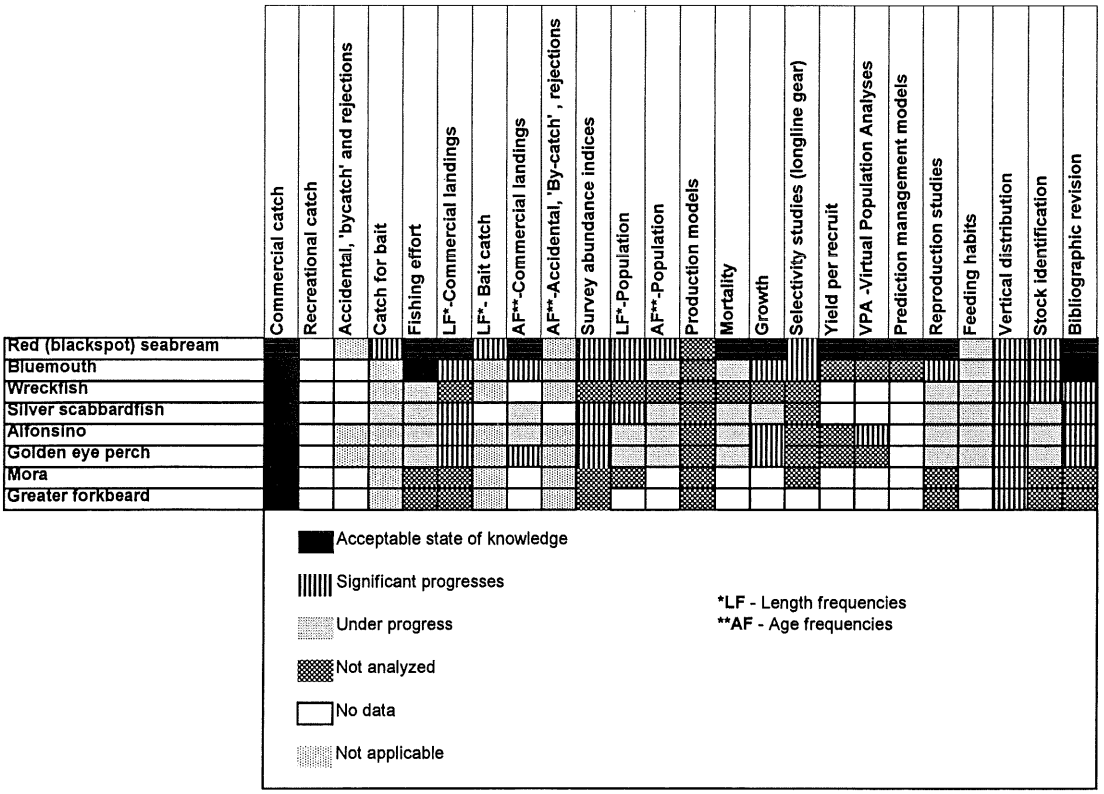
5.2.11.2 Azores

Selectivity studies were made on the red (blackspot) seabream (*P. bogaraveo*) and the bluemouth (*H. dactylopterus*) using three different hook sizes.

Data from the 1995 cruises have also allowed some ecological analyses, including cluster analyses of the degree of association among the different fish species caught. Depth and type of substrate seem to be the major responsible factors for the observed clusters. One major deep-water cluster was found at 301–500 m and was composed of bluemouth, golden eye perch (*Beryx splendens*) and alfonsino (*B. decadactylus*), whereas another sub-cluster within the same depth range was composed of Spanish ling (*M. macrophthalma*) and greater forkbeard (*P. blennoides*). At 501–800 m another cluster was identified which also being composed of two sub-clusters. One included the deep-water shark *Deania profundorum* and Mora (*M. moro*), the other one consisted of the grenadier *Coelorincus coelorincus* and the squaloid shark *Etmopterus spinax*. Further analyses included the determination of diversity and evenness indices along the gradients of depth.

The actual state of knowledge of the biology, ecology, assessment and fishery related information of some deep-water species in the Azores region is summarised in the figure below:

Summary of biological, ecological and assessment information for deep-water species at the Azores.



5.2.11.3 Madeira

Basic biological data have been collected for the black scabbardfish and, to lesser degree, also for wreckfish. Several other species were sampled for maturity information and collecting material for ageing during the 1995 survey, including golden eye perch, alfonsino, red seabream, orange roughy and others.

5.2.12 Russia

Data on length frequencies, sexual maturity, stomach contents, ageing, behaviour and distribution have been obtained for various species during the 1971-1995 surveys on the Mid-Atlantic-Ridge. See 5.1.12 and 3.1.10 for description of these surveys and further biological details under individual species of 5.3.

5.2.13 Spain

Length-weight relationships were obtained during bottom trawl surveys DEMERSAL 0993 and DEMERSAL 0994 in September–October 1993 and 1994 (Pereda and Perez, 1995) in northern and north-eastern Spanish mainland waters (ICES areas VIIIc and IXa) for a number of species (see table below).

Length-weight relationships for 10 deep-water species. N = number of specimens, R = length range in cm, P = weight range in gr, a = constant, b = regression coeficient, r^2 = determination coefficient.

	N	R	P	a	b	r2
Chimaera monstrosa	33	5-17	10-413	0.0473	3.1381	0.98
Conger conger	155	28-130	31-5100	0.0003	3.3852	0.97
Etmopterus spinax	16	12-24	8-67	0.0045	2.9583	0.96
Galeus melastomus	171	14-70	7-1158	0.0024	3.0424	0.99
Helicolenus dactylopterus	58	9-37	11-1240	0.0104	3.1504	0.99
Lepidion eques	34	8-27	2-102	0.0018	3.3073	0.99
Lepidopus caudatus	53	39-66	29-97	0.0002	3.2797	0.95
Molva dipterygia	46	18-35	9-91	0.0015	3.0904	0.96
Phycis blennoides	178	11-44	9-687	0.0033	3.2345	0.99
Trachyrhinchus trachyrincus	17	10-34	2-109	0.0007	3.3802	0.98

All lengths are TL, except for *C. monstrosa* measured from snout tip to cloaca, and *T. trachyrincus* with preanal length

Under EC Project "Spanish Discards of the Spanish Fleet in ICES Divisions" (Study Contract DGXIV Ref. n PEM/93/005), a sampling programme was carried out during 1994. In all fisheries, catch was sampled by one observer on board a commercial fishing vessel during normal fishing activity. The main species discarded were deep water species and by order of importance were: *Argentina silus, Molva dipterygia, Chimaera monstrosa, Phycis blennoides, Helicolenus dactylopterus, Molva molva, Beryx decadactylus, Conger conger, Galeus melastomus, Etmopterus spinax, Deania calcea* and Crustacea such as *Geryon longipes*.) The biological information obtained in these surveys for the most common species is: length frequency distributions, maturity stages, sex-ratio, age structures collections, etc. (N. Perez, C. Piñeiro and X. Paz, in preparation).

5.2.14 United Kingdom

The Scottish Association for Marine Science has completed a project fund by the EC MAST Programme. This project was concerned with working up samples collected from the Porcupine Sea Bight, off Southwest Ireland. Although the main emphasis was on the deeper living, non-target species, some research on ageing and reproductive cycles is appropriate to the upper slope species of commercial importance. Biological data is also available from the 1970s surveys by MAFF and work is in progress on ageing a number of species.

5.3 Biology of Species

Except for the nine primary target species treated individually under sections 6 to 14, available new information on secondary or non-target deep-water species will be given here.

5.3.1 *Dalatias licha* (Kitefin Shark)

No new information.

5.3.2 *Deania calcea/profundorum* (Birdbeak Dogfishes)

5.3.2.1.1 Portugal (Mainland)

Although specific landing information is scarce, *D. calcea* is known to be very common in trawl surveys deeper than 500 m. Length frequency distributions, with 5 cm class intervals but not separated by sex, were established for specimens caught in the Estremadura and Alentejo regions. The results suggest, that stocks consist of mixed age classes. (WP by Figueiredo *et al.*, 1996).

5.3.3 *Centrophorus granulosus/squamosus* (Gulper/Leafscale Gulper Shark)

5.3.3.1.1 Portugal (Mainland)

Large landings are closely related with bottom longline fishery for black scabbardfish, and these sharks form an important by-catch of this particular fishery in ICES area IX. (WP by Figueiredo *et al.*, 1996).

5.3.4 *Centroscymnus coelolepis* (Portuguese Dogfish)

No new information.

5.3.5 *Centroscyllium fabricii* (Black Dogfish)

No new information.

5.3.6 *Etmopterus spinax* (Velvetbelly Dogfish)

No new information.

5.3.7 *Etmopterus princeps* (Great Lanternshark)

No new information.

5.3.8 *Galeus melastomus* (Blackmouth Dogfish)

5.3.8.1.1 Portugal (Mainland)

Landings showed an increasing tendency in recent years, when almost 90% of the total landings appeared in the Algarve ports. In this region, and especially during Christmas time, the blackmouth dogfish is much appreciated salted, and its value at the market can reach high prices. A frequent species at depths >300 m. Length frequency distributions, based on 5 cm length classes separately for both sexes, were established from samples collected at Beira, Estremadura, Alentejo and Algarve regions. A similar distribution pattern was found for both sexes, which both showed increasing TL with depth. (WP by Figueiredo *et al.*, 1996).

5.3.9 Various sharks

5.3.9.1.1 Portugal (Mainland)

Landing information on deep water sharks is relatively unspecific, because species are not discriminated and are recorded under collective group names in many cases. These sharks are also appreciated for their liver oil, and in many cases liver weights constitute the only information available. (WP by Figueiredo *et al.*, 1996).

5.3.10 *Chimaera monstrosa* (Rabbitfish)

5.3.10.1 Iceland

Data have been collected in ICES area Va on individual total lengths and weights separated by sex.

5.3.10.1.1 Portugal (Mainland)

No landing reports available, because this species has presently no commercial value and is mostly discarded. Generally captured at 300–700 m depth, but particularly abundant in the Algarve region. Length frequency distribution, based on precloacal length and not separated by sex, indicated a shallower occurrence of smaller specimens at 300–600 m. (WP by Figueiredo *et al.*, 1996).

5.3.11 *Alepocephalus bairdii* (Baird's Smoothhead)

5.3.11.1 Iceland

Data have been collected in ICES area Va on individual total lengths and weights separated by sex.

5.3.12 *Epigonus telescopus* (Bigeye, Deep-water Cardinalfish)

5.3.12.1 Russia

Surveys on the Mid-Atlantic-Ridge as described above caught Cardinalfish of 15–75 cm TL, mainly 27–54 cm TL, 600–1100 m with greatest abundance deeper than 800 m. Spawning was found to occur at depths deeper than 800 m in August to September. Mesopelagic fish, squid and shrimp were found as stomach contents.

5.3.13 *Helicolenus dactylopterus* (Bluemouth)

5.3.13.1 Ireland

See 5.2.8.

5.3.13.1.1 Portugal (Mainland)

Bluemouth occurs frequently on the continental slope of Portugal both, off the west and south coasts. This species dwells mostly around submarine mountains in the neighbourhood of deep canyons. Length frequency distributions are available for catches in the Estremadura, Alejento regions and DEL subsector and show an increase of length with depth (WP by Figueiredo *et al.*, 1996).

5.3.13.1.2 Portugal (Azores)

See figure in Section 5.2.11b. A study was previously presented on age and growth of the species in the Azores area (Isidro, 1988) and was recently redone (Esteves *et al.*, in prep. 1996).

Direct and backcalculated growth curves were fitted through 401 observations made on bluemouth otoliths collected during a survey carried out at the Azores during March and April 1995. A von Bertalanffy growth equation was fitted through the observations obtained for sexes combined. The estimated parameters were, by direct and backcalculated methods, respectively: $L\infty = 55.74$, $K = 0.117$, $t_0 = -0.66$ and, $L\infty = 49.67$, $K = 0.119$, $t_0 = -0.3$. Since the species is known to be dimorphic in respect to growth in length, the information above is of little biological value. Analyses for sexes separated are in progress and will be available soon.

5.3.14 *Hoplostethus mediterraneus* (Silver Roughy)

5.3.14.1.1 Portugal (Mainland)

Of no commercial value in Portugal and most are discarded. Although it is a very frequent species on the continental slope occuring in great concentrations on some fishing grounds mostly deeper than 400 m, concentrations in the Alentejo region and in parts of the south coast area suggest a well defined distribution pattern correlated with large plain grounds. Larger specimens also appear to occur in deeper water than juveniles. Greatest abundance was found in the Algarve region at depths >500 m, whereas in the Alentejo region maxima were at shallower depth of 300–400 m. (WP by Figueiredo *et al.*, 1996).

5.3.15 *Lepidopus caudatus* (Silver Scabbardfish)

5.3.15.1.1 Portugal (Azores)

See figure in Section 5.2.11b.

5.3.16 *Macrourus berglax* (Roughhead Grenadier)

5.3.16.1 Iceland

Data collecting on length, weight and maturity continued in 1994–1995.

5.3.17 *Mora moro* (Mora)

No new information.

5.3.17.1.1 Portugal (Azores)

See figure in Section 5.2.11b.

5.3.18 *Phycis blennoides* (Greater Forkbeard)

5.3.18.1.1 Portugal (Mainland)

Surveys as described above found this species in the Algarve and Alentejo regions at all depths from 200 m to 700–800 m. Individual size increased with depth; specimens >40 cm TL were mostly confined to water deeper than 500 m, whereas juveniles appeared concentrated between 200 and 500 m. The relative abundance in the Algarve region was about half of that in the Alentejo region, but the variablity in abundance was found to be greater in the latter region. (WP by Figueiredo *et al.*, 1996).

5.3.18.1.2 Portugal (Azores)

See figure in Section 5.2.11b.

5.3.19 *Polyprion americanus* (Wreckfish)

5.3.19.1.1 Portugal (Azores)

See figure in Section 5.2.11b.

5.3.19.2 Russia

During surveys described above on the Mid-Atlantic-Ridge north of the Azores, wreckfish were periodically found in catches at 580–1000 m depth.

5.3.20 *Trachyrhinchus trachyrincus* (Roughnose Grenadier)

5.3.20.1.1 Portugal (Mainland)

Of no commercial value in Portugal, and official landing figures not available. Survey data were sampled in the Alentejo and Algarve regions in 1994 and 1995 from depths greater than 400–500 m. Distinctly higher abundance was found in 1995, nearly twice as much in 1995 in the Alentejo region than 1994. The species is mostly taken in the depth range 500–800 m. (WP by Figueiredo *et al.*, 1996).

5.3.21 Various grenadiers

5.3.21.1.1 Portugal (Mainland)

Malacocephalus laevis: Presently of no commercial value in Portugal and probably not in the near future. In the Alentejo and Algarve regions mostly taken at 300–700 m depth.

Nezumia sclerorhynchus: Presently of no commercial value. Very common species in Portuguese waters deeper than 300 m. A length frequency analysis, based on TL, did not reveal different bathymetric distribution of younger and older individuals. (WP by Figueiredo *et al.*, 1996).

5.3.22 Various decapod crabs

No new information.

5.3.23 Various shrimps

5.3.23.1.1 Portugal (Mainland)

Aristeus antennatus (Red Shrimp): Density estimates based on surveys in the Alentejo and Algarve regions up to 1995 showed no marked difference between both regions. Cephalothorax length frequency distributions, separated by sex, indicated that females were larger than males at similar depths. Hence, different growth rates may be assumed for both sexes.

Aristeomorpha follacea (Giant Red Shrimp): Again, no evident difference was found in density estimates between the Alentejo and Algarve regions at depths greater than 500 m and 400 m, respectively. Females were also found to grow larger than males.

Pleosinika martia (Golden Shrimp): a very frequent species at depths >400 m. In contrast to both the other shrimp species mentioned above, sex related differences in cephalothorax length were not found in any of the investigational areas. (WP by Figueiredo *et al.*, 1996).

6. LING (*MOLVA MOLVA*)

6.1 Catch Trends

Landings by Division are given in Table 4.15. The major fishery in Division IIa is the Norwegian longline fishery (See section 3). The preliminary total landing of 5,954 tin 1995 is only slightly lower than the average landings in the period 1988–1994. In Division IVa the total landings increased slightly in 1995 compared with the level in recent years, primarily due to an increase in the landings of the United Kingdom. In Divisions Va the catches have decreased from about 5,700 in 1991 to about 3,900 in 1994. Since 1987, the total annual landings in Divisions Vb, VI and VII have shown a consistent decrease, most pronounced in Division VI. In Division VIa, however, the landings increased in 1995 due to increased effort in the United Kingdom fishery.

6.2 Stocks

Ripening adult ling and ling eggs have been found in all parts of the distribution area of the ling, but the banks to the west and north of Scotland and around Iceland and the Faroes seem to be the most important spawning areas. Nothing is known about migrations within the areas of distribution. In recent Norwegian studies of enzyme and hemoglobin frequencies characters with sufficient variation to study spatial differences could not be found. There is currently no evidence of the existence of separate stocks within the ICES area.

6.3 Length Distribution, Age Composition, Mean Weight at Age, Maturity and Catch-Effort Data

Data available from different countries and Divisions are indicated in Tables 6.3.1–6.3.6. It should be noted that extensive Icelandic otolith collections have not yet been processed and that data may not be available on computer files. Data series available to the Northern Shelf Working Group in 1994 were updated. The quality and quantity of data has improved significantly the last three years due to increased sampling effort in Iceland, the Faroes and Norway, and new data were available from the French trawl fishery.

New data on the length-weight relationship of ling in the Division VIa from Moguedet (1987):

Males: Total Weight (g) = 0.00312x Total length (cm)$^{3.07}$

Females: Total Weight (g) = 0.00312x Total length (cm)$^{3.10}$

The Von Bertalanffy growth parameters for both sexes were estimated using otoliths from 1985 from Division VIa:

	$L\infty$	K	t
males	125	0.17	-0.78
females	185	0.09	-0.45

6.4 Overall Trends in Abundance and Recruitment Based on CPUE

Catch per unit of effort analyses of the Norwegian longliners operating in most of the Divisions under consideration indicate an overall downward trend since the early 1970s (see working document by Hareide and Godø, Ch. 3). The same trend is indicated in an area-specific analysis. These observations suggest that a reduction in abundance has occurred in several Divisions.

The ling recruit to the longline fisheries in the size range 50–70 cm. The CPUE of ling smaller than 72 cm is shown in Figure 6.4.1 (note that data from some years are missing). Recruitment seems rather variable, but there is no clear trend in the data.

Time series of catch, effort and CPUE from Faroese trawlers and longliners in the period 1986-94 were available to the Study Group. The majority of the catch is taken by longliners, especially those greater than 100 GRT, which showed the same trend in CPUE as the Norwegian longliners fishing in Division Vb.

For Division Va, a time series of catch, effort and CPUE data from 1988 to 1995 was supplied (Figure 6.4.2). The catches in Division Va are by-catches in longline, gillnet and bottom trawl fisheries. Data obtained from Icelandic groundfish surveys carried out in Va since 1985 (Figure 6.4.3), did not show any clear trends in recruitment, but progression of modes in the length frequency distributions indicated that particularly strong yearclasses may occur in certain years.

CPUE data from French trawlers from Divisions VI for the period 1983 to 1993 showed a consistent decline, although with slight rise in 1993 (Figure 6.4.4). In Divisions Vb there has been a decline since 1987. In VII the CPUE is lower than in the previous areas but a declining trend is indicated since 1987.

In 1994, the Northern Shelf Working Group undertook a production model analysis based on available CPUE data, but with limited success. Since the database had not changed significantly since then, the Study Group did not pursue this option.

6.5 Mortality

Estimates of total mortality, Z, were obtained for different Divisions by catch-curve analyses based on new age-distributions from Norwegian longliners in Divisions IIa, IVa and Vb (Figures 6.5.1 and 6.5.2). The estimates were in the range 0.4–1.0, with a mean value of 0.6 (S.D.=0.2, n=9). Emigration and variability in recruitment may affect these estimates, and they should be considered preliminary.

6.6 Quality of Assessment

It is not possible to make an analytical assessment for the ling stocks due to lack of good time series of data. With the present level of sampling, this situation may improve in the future. The much improved Norwegian CPUE analyses presented to the Study Group (Hareide and Godø, 1996), support the conclusion drawn by the Northern Shelf Working Group in 1994 that there has been a downward trend in the stocks, particularly in Divisions Vb and VI. The same trends are seen in Faroese and French CPUE data. The Study Group is of the opinion that further improvement in the recording of effort and catch data should be encouraged, since CPUE analyses may prove very useful as a monitoring method in addition to future analytical assessments.

7. BLUE LING (*MOLVA DYPTERYGIA*)

7.1 Catch trends

Landings of blue ling are given in Table 4.16.

Landings from Division IIa are mainly catches in a gillnet fishery off mid-Norway. In recent years, the landings have declined to a very low level compared with the 1980s.

The relatively minor landings from Divisions III and IVa are by-catches in trawl fisheries.

In Division Va, blue ling has been taken mainly as a by-catch by trawlers engaged in the redfish and Greenland halibut fishery in recent years. Iceland takes most of the catches. During the years 1980–1984, a direct fishery for blue ling was carried out in a very limited area on spawning aggregations. No aggregation of spawning blue ling has been detected in this area since then and consequently the catches have declined from about 8,500 t in 1980 to a level of 1,000–2,500 t since 1985.

In 1993 the Icelandic fleet fished on aggregations of spawning blue ling in a small area on the Reykjanes ridge at the border between Divisions Va and XIV. This resulted in landings by Iceland of more than 3,000 tonnes from Division XIV. The French fleet fished in this area prior to the Icelandic fleet but information on landings are lacking.

In Division Vb total catches fluctuated between 5,000 and 9,500 t during the 1980s, but have since then declined to about 1,500–3,500 t. Most of the catches are taken in the spawning time and the fluctuations in the catches reflect the localization of spawning aggregations; at other times the effort moves to other areas/species in order to maintain catch rates. In recent years most of the catches have been taken by Faroese vessels.

In Division VI, total catches peaked at about 13,000 t in 1985, but have since then declined to 4,500 t in 1991-1993. No data for the French fishery were available for 1994-1995. French trawlers take more than 95% of the total catch.

7.2 Stocks

Biological investigations in the early 1980s suggested that at least two adult stocks were found within the area, one in Division XIV and Division Va with a component in Vb, and another in Division VI and adjacent waters in Division Vb. However, the observations of spawning aggregations in each of these areas and elsewhere suggest further stock separation. Egg and larval data from early studies also suggest the existence of many spawning grounds. The conclusion must be that the stock structure is uncertain within the areas under consideration.

7.3 Length Distribution, Age Composition, Mean Weight at Age, Maturity and Catch-Effort Data

Data available from different countries and Divisions are indicated in Tables 7.3.1–7.3.4. Catch and effort data for the French trawl fishery in Divisions Vb, VI and VII were updated (Table 7.3.5).

It should be noted that extensive Icelandic otolith collections have not yet been processed and that data may not be available on computer files.

7.4 Development in CPUE

In the period 1987–1993, there was a consistent decline in both the catch and CPUE of the French trawlers fishing in Divisions Vb and VI. In Division VI the effort has increased in the same period, whereas the opposite pattern is seen in Division Vb.

Icelandic effort data show a considerable increase in CPUE in 1993 associated with the fishery on a

spawning aggregation and a decrease again in 1994 to the 1992 level (Figure 7.4.1).

Time series of catch, effort and CPUE were provided for Faroese trawlers in Vb for the years 1985–1994. CPUE values for this fleet have been declining since 1988, except in 1992, where the CPUE increased for all fleets. However, trends in CPUE should be treated with caution when fishing is on aggregations of fish.

7.5 Quality of Assessment

No analytical assessments were carried out for any of the Divisions. Previous attempts by the Northern Shelf Working Group based on more or less the same data were considered to be of poor quality for a number of reasons. The biological sampling level, although improving, seems not to be adequate or the time series with sufficient data are too short. Ageing of this species is difficult and comparative readings of the same sample of otoliths by different institutes made in a Nordic project (Ch. 15), but also involving French readers, showed large discrepancies. There is a need for an agreement on interpretation of otolith patterns. The stock identity is also questionable.

If the CPUE series from commercial fleets reflect major changes in abundance, a consistent decrease is indicated in Divisions Vb and VI, i.e. the areas in which most of the directed blue ling fishery occurs.

8. TUSK (*BROSME BROSME*)

8.1 Catch Trends

The landings of tusk are given in Table 4.17.

In Division IIa there has been a decreasing trend in the landings since 1991 and the total landing in 1995 was 11,320 t. In Division IVa the landings in 1994–1995 were reduced to 3,200 t from a level of 4,000–6,500 tonnes in 1988–1993. In Va and Vb landings increased in the period 1989–1991 but decreased again in 1994–1995. In Va, the effort increased greatly in 1989 to 1992.

8.2 Stocks

Ripening adult tusk and tusk eggs have been found in all parts of the distribution area, but the banks to the west and north of Scotland, around the Faroes and off Iceland, as well as the shelf edge along mid and north Norway seem to be the most important spawning areas. Nothing is known about migrations within the area of distribution. In recent Norwegian studies of enzyme and hemoglobin frequencies no geographical structure could be found, hence it was concluded that tusk in all areas belong to the same gene pool. There is currently no evidence of the existence of separate stocks within the ICES area.

8.3 Length Distribution, Age Composition, Mean Weight at Age, Maturity and Catch-Effort Data

Data available from different countries and Divisions are indicated in Tables 8.3.1–8.3.6. It should be noted that extensive Icelandic otolith collections have not yet been processed and that data may not be available on computer files. Data series available to the Northern Shelf Working Group in 1994 were updated. The quality and quantity of data has improved significantly in the last three years due to increased sampling effort in Iceland, the Faroes and Norway.

8.4 Overall Trends in Abundance and Recruitment Based on CPUE

Catch per unit of effort analyses of the Norwegian longliners operating primarily in Divisions IIa, Vb, VIa, and VIb indicate an overall downward trend since the early 1970s (see working document by Hareide and Godø, Ch. 3). The same trend is indicated in an area-specific analysis and from analyses of Faroese CPUE data from trawlers and longliners from the period 1986–94. These observations suggest that a reduction in abundance has occurred in several Divisions. Although the CPUE for longliners in Va does not show a downward trend (Figure 8.4.1), a decrease is observed in both the abundance indices if fishable sizes and juveniles in the Icelandic groundfish survey (Figure 8.4.2).

Data obtained from Icelandic groundfish surveys carried out in Va since 1985 (Figure 8.4.3), did not show any new strong year classes being recruited lately. Progression of modes in the length frequency distributions indicated that particularly strong yearclasses may occur in certain years (e.g. the one appearing in 1986 upon which the fishery still seems to depend on to a great extent).

In 1994, the Northern Shelf Working Group undertook a production model analysis based on available CPUE data, but with limited success. Since the database had not changed significantly since then and the time series are still short, the Study Group did not pursue this option.

8.5 Mortality

Total mortality, Z, was estimated from catch curves from Divisions IIa, IVa, Vb, VIa and VIb in the years 1993–1995 (and 1988 for IVa) based on age distributions of the Norwegian longline catches. The average Z was 0.6 (S.D.=0.2, n=12).

8.6 Quality of Assessment

It is not possible to make analytical assessments for the tusk due to lack of good time series of data. With the

present level of sampling, this situation may improve in the future. The much improved Norwegian CPUE analyses presented to the Study Group (Hareide and Godø, 1996), support the conclusion drawn by the Northern Shelf Working Group in 1994 that there has been a downward trend in the stocks, particularly in Divisions Vb and VI. The Study Group is of the opinion that further improvement in the recording of effort and catch data should be encouraged, since CPUE analyses may prove very useful as a monitoring method in addition to future analytical assessments.

9. GREATER SILVER SMELT (*ARGENTINA SILUS*)

9.1 Biological Data

The biology of *Argentina silus* was described in the report of the first Study Group (ICES CM 1995/Assess:4, Ref. G). Icelandic length frequencies, age/length keys and maturity at age from catches of Argentina are available for 1994 and 1995 as well as information on the length distribution (no. per 1 nm towed) from Icelandic annual groundfish surveys carried out since 1985.

9.2 Data for Assessment

The Norwegian acoustic surveys in the 1980s and early 1990s provided considerable information on the distribution of *Argentina silus* in the shelf areas from Ireland to northern Norway and in the North Sea. In some years attempts were made to estimate abundance (Table 9.1). It should be stressed that these estimates remain uncertain due to several factors i.e. the choice of density coefficient or target strength, extensive mixing with other species, and difficulties with using acoustics at great depths.

Along the Norwegian shelf (Division IIa) the acoustic estimates from the 1980s and early 1990s suggested a total biomass of 400–500,000 tonnes. The directed fishery then exploited fish of total length greater than around 30 cm which were 6 years old and older. However, more than 50% of the landings were fish of 15 years old and older. This size- and age-structure seemed stable through the 1980s and up to 1992 when sampling was interrupted. The size- and age-distributions were similar in the Skagerrak landings from the directed trawl fishery and research surveys in 1987 (Bergstad, 1993a). Length- and age data from 1992 showed the same structure (Bergstad, unpublished).

In order to prevent an uncontrolled increase in effort, Norway introduced a national TAC for the fishery in IIa in the 1980s. The landings never reached the level of the TAC, and there has been no expansion in the fishery in recent years. The landings are only 2% or less of the acoustic abundance estimates. Since 1992, no TAC has been imposed on the fishery because further increase in effort seemed unlikely. There has been no TAC for the fishery in Division IIIa.

Attempts to assess the stocks of Argentine using other methods have not been possible. There is a lack of time-series data of age and length and there may also be a problem ageing older fish. Available biological data are limited and are derived mainly from discrete research projects of short duration or from sporadic sampling of bycatches on fishing surveys.

CPUE and effort data are available from a small directed fishery at Iceland and possibly from a directed fishery in Division IIa prosecuted by Norway. In Division Va the catches of the greater silver smelt are always more or less mixed with other species, mainlt redfish. During experimental fishing for Argentina carried out in the period 1986-1994 off south-west, south and southeast coasts of Iceland, the average catch of Argentina was 53.2% of the catch. The Norwegian data were not available to the Study Group and the CPUE data from Iceland are considered too sparse to evaluate. There is also a Norwegian fishery in sub-area III but it is targeted at spawning fish and consequently the CPUE signals may be masked by shoaling.

It is known that Irish landings of Argentine from grounds to the west of Scotland and Ireland diminished markedly in 1990, but it is not known if this was caused by a collapse of stock or by changes in stock distribution (McCormick, 1994). Dutch landings from these areas have remained steady since 1988 (Table 4.2).

10. ORANGE ROUGHY (*HOPLOSTETHUS ATLANTICUS*)

10.1 Biological Data

There is no new information on the geographical or depth distribution. The standard length/total length relationship calculated in French landings is: SL = 0.83TL -0.55.

Reproduction: in French landings preliminary observations have shown that the length at first maturity appears to be about 50 cm (TL) in males and females. The spawning period ranges from late January to the beginning of March (Du Buit, 1995).

Some of the problems concerned with the ageing of orange roughy have been mentioned in 5.2.

10.2 Landings

The directed exploitation of orange roughy in the ICES area is recent; France, Iceland and Faroe are the main participants in the fishery. Landings estimates of *Hoplostethus atlanticus* were presented by ICES Sub-

areas from 1991–1994 (Table 4.5). Landings in ICES area ranged between 3,839 t in 1991 from France (mainly from ICES Sub-area VI and VII) and 2,473 in 1994 from ICES area V, VI and VII from France, Iceland and Faroe.

10.3 Effort and CPUE

France provided effort and CPUE total for Sub-areas V, VI and VII together and VI only (table 10.3.1).

The effort of French trawlers operating in deep waters is calculated for the following species combined: roundnose grenadier, blue ling, black scabbardfish, deep-water sharks and orange roughy. This estimate of effort is not ideal for orange roughy because it has a different distribution due to nature of bottom where this species is lives (very hard and steep bottom) and also due to its aggregative behaviour. It is a hazardous fishery; many fishermen can exploit orange roughy but few are prepared to take the risk in spite of its high value.

10.4 Length Distribution

The data of length distribution are provided by France from ICES Sub-areas V, VI and VII and by Iceland from ICES Sub-area Va.

The maximal recorded length of orange roughy in French catches is 73 cm TL. The minimum is 12 cm TL but small specimens are very scarce and discarded.

A study of lengths in catches shows a markedly bimodal distribution in 1991, 1992, 1993 (Figure 10.4.1); in the landings distribution for 1994, the length frequency distribution tends to be unimodal (Figure 10.4.2).

Length of orange roughy in Icelandic landings from 1991–1995 from ICES Division Va shows an unimodal distribution with a peak about 58–60 cm (Figure10.4.3).

Length/weight relationship calculated from French landings (Anon., 1992) are:

male: $W(g) = 0.0178 * L^{2.972}$
female: $W(g) = 0.0113 * L^{3.095}$
male and female: $W(g) = 0.00897\ L^{3.159}$ where L = total length (cm)

In Icelandic landings the length/weight relationship were:

male: $W(g) = 0.0381 * L^{2.808}$
female: $W(g) = 0.0598 * L^{2.678}$

11. ROUNDNOSE GRENADIER (*CORYPHAENOIDES RUPESTRIS*)

11.1 Biological Data

The ageing problem

The roundnose grenadier has well marked annuli on its scales and otoliths. The annuli on the scales were first reported by Farran (1924) who discussed their suitability for aging this species. He had considerable difficulty in interpreting the annuli and concluded that it was not possible to assign a definite age to any particular fish.

Savvatimsky (1971) was the first to try to age roundnose grenadier by counting what he assumed to be annual rings on scales and otoliths. He found that attempts to age fish from Newfoundland using otoliths were not very successful. He therefore examined scales using polarised light and obtained what he considered to be reliable estimates of age. He determined the age of 420 fish by means of scales and found ages of between 12 and 27 from the slopes off Iceland. In the western North Atlantic ages of between 3 and 19 were found.

Koch (1976) used whole otoliths which had been preserved in formalin for aging roundnose grenadier. He concluded that otoliths can be used for aging small fish where scales are often difficult to read. He advocated the use of scales for larger fish.

Bridger (1978) used otoliths to age fish caught by the MAFF surveys to the west of the British Isles by assuming the rings to be annual because "there is no evidence to suggest that they are not". He successfully aged fish up to about 90 cm total length and at least 39 years old. He does not give the age of the oldest fish but simply combines all fish of 40 years and over in his age/length key. Gordon (1978) also used otoliths to age fish from the Rockall Trough and found that gentle charring of the broken surface could help to clarify the rings.

Magnusson (1987) used scales to age roundnose grenadier from samples collected in 1984, 1985 and 1987 and found ages between 8 and 18 years with the majority between 12 and 16 years. Ages of up to 23 years were determined from scales from fish caught off western Norway by Eliassen (1986). In his studies of the age of roundnose grenadier caught to the west of the British Isles and at Faroes, Kosswig (1981, 1983, 1985) found fish of between 11 and 22 years. Over 75 % of the fish aged were between 13 and 18 years. The scales were impregnated with silver nitrate and read with polarised light (Kosswig, 1981).

Although Bergstad (1990b) experimented with scales for aging roundnose grenadier from the Skagerrak he considered otoliths to be preferable. He used a diamond

saw to cut sections of the larger otoliths. He found that the catches in the Skagerrak were dominated by older fish, particularly in the case of females, where 18 to 30 year old fish were abundant. The oldest fish was estimated to be 72 years and fish between 50 and 60 were not unusual.

French otolith studies started in 1990 (Dupouy, pers.com.). Otoliths are imbedded in black resin and then cut into sections by a diamond saw. They were previously aged under binocular after polishing and examined under a mixture of 50% of alcohol and 50% of glycerin under transmitted light. The edge of most otoliths was difficult to interpret so a preparation with acid was performed before examination under microscope with magnification of 100. This new method provides higher readings that binocular (ages ranging between 15 to 35 years against 15 to 25 years).

Gordon *et al.* (1995) examined the growing edge of the otoliths from seasonal samples of juvenile fish from west of the British Isles. They concluded that the rings were laid down annually in fish up to about 6 years. It was impossible to determine the nature of the growing edge in fish with more than 6 rings.

The available information on ageing of *Coryphaenoides rupestris* must be treated with caution for the following reasons:

1) There has been no attempt to validate the annual nature of the rings on scales or otoliths of larger fish. (There have been few attempts to validate ageing of deep-water species in general (see Bergstad (1995) for a review).

2) Many different methods have been used and there has been no attempt at intercalibration.

Russian data

Russian data (for the former USSR) was available on growth of this species for Sub-area XII, based on the reading of scale (Table 11.1.1). Also a maturity ogive for this area was produced by Russia (Table 11.1.2).

11.2 Landings

Official landings of *Coryphaenoides rupestris* are available to ICES from 1988 to 1994 except for France since 1989. French estimates were provided to the group.

Total landings in ICES area ranged between 17,065 t in 1988 (mainly from USSR in ICES Sub-area XII) to 17,099 t in 1992 (mainly from France in ICES Sub-area VI). Then a decline was observed in recent years with 11,950 t in 1994 (preliminary data) The other major producers are Denmark (mostly from Sub-area III), Latvia and Russia (mostly in XII) and Faroe Islands (mostly in Vb and XII).

11.3 Effort and CPUE

Data from Russia (for the former USSR) was produced on catch and effort for the Roundnose Grenadier directed fishery in ICES Sub-area XII for the years 1974 to 1984 (Table 11.3.1).

France provided effort and CPUE for Sub-areas V, VI and VII from 1989 to 1993, for Roundnose Grenadier. Because in these areas French effort is not only directed on the deep-sea species from the slope, but also on the species of the shelf during the same trip, a measure of effort was needed and defined as follow:

Within each trip, the effort in a statistical square is defined on roundnose grenadier if at least 10% of the catch from this trip in this square is composed of this species. Another solution proposed is to replace 10% by 100 kg.

Table 11.3.2 gives the measure of effort on roundnose grenadier and the CPUE per sub-areas based on the two criteria. Most of effort by the French fleet was directed on Sub-area VI with a maximum of 76,000 hours fished in 1992. CPUE are very similar in their trends whatever the criterion selected (or more than 10%, or more than 100 kg). The best CPUE were made in Sub-area V with a peak in 1991 and then a small decline (from 400 kg/h to 300 kg/h), instead in the Sub-areas VI and VII no particular trend is observable (the CPUE ranging from 50 to 100 kg/h).

11.4 Length, Age Distributions and MSY

Age distribution in percentages from surveys of former USSR for the years 1985 to 1989 in Sub-area XII were available from Russia (Table 11.4.1).

Length and age distributions of landings were provided by France from 1990 to 1993 for Sub-area VI (see Tables 11.4.2 and 11.4.3). The total number of fish landed by French trawlers is increasing (ranging from about 5 millions of fish in 1990 to 7 millions of fish in 1993). The mean weight and the mean length are slowly decreasing from 1.11 Kg and 21.0 cm of preanal length to .93 kg and 18.6 cm. The size ranges from 13.5 cm to 27.5 cm with most between 17.0 cm and 23.0 cm. The distribution of ages varies from year to year mostly due to the difference between readers of otoliths and to development in reading methods. So the minimum age of the series is of 10 years and the maximum is of 35 years. Most range from age 15 to age 25. Calibration of age determination between readers of different countries will be a helpfull exercise, and in the view of the Study Group is an essential step before age based assessments can be carried out. The Group noted that two different estimates of maximum sutainable yield are given for

ICES Sub-area VI, the first by Gordon and Hunter (1994) which was based on a large number of assumptions, gave a range between 10,000 t and 17,000 t and the second by Dupouy and Kergoat (1992) gave a range between 7,000 t and 9,000 t.

12. BLACK SCABBARD FISH (*APHANOPUS CARBO*)

12.1 Biology

A sampling programme at Sesimbra harbour, Portugal has been carried out between 1984 and 1993 to estimate the length frequency distribution of black scabbard fish landings. The results indicate that fish smaller than 80 cm were present in the commercial landings in a very low quantity. The absence of small fish was also observed in catches of longliner surveys carried out in Portuguese waters since 1986. In addition, no spawning fish were found in Potuguese continental waters, but in Madeira waters this species spawns in winter. However, small fish (<80 cm) did not appear in Madeira landings (Fernandes, 1984, this reference not given in the working paper). This information may suggest that black scabbard fish migrates for spawning to Madeira waters, but young fish are not vulnerable to the fishing gear, or they are not distributed in the traditional fishing areas. Further investigations in international cooperation should be developed to determine the geographical distribution of young black scabbard fish. New data on length frequency distributions and weight at length were provided by Iceland for Division Va.

12.2 Assessment

Assessment analyses are confined to Sub-area VIII and IX where there is data from a Portugese longline fishery in deep water off Sesimbra. The most recent assessment was in 1994 (Martins *et al.*, 1994). Length based catch curves and length cohort analysis indicate that Z is around 0.7. Natural mortality was calculated using Pauly's empiric formula relating M with growth parameters and mean ambient temperatures, and is estimated at 0.17. This gives a F of 0.43, marginally lower than the 0.53 value estimated by similar methods in 1989. These results are consistent with available time-series data of effort which shows an increase to a maximum in 1990 and a slight decline thereafter. Length distributions, effort and CPUE data were not available for 1994 and 1995, but Table 4.1 shows that landings continue to be reasonably steady at around 3500 t to 4000 t.

France provided effort and CPUE total for Sub-areas V, VI and VII together and VI only (Table 12.1).

13. GOLDEN EYE PERCH (*BERYX SPLENDENS*)

This is a summary of a working document provided to the Study Group.

13.1 Introduction

The golden eye perch is a demersal species that lives along the continental slopes (200–600 m depth) in all the eastern Atlantic (Quéro, 1984) and around seamounts and the North Atlantic islands of Madeira, Canaries and the Azores (Maul, 1986). In the Azores, most of the fish are distributed between 150 and 800 m (Menezes, 1996). The species also occurs in the western Atlantic, the Pacific and the Indian Ocean (Bushakin, 1982 *in* Kotlyar, 1987).

In the ICES area most of the landings come from Sub-area X and are mostly made by longliners within the Azorean EEZ and by trawlers north of that area. Catches by former USSR trawlers were 1800 t during 1978–1979 and 964 t during 1994–1995. Landings from the Azores have been increasing steadly from 108 t in 1987 to 404 t in 1995 (Figure 13.1).

13.2 Study Material

During 1995 the University of the Azores initiated an annual longline cruise survey to obtain estimates of relative abundance for several demersal and deep-sea exploited fish species.

A total of 406 golden eye perch were aged from a total sample of 868 specimens collected onboard the R/V "Arquipelago" from the University of the Azores during March and April 1995. Fork length, body weight and sex were also recorded. Growth in length was described using the von Bertalanffy growth equation. Back-calculation was also done. Length frequency samples were collected. A length-weight relationship was established using data collected during another survey, onboard the same R/V, in September and October 1995.These cruise surveys are planned to be run each year during Spring and to cover all the area of the archipelago down to a depth of 600 m. These cruise surveys are primarily directed towards the red (blackspot) seabream, the target species of the multispecific and multigear fisheries that occur in the Azores and also the most important, both quantitatively and economically. At lower level, these surveys also target, among others the forbeard (*Phycis phycis*), the blackmouth (*Helicolenus dactylopterus*) the alfonsinos (*Beryx splendens and Beryx decadactylus*), and the conger eel (*Conger conger*).

A stratified random sampling design was established, and a total of 30 sets were distributed by the all stratification levels. The levels of stratification include 6 geographic areas and 8 depth strata, considered *a priori*

as ecologically homogeneous. Each set was made along the depth gradient from the shallowest to the deepest stratum. The sampling effort allocated to each depth strata holds proportional to its specific area. Per set, the longline roughly averages 40 skates, each skate comprising 120 hooks number 9 (i.e. size 12).

The relative abundance indices were estimated using the nonparametric bootstrap method and the confidence limits were given by the 2.5 and the 97.5 percentiles obtained from the distribution of the 1000/bootstrap/weighted means.

13.3 Age and Growth at the Azores

Direct ageing gave the following estimates for the growth parameters $L\alpha$, K and t_0: 53 cm; 0.0873 and; -4.71 (sexes combined; Figure 13.2).

The length-weight relationship was established through an exponential model. Parameters a and b were, respectively (length in cm and weight in g): 0.0638 and 2.71 (n=305).

13.4 General Description of the Biology to the North of the Azores

Golden eye perch were represented in Russian catches in ICES Sub-area X by specimens of 15–58 cm fork length, mainly 20–40cm (Figure 13.3), and 0.14–2.1 kg weight. Both the small immature and large mature specimens inhabit the area. No spawning was noted, however, it is expected to occur in deep waters during summer-autumn. Golden eye perch feed on different mesopelagic fish (lanternfishes, hatchetfishes, viperfishes), squids, shrimps and euphausiids. Golden eye perch were recorded at 150 to 850 m depth both in the near-bottom and mid-water layers (Figure 13.4). Specimens were fished with pelagic and bottom trawls. Fish length in catches increased with increasing trawling depth.

The accessibility of golden eye perch to the fishery depends first of all on peculiarities of its vertical distribution and bottom conditions of sea mounts. The main factor, determining the pattern of golden eye perch vertical migrations, is a vertical shifting of its food organisms. The latter, in their turn, are closely related to variations in light levels (both by the Sun and Moon) and hydrometeorological conditions in the area of the sea mounts.

Two hypotheses have been proposed to account for the intraspecific structure of the golden eye perch. Most Russian investigators maintain that golden eye perch forms an independent population on each separate sea mount in the North Atlantic and all stages of its life cycle are developed within one sea mount (Titova, 1981; Klimenko, 1983; Vinnichenko, 1995). Others suggest that migrations between banks occur and that a single population exists in the whole North Atlantic (Alekseev *et al.*, 1987).

13.5 Abundance from Surveys in the Azores

A total number of 868 golden eye perch were caught during the cruise survey (see 13.2), corresponding to a catch rate of 7.38 no. ind.hooks^{-1}x1000 and 3.93 Kg. hooks^{-1}x1000 in weight units; being the fourth most captured species.

Length frequencies (Figure 13.5) ranged between 16.5 and 41.0 cm, with an average of 26.65 cm (± 3.98 SD). Figure 13.6 shows how the mean length changes with depth.

The global relative indices of abundance for the golden eye perch obtained in the 1995 cruise survey were 10.054 no.ind.hooks^{-1}x1000 (CL: 5.531 - 14.760) and 5.029 Kghooks^{-1}x1000 (CL: 2.673 - 7.397). Area III shows the highest abundance in number (4.04) and the highest biomass (1.70). The western areas (areas I and VI) had the lowest abundances (Figure 13.7).

Cluster analysis showed that 5 among the 8 strata initially considered were homogeneous in respect to their species composition. These 5 strata were then considered in the estimates of abundance by depth. At this time of the year almost 71% of the population is confined to the 301–500 m depth contours. Most of the rest of the population is distributed through the next depth strata (501–600 m; Figure 13.8).

The sampling design used in the cruise survey described above allowed some ecological inferences about the demersal and deep-sea fish communities of the Azores. Cluster analysis indicated that *Beryx splendens* appears closely related with *Helicolenus dactylopterus* and *Beryx decadactylus*. At a lower level, that species is also associated with *Pagellus bogaraveo*, *Lepidopus caudatus*, *Conger conger* and *Pontinus kuhlii*. This group, which is distributed mainly in an intermediate Atlantic water mass between 150 and 1000 m, includes some of the most abundant and commercially important species in the longline Azorean fishery. This suggests that an holistic approach should be used in future assessments.

14. RED (=BLACKSPOT) SEABREAM (*PAGELLUS BOGARAVEO*)

14.1 *Pagellus* in the Azorean Region

The biology, ecology and assessment of the red (blackspot) seabream, *Pagellus bogaraveo,* in the Azores was described by Krug (1995) and summarised as a working document for this Study Group. The Group had some major concerns regarding the assessment section, but decided to present the results of

the work because it is the only analytical assessment presented to the meeting in any detail. Concerns expressed by the Group are given in bold type. Effort data for tuning were not available at the meeting so there was no opportunity for the Study Group to re-run the assessment. The results, therefore, should be seen to reflect the views of the authors.

The red seabream is a southern species which is distributed in the eastern Atlantic Ocean and in the Mediterranean Sea from southern Norway, in the north, to the Canary Islands in the south. The vertical distribution of the species varies according to the size of the individuals and the season. Young immature individuals distribute at depths less then 100-200 m, while the large adults are found at depths of 150–500 m in the English Channel but reaching 2000 m in the Azores (Whitehead et al., 1984–1986). In the Azores, most of the fish are distributed from less then 50 m down to 600 m (Menezes, 1996).

Most of the fishing for red seabream occurs in ICES sub-areas VI, VII, VIII, IX and X. The UK, France, Spain and Portugal (including the Azores) are responsible for most of the landings which peaked at more then 20 thousand tonnes in 1974, including landings from Spain made on the Sahara Bank. Spain has been responsible for most of the catches of seabream, at least since the early 1960s, after the collapse of the UK 'stock'. Landings from France, Spain and mainland Portugal started declining in the mid-1970s. During the same period, those landings from the Azores have been increasing and reached, during the last few years, close to 1,000 t. While the UK and France fishing was mostly done by trawlers, Spain and Portugal (including the Azores) have used mostly longliners (Krug, 1995; Sanchez, 1983)

Reproduction

Fish were sampled for reproduction parameters during 1982–1986 and again during 1991, on a monthly basis. The combined analysis of the stage of maturity throughout the year and GSI's indicated that the spawning period occurs between January and March. Length at 50% maturity of the males was 26.4 cm in 1982-1983, 28.2 cm in 1984–1986 and again 28.2 cm in 1991. For females the opposite trend was observed during the same respective periods: 34.4; 33.9 and; 32.3 cm. Those differences were considered significant (ANCOVA; $P<0.01$). Fecundity increased over the period 1984–1986 to 1991 from 92,000 and 1,090,000 oocytes at 29 and 46 cm, respectively, to 290,000 and 1,125,000. Those differences were significant (ANCOVA; $P<0.01$).

The red seabream is a protandric hermaphrodite species. An analysis of hermaphroditism over the periods 1982–1983, 1984–1986 and 1991 showed that by season, males were dominant in the Autumn and the intersexuals in the Spring and Summer, when most fish are in post-spawning maturity stage, so using this period to undergo sex change. This is true for those intersexuals which are active females, while those actively males are more abundant in the Autumn and Winter. Consequently, these intersexual males are spawning as males for the last time and will become active intersexual females over the following Spring and Summer.

The proportion of the sexes by each cm length class revealed that those fish immature follow a negative exponential model, males and females follow inverse logistic models and intersexuals are best represented by a dome-shaped model. The main conclusions from the analyses above were: immature fish have become males at larger sizes in recent years; males were predominant in the first period but hermaphrodites became more abundant then males after 1984–1986 and; the logistic function that represents the proportion of females at length is constant over the whole period analysed. This leads to a general conclusion about the reproductive strategy exhibited by the species: the species maintains the proportion of females at the cost of a decreasing proportion of males over time as a compensatory response to exploitation in the Azores.

Age and growth

Fish were sampled for ageing from September 1982 through to November 1991. Fork length, body weight and sex were also recorded. Back-calculation was also done. Length-weight relationships were established and the growth in weight predicted. Length frequency samples were collected over the period 1983–1993, mostly from landings in the major harbours. MULTIFAN was applied to those length frequencies and the von Bertalanffy growth parameters estimated on a yearly basis. The growth curves obtained from different methods were compared as were the annual curves obtained using the same method in different years (MULTIFAN) or groups of years. The hypothesis of compensatory changes in growth through time was tested.

The use of otoliths for ageing the red sebream was validated through the analysis of the proportion of hyaline and opaque rings in the border of those otoliths. Direct ageing gave the following estimates for the growth parameters L^{∞}, K and t_0: 58.89, 0.118 and -0.911 (1982-85; n=685) and; 64.18, 0.121 and -0.387 (1987-91; n=640). Backcalculated growth parameters, L^{∞}, K and t_0, were: 51.21, 0.144 and -0.753 and; 55.70, 0.154 and -0.342 (in the same respective periods).

Length-weight relationships were established in the periods 1982–1985 and 1987–1991 through an exponential model. Parameters a and b were, respectively (length in cm and weight in g): 0.0186 and 3.0247 and; 0.0094 and 3.2183. So, from backcalcul-

ation, W_∞ were estimated to be 2753 and 3907 g, for the two periods mentioned above.

When the 11 growth curves obtained from MULTIFAN were compared, differences were found (Newman-Kewls; $P<0.05$) between those for the first few years (1983, 1984 and 1985) and the last two (1992–1993).

In order to perform an analysis of possible density dependent changes in growth, as a result of changes in abundance and biomass, the growth curves estimated from MULTIFAN were first normalised (i.e. K and t_0 were fixed and L_∞ changed accordingly). Biomass and abundance figures for the population in each year were obtained from VPA described below. Spearman correlation analyses showed that a significant inverse relationship existed between L_∞ and biomass in each year, but not with abundance ($P<0.1$).

Analytical assessment

A Virtual Population Analysis was performed on catch data from the period 1982–1993 for the Azorean fleet only and does not take into account of landings by Spanish vessels, for example. Tuning was carried out using separable VPA and Laurec-Shepherd on the matrix of catch in numbers at age given in Table 14.1.1. The growth curves computed from direct ageing, whose parameters were presented above for periods 1982–1986 and 1987–1993, were used to produce this matrix of catch at age. **Grouped ALKs for two periods, 1982-86 and 1987-91, were applied to annual length distributions. The Study Group expressed concern that this approach may lead to errors because of yearclass effects and changes in growth. It should also be noted that the same catch at age matrix is used in tuning and in the VPA.** The matrix of mean weights at age is also presented and was produced from the same respective length-weight relationships for the two periods (Table 14.1.2). Proportions mature at age were held constant for the full period 1982–1993 (Table 14.1.3). **The Study Group expressed concern as to the effect on maturity ogives of changes in the sex ratios and maturity at length described earlier.** Natural mortality was set at 0.2.

A stock/recruitment relationship was then computed using a Ricker model on the estimates of spawning stock and recruitment from VPA. Ideally, the analyses should be done with variables estimated independently from each other, but such data was not available. Data from 1982–1989 was used due to the likelihood of having large errors in the subsequent period. **The Study Group felt that this procedure was flawed because of circularity.**

The results from separable analyses are presented in Table 14.1.4. **The Study Group felt that the log catch ratio residuals were reasonably acceptable although it was noted that a dome-shaped pattern was evident for the three most recent years.** Laurec-Shepard tuning was then used to estimate F in 1993 (Table 14.1.5) A mean F of 0.8 was obtained, and the time-trend in F showed good correlation with available effort data (Figure 14.1.1).

A final VPA was then run using separable tuning with an F in 1993 of 0.8. The matrix of fishing mortalities and the full time-series of results are presented in Tables 14.1.6 and 14.1.7. **The Study Group expressed concern that there was considerable differences between the final year fishing mortalities estimated by tuning and the final VPA, inferring a lack of convergence. Had fleet data been available at the meeting the Study Group would have preferred tuning with Extended Survivors Analysis because this method does not fit exactly the data for the final year. Regression coefficients would then have been available for the log catchability residuals and any time-trends could have been evaluated.**

Average fishing mortalities should be calculated over the main age groups in the fishery.

The VPA estimates of recent recruitment was then amended using a recruitments estimated from a stock/recruitment relationship **(circularity?)** and population estimates for recent years were re-calculated. Female spawning stock biomass decreased from 1,482 to 368 t over the period 1982–1994 (513 in 1993) while total biomass decreased from 3,875 to 2,252 tonnes over the same period.

Results from the stock/recruitment relationship resulted in a=13.336 and b=0.0126 (Figure 14.1.2). The overlap of the recruitment/stock relationships for 1982–1985 and 1986–1988 indicates that the level of fishing mortality has increased drastically and raises the question of what the state may presently be. **The Study Group were concerned as to the exact derivation of the recruitment estimates in this plot.**

Reference points were also computed (Figure 14.1.3).

The Study Group was encouraged by the presentation of a detailed analytical assessment. However, given the concerns raised by the Study Group and the uncertainties in the analysis, it was felt that the assessment should only be taken as preliminary. The authors carried out the work prior to some of the results presented above for the biology of the species, and available information suggests that the analyses could be much improved. This is recommended before the next Study Group meeting. Notwithstanding the concerns with the assessment, the Study Group was convinced that the escalating trend in fishing effort was real and this is reflected by the results for F in the assessment.

Abundance from surveys

During 1995 the University of the Azores initiated an annual longline cruise survey aiming to obtain estimates of relative abundance for several demersal and deep-sea exploited fish species (Menezes, 1996). Those abundance estimates are intended to be used in the tuning processes of namely VPA's, but also as direct monitoring instruments. Secondarily, these cruises intend to be used for the collection of length frequency and biological samples of the most important species caught.

These cruise surveys are planned to be run each year during Spring and to cover all the area of the archipelago down to a depth of 600 m. In 1995 some sets were extended to 1,000 m only for prospective reasons.

These cruise surveys are primarily directed towards the red (blackspot) seabream, the target species of the multispecific and multigear fisheries that occur in the Azores and also the most important, both quantitatively and economically. At lower level, these surveys also target, among others the forbeard (*Phycis phycis*), the blackmouth (*Helicolenus dactylopterus*) the alfonsinos (*Beryx splendens and Beryx decadactylus*), and the conger eel (*Conger conger*).

A stratified random sampling design was established, and a total of 30 sets were distributed by the all stratification levels. The levels of stratification include 6 geographic areas and 8 depth strata, considered *a priori* as ecologically homogeneous. Each set was made along the depth gradient from the shallowest to the deeper stratum. The sampling effort allocated to each depth strata holds proportional to its specific area. Per set, the longline roughly averages 40 skates, each skate comprising 120 hooks number 9 (i.e. size 12).

The relative abundance indices were estimated using the nonparametric bootstrap method and the confidence limits were given by the 2.5^{th} and the 97.5^{th} percentiles obtained from the distribution of the 1000 bootstrap means.

In 1995, a total number of 2,476 red (blackspot) seabream were caught, corresponding to a catch rate of 20.51 n°ind.hooks^{-1}x1000 and 12.99 Kghooks^{-1}x1000 in weight units, being the second most captured species. Length frequencies ranged between 11 and 53 cm, with an average of 29.83 cm (± 7.69 SD) (Figure 14.1.4).

The global relative indices of abundance for the red seabream obtained in the 1995 cruise survey were 18.035 n°ind.hooks^{-1}x1000 (CL: 15.726 - 20.484) and 11.737 Kghooks^{-1}x1000 (CL: 9.908 - 13.801). Area II shows the highest abundance in number (7.76) and Area I the highest biomass (4.46). The eastern areas (areas III, IV and V) had the lowest abundances (Figure 14.1.5).

Cluster analysis showed that 5 among the 8 strata initially considered were homogeneous in respect to their species composition. These 5 strata were then considered in the estimates of abundance by depth. At this time of the year almost 70% of the population is confined to the 151–500 m depth contours. Depth strata III (151–300 m) presented the highest abundance in numbers (6.81) while strata IV (301–500 m) showed the highest abundance in biomass (Figure 14.1.6). This results from the fact that different habitats are occupied by fish of different ages and sizes, with the larger individuals occupying deeper waters (Figure 14.1.7).

The sampling design used in the cruise survey described above allowed some ecological inferences about the demersal and deep-sea fish communities of the Azores. Cluster analysis indicated that *Pagellus bogaraveo* appears closely related with *Lepidopus caudatus*, *Conger conger*, *Pontinus kuhlii* and, at a lower level, with *Helicolenus dactylopterus, Beryx splendens* and *Beryx decadactylus*. This group, which is distributed mainly in an intermediate Atlantic water mass between 150 and 1000 m, includes some of the most abundant and commercially important species in the longline Azorean fishery. This suggests that an holistic approach should be used in future assessments.

14.2 *Pagellus* in Sub-areas VI, VII and VIII

Depth distribution

In the Cantabrian Sea red (blackspot) seabream of 0 and 1 years old (<15 cm) are found near to the coast, in rather estuarine waters and have a semipelagic behaviour. Later they go to deeper waters and they are found on the shelf on rocky bottoms (150–200 m). Adults more than 5 years old (>35 cm) are found during the spawning season on the slope of the continental shelf, mainly between 300 and 600 m (Sanchez, 1983).

Length-weight relationship

Length-Weight relationships for red seabream have been calculated for different sea areas as follows:

Gueguen (1969)	VII-VIII	Total weight (g) = 0.0082 x Total length (cm)$^{3.137}$
Sanchez (1982)	VIIIc/males	Total weight (g) = 0.010 x Total length (cm)$^{3.096}$
Sanchez (1982)	VIIIc/females	Total weight (g) = 0.018 x Total length (cm)$^{2.928}$
Sanchez (1983)	VI-VII-VIII	Total weight (g) = 0.011 x Total length (cm)$^{3.079}$
Castro (1990)	VIIIb,c	Total weight (g) = 0.0168 x Total length (cm)$^{2.974}$

Growth in length

Red seabream is a species of medium lifespan with a rather slow growth rate. They may live to 20 years. Most of the catches in the Bay of Biscay and Cantabrian Sea correspond to fish between 5 and 10 years old (Castro 1990).

Different authors have estimated the Von Bertalanffy growth equations for red seabream from different sea areas as follows:

			Loo	K	t	n
Ramos *et al.* (1967)	VIIIc	Scales	53.9	0.174	-0.66	
Gueguen (1969)	VII-VIII	Scales	56.86	0.092	2.92	
Sanchez (1983)	VIIIc	Otoliths	51.56	0.209	-0.53	530
Alcaraz (1987)	VIIIc	Otoliths	48.06	0.196	-0.47	
Castro (1990)	VIIIb,c	Otoliths	54.2	0.174	-0.66	

Reproduction

In the Bay of Biscay (Divisions VIIIa,b,d), all fish less than 25 cm length appear to be immature. Protandric hermaphroditism is observed. The largest seabream are female. There is little information on egg abundance and distribution of seabream. In the spring low abundances of eggs have been observed in the south of Bay of Biscay and the Cantabrian Sea (Dardignac, 1988).

The spawning period extends from January to April in the Cantabrian Sea (Division VIIIc). The most of the individuals are bisexual until about 35 cm. The largest fish have only the female gonads developed (Sanchez, 1983).

According to Castro (1990), the development of oocytes is activited by the cooling of the waters at the end of the autumn; at this time the fish began to concentratem on the slope of the continental shelf. The spawning season starts in winter in the southern Bay of Biscay, Cantabrian Sea included; it takes place later, in the spring in more northern areas and it ends in the Celtic Sea at the beginning of the summer. The areas of the main catches correspond with this time sequence which might suggest that the red seabream fishery in the Northern Atlantic is on spawning concentrations.

Feeding

In the Bay of Biscay, Divisions VIII a,b and d red seabream feed on a varied diet that extends from planktonic organisms to fish, such as anchovy and sardine. The most frequent prey items belong to the groups of tunicates and coelenerates (Dardignac, 1988).

In the Cantabrian Sea (Division VIIIc), the diet of red seabream is mainly pelagic (Olaso, 1989) and it consists on apendicularians, crustaceans, cephalopods andfish. It appears that the red seabream has a daily vertical migration for feeding, mainly during the night (Castro, 1990).

Migrations

Movements of red seabream between Sub-areas VI, VII, VIII and northern IXa have been confirmed by tagging methods (Gueguen, 1974). These displacements seem to be related to seasonal factors corresponding to the reproductive and feeding habits of the species. Adult fish appear in the Cantabrian waters (Division VIIIc) at the end of autumn and they remain there during the winter and until the early spring, to spawn. The large fish then migrate along the continental slope of the Bay of Biscay, they move to the north (Northewestern Ireland), and in some years to the West of Scotland, at the end of the summer (Dardignac, 1988). A part of the population moves towards Galician coast (Northwest Spain) and Northern Portugal (Sanchez, 1983). At the end of autumn or beginning of the winter the mouvement of return of adult fish takes place from the north to the south. The younger fish seem to restrict their displacements into the Bay of Biscay and Celtic Sea. The smaller fish remain in the coastal areas. In these coastal areas adult fish are ocassionally also found, for instance, in the estuaries of Loire and Garone (Dardignac, 1988).

This probable migration pattern might suggest that all the catches of red seabream at least in the Northeastern Atlantic waters (from Northern Division IXa to Sub-area VI), i.e., from Northern Portugal, Cantabrian Sea, Bay of Biscay, banks of the Celtic Sea, Porcupine and Rockall, belong to the same fishery unit.

To study the seabream migration, three tagging surveys were conducted by IFREMER. The first two first were in 1968 (773 fish tagged in the Litle Sole Bank (Division VII)) and in 1970 (635 fish tagged in the Bay of Biscay (Division VIIIa,b)). The number of fish recovered was: 10 fish from 1968 and 21 fish from 1970. The third tagging survey was made in January 1972 in the Central Cantabrian Sea (near Cabo Penas, Asturias). 4,228 fish of medium and large size (>30 cm) were tagged and 237 fish were recovered between 1972–1973. About 75% of the recaptures were found at more than 200 miles from the tagging point. The most extreme places of recapture in relation to the tagging

point (43°N) were at West of Aveiro, Portugal, (40°N) and at West of Shetland (60°N). It seems that only the largest fish migrate to the north, as only fish more than 40 cm length were found north of 52°N (Gueguen 1974).

Catches

It is difficult to determine with precision the development of the international catches of red seabream, because the statistics available do not in many cases separate the catches of the different Sparids. But, in any case, the authors who have been dealing with this fishery in recent years are of the same opinion: the situation of the red seabream fishery in the Northearn Atlantic (Sub-areas VI, VII and VIII) has became "catastrophic" (Dardignac, 1988).

The official international landings, in tonnes, of "seabreams" in the Northern Atlantic in the period 1979–1985, by Sub-areas are presented in Table 14.2.1, and by countries, in Table 14.2.2. The evolution of official French and Spanish catches of "seabreams" in the Northern Atlantic, in the period 1950-1986 is shown in Table 14.2.3. More recent data (1986–1994) about the Spanish fishery of *Pagellus sp.* (mainly *P. bogaraveo*) are in Table 4.18. The evolution of the red seabream *Pagellus bogaraveo* (sic) in the fishing ports of the Basque country during the period 1900 to 1995 is presented in Figure 14.2.1. The mean monthly landings by decades of red seabream in the Basque country, during 1930–1995 is shown in Figure 14.2.2.

15. COLLABORATIVE ACTIVITIES

15.1 EC Fair

EU FAIR Project No. PL 95/655 Developing deep-water fisheries: data for their assessment and for understanding their interaction with and impact on a fragile environment.

The project has 13 partners belonging to the following countries; Iceland, Norway, United Kingdom, Ireland, Germany, France, Spain, Portugal, Italy and Greece. The project, which began on 1 December 1995, has the following objectives:-

Objective 1: To describe in detail the deep-water fisheries presently being prosecuted by member states with particular reference to geographic area, depth of occurrence, seasonal distribution, migration patterns, aggregations and other parameters. To make an inventory of the types and specifications of fishing vessels involved in deep-water fishing. To record and describe the gears, both mobile and static, which are currently being used for specified fisheries.

Objective 2: To make an inventory of existing survey data on deep-water resources and ensure that historical data sets are preserved and are accessible. To support the working up of survey data.

Objective 3: To describe and quantify the by-catch of unwanted species and undersized fish of target species in the fisheries identified in objective 1.

Objective 4: To sample at the markets to accurately record the quantities of species landed with particular reference to fishes that are not presently identified to species level.

Objective 5: To use the information collected by research and commercial surveys and, from market sampling past and present, to provide data on biological parameters of both target and by-catch species, which will be of value for the assessment and management of the resource. Particular importance will be paid to studies on age determination, growth and reproduction. An underlying theme of all these studies will be to (1) consider how the special environmental factors of the deep waters influence the biological parameters of these new resources and (2) understand how the fishery, especially the removal of top level predators and the probable high mortality of escapees from trawls, will effect what is generally considered to be a fragile ecosystem.

The results of this study will be highly relevant to future meetings of this Study Group.

15.2 Nordic Countries

In 1993, a three-year Nordic Council project on the fishery and biology of ling, blue ling and tusk was initiated with Iceland, the Faroes and Norway as collaborating partners. This provided the means for increasing the sampling activity of these species and for assembling new and historical biological data. A major activity in the project has been the development of ageing methods, and workshops and intercalibration exercises have improved significantly the consistency of age readings of ling and tusk. Results from the project will become significant supplements to the information now available to the Study Group.

15.3 Portugal - Azores

Most of of the research conducted in recent years, and updated under Section 5.1.11 for the Azores, has been supported by two projects partially financed by the EC DG XIV through the programme for biological and technical studied in support of the Common Fisheries Policy: Design Optimisation and Implementation of Demersal Survey Cruises In the Macaronesian Archipelagos (Project No. 94/034) and An Intensive Fishing Experiment in the Azores (Project No. 94/028). During 1995 another project was approved to continue the first project mentioned above. Simultaneously, also in 1995, a project was approved for the study of the biology of some deep-sea fishes and of the deep-sea red crab (*Chaceon affinis*).

16. STOCK SUMMARY

Table 16.1 gives a summary of stocks considered, the data and analysis available, the state of the stocks and some comments/concerns that the present Study Group has.

17. PROPOSALS, RECOMMENDATIONS AND FUTURE WORK OF THE STUDY GROUP

1) The Study Group notes the comments of the Working Group on Methods of Fish Stock Assessment (ICES CM 1995/11) on length based methods of assessment to the effect that the collection of ALK data "results in considerable costs that can only be afforded for those stocks that are of major importance in each country". The Group also endorses the recommendation of the Working Group that ICES should implement these methods on the ICES computer system, thoroughly test them, and ensure that Working Group members should receive proper guidance in their use.

2) The Study Group recognises that there are some data sets which might be suitable for assessment by VPA or alternative methods. It strongly recommends that these data sets should be circulated well beforehand so that experts within national institutes may have an opportunity to evaluate them and run preliminary assessments.

3) The Study Group recommends that methods to monitor recruitment should be explored, e.g. by indices of abundance of pre-recruit stages.

4) The Study Group notes the initiatives that are being taken by the EC to encourage joint research on ageing methods and intercalibration of age determination. Age determination in deep-water fishes present major problems and the Study Group hopes that ICES will support any new initiatives on fish ageing.

5) The Study Group recognises that there are collections of material for ageing of deep-water species in national institutes. It recommends that priority should be given to the analysis of the Icelandic time-series of ling and tusk otoliths.

It is proposed that the Group should meet again in late 1997 by which time there should be new information on a number of species resulting from the projects reported in Section 15. The next meeting should focus its attention on determining trends in stock size and estimation of fishing mortality in order to better advise on appropriate management measures.

18. WORKING DOCUMENTS AND REFERENCES

LIST OF WORKING PAPERS SUPPLIED TO THE STUDY GROUP ON THE BIOLOGY AND ASSESSMENT OF DEEP-SEA FISHERIES RESOURCES

Information on landings, biomass and distribution of some deep-water species in Portuguese waters. M J Figueiredo, O Moura, I Figueiredo and J Correia; IPIMAR, Portugal.

Portuguese black scabbard fishery. R. Martins; IPIMAR, Portugal.

Some preliminary biological data on the stocks of ling from the Norwegian longline fisheries. N-R Hareide; Møre Research, Norway.

Catch per unit of effort (CPUE) analyses of ling and tusk based on logbook information from Norwegian longliners. O R Godø and N-R Hareide Institute of Marine Research and Møre Research, Norway.

Russian investigations an fishery on deep-water fish in the North Azores area. V.Vinnichenko, PINRO, Russia.

An update of the state of knowledge on the biology, ecology, abundance and fisheries on deep-sea fishes in the Azores. H M da Silva and G Menezes; Department of Oceanography and Fisheries, Azores Portugal.

Biology, ecology and abundance of the golden eye perch, *Beryx splenden*, in the Mid-Atlantic Ridge (ICES Area X) H da Silva, V. Vinnichenko, V N Shibanov, G Menezes, E Esteves and J. Ramos. University of Azores, Portugal, PINRO Russia and University of Algarve Portugal.

Biology, ecology and assessment of the red (blackspot) seabresam, *Pagellus bogaraveo*, in the Azores. H.M.Krug, H M da Silva University of the Azores, Portugal.

(Preliminary notes on some deep-sea fisheries in the Basque Country (Spain) P. Lucio, AZTI, Spain.

Preliminary Notes about Spanish Deep-sea fisheries and some biological information. Carmen Pineiro Alvarez, IEO Spain.

REFERENCES

Alcarraz (1987) cited in Castro (1990).

Anon. 1992. Estimation des paramètres biologiques de l'empereur (*Hoplostethus atlanticus*) et du grenadier (*Coryphaenoides rupestris*). Rapport final EC DGXIV/C/1 1992/12.

Anon. 1993. Fisheries description of the North Azores complex of sea mounts and Corner Rise. St.-Petersburg, PINRO, 1993. - 170 p. (In Russian).

Anon. 1995. Report on the Deep Water Fish Workshop held at the University of South Florida, St. Petersburg Campus, 27-28 January, 1995. University of Hawai`i at Manoa:5 pp.

Anon. 1995 State of marine stocks in Icelandic waters. 1994/95, prospects for the quota in 1995/96 Hafrannsoknastofnun Fjolrit Nr 43.

Anon. 1995. Report of the ICES Advisory Committee on Fishery Management 1994. ICES Coop. Res. Rep. No 210, Part 2.

Alekseev, F.E., Alekseeva, E.I., Trunov, I.A. and V.I. Shlibanov, 1987. Macroscale water circulation, functional structure of area and population structure of Alfoncino (*Beryx splendens* Lowe) in the Atlantic Ocean. // Ecological studies in the Atlantic Ocean and southeastern Pacific Ocean.// Kaliningrad, AtlantNIRO, P. 4-19. (In Russian).

Bergstad, O.A. 1990 Distribution, population structure, growth and reproduction of the roundnose grenadier, *Coryphaenoides rupestris* (Pisces: Macrouridae) in the deep waters of the Skagerrak. Marine Biology 107, 25-39.

Bergstad, O.A. 1993a. Distribution, population structure, growth, and reproduction of the greater silver smelt, *Argentina silus*, (Pisces, Argentinidae), of the Skagerrak and the northeastern North Sea. ICES J. mar. sci. 50:129-143.

Bergstad, O.A. 1993b. Distribution, population structure, growth, and reproduction of the greater silver smelt, *Argentina silus*, (Pisces, Argentinidae), of the Skagerrak and the northeastern North Sea. ICES J. mar. sci. 50:129-143.

Bergstad, O A. (1995) Age determination of deep-water fishes; experiences, status and challenges for the future. In A.G.Hopper (ed.) Deep-Water Fisheries of the North Atlantic Oceanic Slope, 267–283. Kluwer Academic Publishers. 1995.

Bridger, J.P. (1978) New deep-water trawling grounds to the west of Britain. Laboratory Leaflet, MAFF Directorate of Fisheries Research, Lowestoft. No.41, 40pp.

Castro, R., 1990. Biologia y pesca del Besugo (*Pagellus bogaraveo* B.). Informes Tecnicos N. 30. Departamento de Agricultura y Pesca del Gobierno Vasco. Vitoria 1990. 42 pp.

Connolly and Kelly 1994 Sampling surveys for deep water demersal fish in 1993. Department of the Marine, Fishery Leaflet 163.

Connolly and Kelly 1996a Sampling surveys for deep water demersal fish in 1995. Department of the Marine, Fishery Leaflet (in preparation).

Connolly and Kelly 1996b Deep-water longline survey on the eastern slopes of the Rockall Trough in 1995 (in preparation).

Connolly, P.L., C.J. Kelly, J.D.M. Gordon and O.A. Bergstad, 1995. Inventory of otolith collections and ageing work on north east Atlantic deep water fish species. Irish Department of the Marine, Dublin, Fishery Leaflet 165:16 pp.

Dardignac, J. (dir.) 1988. Les Pêcheries du Golfe de Gascogne. Bilan de Connaissances. Rapp. Scient. et Tech. de l'IFREMER, n.9, p. 74–78, 1988.

Du Buit, M.-H. (1995). Notes préliminaires sur la ponte de l'hoplostèthe (*Hoplostethus atlanticus*, Trachichthyidae) à l'ouest des Iles Britanniques. Cybium, 19, 199–200.

Dupuoy, H and Kergoat, B. (1992) La pêcherie de grenadier de roche (*Coryphaenoides rupestris*) de l'ouest de l'Ecosse: production, mortalite par peche et rendement par recrue. ICES C.M. 1992/G:40.

Eliassen, J.E. (1986). Undersoekelser av utbredelse, forekomster og bestandsstruktur av skolest (*Coryphaenoides rupestris* Gunnerus) i Trøndelag. FiskDir. Skr. (Havunders.). 1, 1-19.

Esteves, E., H.M. Krug and H.M. Silva (in prep. 1996). Contribution to the study of age and growth of bluemouth from the Azores.

Farran, G.P. (1924). Seventh Report on the fishes of the Irish Atlantic Slope. The macrurid fishes (Coryphaenoididae). Proceedings of the Royal Irish Academy, 36 (B), 91–148.

Gorchinsky, K, Shibanov, V. Vinnichenko, V. Hareide, N.-R. and Kjerstad, M., 1994. Northern Mid-Atlantic Ridge (42°–48°N) ichthyophauna characteristics. Some results from the Russian-Norwegian deep water expedition in September-October 1993. Abstracts of scientific papers. 1994 Annual Science Conference. St.John's. P. 28–29.

Gordon, J.D.M. (1978). Some notes on the biology of the roundnose grenadier *Coryphaenoides rupestris* to the west of Scotland. ICES Council Meeting 1978 (Collected Papers). ICES CM 1978/G:40. ICES, Copenhagen,; 13 pp.

Gordon, J.D.M. and Hunter, J. 1994 A study of the deep-water fish stocks to the west of Scotland. Unpublished report, 2 volumes.

Gordon, J.D.M., S.C .Swan, C.J. Kelly and N.-R. Hareide (1995). Age determination of Juvenile roundnose grenadier, *Coryphaenoides rupestris*, a deep-water macrourid fish: a preliminary report. ICES CM 1995/G:6.

Gormley, T.R., Connolly, P.L and Ward, C.J. (1994) Evaluation of deep-water fish species. Teasgasc, Farm and Food, Vol 4. (1) 8–11.

Greenwood,B., Prout, P., MacNamara, J.P. and Dunlin, G. (1995). Deep-water fishing along the North Atlantic Slope. Fishing trials on board MFV Maranatha III. Seafish Report No 403, No SR 449, 44 pp.

Gueguen, J. 1969. Croissance de la Dorade Pagellus centrodontus Delaroche. Rev. Trav. Inst.Peches Marit. n.33 (3), p. 251-264, 1969.

Gueguen, J. 1974. Precisions sur les migrations de la Dorade Rose Pagellus bogaraveo (Brunnich 1768). Science et Peche, Bull. Inst.Peches Marit. n.237, juin 1974.

Gushchin, A.V. and Kukuev, E.I., 1981. On composition of ichthyofauna of the northern Mid-Atlantic Ridge. Fishes of the open ocean. Moscow. P. 36-40. (In Russian).

Hareide, N.-R. and Godø (1996) Catch per unit of effort (CPUE) analyses of ling and tusk based on logbook information from Norwegian longliners. Working Document to the ICES Study Group on the Biology and Assessment of Deep-Sea Fisheries Resources, February 1996.

Iglesias, S. and Paz, J. (1995) Spanish North Atlantic Deep-water fisheries. In:Deep-water Fisheries of the North Atlantic Oceanic slope Ed. Hopper A.G.: Kluwer Academic Publishers, 287–295.

Isidro, E.J. (1987). Age and growth of the bluemouth, *Helicolenus dactylopterus dactylopterus* (Delaroche, 1809) off the Azores. ICES CM 1987/G:63, 6 pp.

Johansen, P.-O. and T. Monstad. 1982. Preliminary results of Norwegian investigations on the greater silver smelt, *Argentina silus* (Ascanius). ICES CM 1982/G:10, 27 p.

Johannessen, A. and T. Monstad. 1984. Bestandsundersøkelser på vassild. Final Project Report, Project 1.701.55, The Norwegian Fisheries Research Council. Institute of Marine Research, Bergen, 22 p.

Kelly, C.J , Connolly, P.J. and Bracken, J.J. (1996a) Age estimation, growth, maturity and distribution of roundnose grenadier *Coryphaenoides rupestris* from the Rockall Trough. Journal of Fish Biology, In press.

Kelly *et al.* (1996b) Age estimation, growth, maturity and distribution of the bluemouth rockfish Helicolenus dactylopterus from the eastern slopes of the Rockall Trough. (in Prep.).

Klimenko, A.P. 1983. Biological aspects of fishery on sea mounts in the open ocean.// Biology, fish stocks and perspectives for fishery on fish and invertebrates. Moscow, VNIRO. P.18–23. (In Russian).

Koch, H. (1976). A contribution on the methodics of age determination in roundnose grenadier (*Coryphaenoides rupestris* Gunn.). ICNAF Research Document, Serial No. 3808; 76/VI/28; 3 pp; 1976.

Kosswig, K. (1981). Investigations on grenadier fish (*Coryphaenoides rupestris* Gunnerus and *Macrourus berglax* Lacepede) by the Federal Republic of Germany in 1979. Annales Biologiques, Copenhagen, 36, 190.

Kosswig, K. (1983). Investigations on grenadier fish (*Macrourus berglax* and *Coryphaenoides rupestris*) by the Federal Republic of Germany in 1980. Annales Biologiques, Copenhagen, 37, 230.

Kosswig, K. (1985). Investigations on grenadier fish (*Macrourus berglax* and *Coryphaenoides rupestris*) by the Federal Republic of Germany in 1982. Annales Biologiques, Copenhagen, 39, 181-182.

Kotlyar, A.N. 1987. Age and growth of golden eye perch, *Beryx splendens*. Journal of Ichthyology. 27(2): 104-111.

Krug, H.M. 1995. Biologia e Avaliação do Stock Açoriano de Goraz, *Pagellus bogaraveo*. Ph.D. Thesis. University of the Azores, Horta. 192pp.

Lahn-Johannessen, J. and N. Radhakrishnan. 1970. Observations on silver smelts (*Argentina* sp.) from the Norwegian Deeps. ICES C.M. 1970/F:13, 8p.

Loctionov, Yu.A. 1981. Some features of mesoscale variability in hydrographic features to the south of subpolar front over the North-Atlantic Ridge. Spatial-temporal variability in hydrometeorological conditions in the Atlantic Ocean commercial areas. Kaliningrad, AtlantNIRO. P.21–27. (In Russian).

Magnússon, J.V. (1987). Grenadier fish in Icelandic waters. NAFO Scientific Council Research Document; 87/87; 24pp; 1987.

Martins, M.R., Martins, M.M. and Cardador, F. (1994). Evolution of the Portugese fishery of Black Scabbardfish (Aphanopus carbo) during the period 1984-93. ICES Doc. CM 1994/G:28.

Maul, G.E. 1986. Berycidae. In Whithead, P.J.P.; M.-L-Bauchot; J.-C. Hureau; J. Nielsen and E. Tortonese (eds.). Fishes of the North-eastern Atlantic and of the Mediterranean. Vol. II. UNESCO, Bungay: 740–742.

Mc Cormick,R. (1995). The Irish Experience of Deep-water fishing in the North East Atlantic. In A.G.Hopper (ed.) Deep-Water Fisheries of the North Atlantic Oceanic Slope, 337–356. Kluwer Academic Publishers. 1995.

Menezes, G. 1996. Interacções Tecnológicas na Pesca Demersal dos Açores. Thesis. University of the Azores, Horta. 187pp.

Moguedet, Ph. 1987. "Contribution à l'étude de la biologie de la lingue franche (*Molva molva*): sex ratio, composition en taille et paramètres de croissance du stock de l'ouest de l'Ecosse" ICES CM 1987/G:43.

Okamura, O., K. Amaoka, M. Takeda, K. Yano, K. Okada and S. Chikuni (eds) (1995). Fishes collected by the R/V "Shinkai Maru" around Greenland. Japan Marine Fishery Resources Research Center, Tokyo:306 pp.

Olaso (1989) Cited by Castro (1990)

Olaso I. y E. Marin, 1995. Alimentacion de vente especies demersales pertenecientes a la Div, VIIIc del ICES. Inf. Tec. Int. Esp. Oceanogr. 157, 56pp.

Olsen, H.E. 1995. Norwegian experience of deep-water fishing with longlines. p. 367-373 in: Hopper, A.G. (Ed.) Deep-water fisheries of the North Atlantic Oceanic Slope. Kluwer Academic Publishers, The Netherlands, 420 pp.

Pereda, P. and N. Perez, 1995. Relaciones talla-Peso de Peces Capturados en las Campagnas de Arrastre Demersal 0993 y Demersal 0994. Inf. Tec. Int. Esp. Oceanogr., 159:16 pp. (in press).

Pshenichny, B.P., Kotlyar, A.N. and A.A. Glukhov, 1986. Fish resources of the Atlantic Ocean thalassobathyal.// Biological resources of the Atlantic Ocean. Moscow, Nauka Press. P.230-252. (In Russian).

Quéro, J.C. 1984. Les poissons de mer des pêches françaises. Maquette Dominique et Philippe Lemmonier, Paris. 394pp.

Ramos, F. et Cendrero, O. 1967. Notes on the age and growth of *Pagellus cantabricus* (Asso) = *P. centrodontus* (Delar.) of Northern Spain. Const. int. Explor. Mer, G. 3, 3 p.

Sanchez, F. 1982. Preliminary fishing and biological data about red sea-bream (Pagellus bogaraveo) in the Cantabrian Sea (N. Spain). ICES CM 1982/G:39, 11 p.

Sanchez, F. 1983. Biology and fishery of the red sea-bream (Pagellus bogaraveo) in VI,VII and VIII Subarea of ICES. ICES CM 1983/G:38, 15 p.

Savvatimsky, P.I. (1971). Determination of the age of grenadiers (Order Macruriformes). Journal of Ichthyology, 11, 397–403.

Shibanov, V.N., Lomakin, I.E. and A.N. Kalugin, 1989. Results from investigations on the North Atlantic thalassobathyal during cruise 12 conducted by "Ichthyandr". // Experience and scientific and technical achievements recommended for introduction. VNIERKH, 5:1-11. (In Russian).

Thomassen, T. 1974. Variasjoner i mengde og sammensetning av reketrålfangster fra et felt vest av Sotra i årene 1965-1972. Thesis, University of Bergen, Norway, 82 pp.

Thorsen, T. 1979. Populasjonsparametrar hos vassild, *Argentina silus*, utanfor Møre-trøndelag og i Skagerrak. Thesis, University of Bergen, Norway. 79 pp.

Totova, N.V. 1981. Differentiation of *Beryx splendens* Lowe from the Atlantic Ocean thalassobathyal by frequency of esterase locus alleles. // Genetics, selection and hybridization of fish. - Theses of Reports. - Rostov-on-Don, 1981. P. 135-137. (In Russian).

Troyanovsky, F.M. and Lisovsky, S.F. (1995) Russian (USSR) fisheries research in deep waters below 500m in the North Atlantic. In:Deep-water Fisheries of the North Atlantic Oceanic slope Ed. Hopper A.G.: Kluwer Academic Publishers 357 - 365.

Vinnichenko, V.I., Gorchinsky, K.V. and V.N. Shibanov, 1994. Commercial and biological characteristic of some sea mounts of the North-Atlantic Ridge by the data from cruise conducted by "Ramoen" in September-October 1993. - Materials of Report Session by results of PINRO's research and development in 1993. Murmansk, PINRO, P.181–199. (In Russian).

Vinnichenko, V.I., 1995. On commercial stock of Alfoncino in the open North Atlantic. // Theses of Reports of the 4th All-Union Conference on problems of commercial forecasting. Murmansk, PINRO. 32 p. (In Russian).

Whitehead, P.J., M.-L. Bauchot, J.-C. Hureau, J. Nielsen and E. Tortonese (Eds.). 1984 and 1986. Fishes of the North-eastern Atlantic and the Mediterranean. Vol. I, II and III. UNESCO, Paris. 1473pp.

Zaferman, M.L. and I.P. Shestopal, 1991. Underwater investigations and deep water long-lining in the North Atlantic sea mounts area. Methods for underwater investigations in fisheries. Murmansk, PINRO. P.50–77. (In Russian).

Table 3.1 Effort in the Norwegian deepwater fisheries distributed on gear type, areas and species (from Hareide and Godø, 1996)

YEAR		1974	1976	1978	1980	1982	1984	1986	1988	1990	1992	1994	1995
Number of vessels:		103	95	93	83	74	72	72	65	60	53	52	56
Total weeks: (Longline+Gillnet)		4049	3812	3747	3428	3144	3185	3067	2875	2722	2448	2366	
Effort (thousands of hooks)		238095	235294	381356	326667	292857	445313	357143	406667	438462	424528	531915	572831
GEAR:	Autoline				1%	58%	71%	81%	94%	93%	95%	93%	
	Handbaited line	86%	83%	84%	88%	32%	21%	14%	1%	4%	2%	4%	
	Gilnet	12%	14%	14%	11%	10%	8%	5%	5%	3%	3%		
PERCENT EFFORT PER AREAS:													
	Shetland/Orkneys/Faroes/Hebrides/Rockall	61%	64%	53%	62%	61%	48%	56%	47%	55%	39%	40%	
	Norwegian Coastal banks 62°-69° N (IIA)	18%	24%	22%	13%	5%	6%	7%	?	8%	11%	4%	
	Skagerrak/North Sea (IIIa+IVa)	15%	8%	11%	12%	9%	15%	4%	?	6%	11%	5%	
	Barents sea and Northern Norway (IIa)				5%	11%	9%	24%	41%	13%	27%	38%	
	Greenland (XIVb)										4%	4%	
PERCENT EFFORT PER TARGET SPECIES:													
	Ling & Tusk	63%	68%	59%	75%	70%	64%	63%	45%	65%	53%	47%	
	Cod & Haddock	6%		18%	10%	19%	28%	31%	49%	30%	44%	47%	
	Saithe	11%	11%	8%	10%	10%	6%	3%	3%	3%			
	Dogfish	16%	13%	14%	3%						2%		
	Greenland Halibut											3%	

Table 3.2.1 Estimated landings (tonnes) of deep-water species by ICES Sub-areas and Divisions, 1988-1993.

I+II	Species	1988	1989	1990	1991	1992	1993	1994	1995
	ALFONSINOS (Beryx spp.)								
	ARGENTINES (Argentina silus)	11351	8390	9123	7668	8234	5716		
	BLACK SCABBARDFISH (Aphanopus carbo)								
	GREATER FORKBEARD (Phycis blennoides)	0	0	23	39	33	1		
	MORIDAE								
	ORANGE ROUGHY (Hoplostethus atlanticus)								
	ROUGHHEAD GRENADIER (Macrourus berglax)	0	0	589	829	424	136		
	ROUNDNOSE GRENADIER (Coryphaenoides rupestris)	0	24	43	70	41	35	15	
	RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)								
	SHARKS, VARIOUS	37	15	0	0	0	0		
	SILVER SCABBARDFISH (Lepidopus caudatus)								
	WRECKFISH (Polyprion americanus)								

III+IV	Species	1988	1989	1990	1991	1992	1993	1994	1995
	ALFONSINOS (Beryx spp.)								
	ARGENTINES (Argentina silus)	2718	3786	2322	2554	4434	567		
	BLACK SCABBARDFISH (Aphanopus carbo)	0	0	57	0	0	0	16	
	GREATER FORKBEARD (Phycis blennoides)	15	12	115	181	145	28		
	MORIDAE								
	ORANGE ROUGHY (Hoplostethus atlanticus)	0	0	0	10	33	0		
	ROUGHHEAD GRENADIER (Macrourus berglax)	0	0	0	0	7	0		
	ROUNDNOSE GRENADIER (Coryphaenoides rupestris)	618	1052	1531	2070	4247	1868	1968	
	RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)								
	SHARKS, VARIOUS	5	16	11	17	2	2	5	3
	SILVER SCABBARDFISH (Lepidopus caudatus)	0	0	0	0	27	0		
	WRECKFISH (Polyprion americanus)								

Va	Species	1988	1989	1990	1991	1992	1993	1994	1995
	ALFONSINOS (Beryx spp.)								
	ARGENTINES (Argentina silus)	206	8	112	247	657	1255		
	BLACK SCABBARDFISH (Aphanopus carbo)								
	GREATER FORKBEARD (Phycis blennoides)								
	MORIDAE								
	ORANGE ROUGHY (Hoplostethus atlanticus)	0	0	0	65	382	717	158	42*
	ROUGHHEAD GRENADIER (Macrourus berglax)								
	ROUNDNOSE GRENADIER (Coryphaenoides rupestris)	2	4	7	48	210	276	210	221*
	RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)								
	SHARKS, VARIOUS	0	0	0	0	2	52	34	97*
	SILVER SCABBARDFISH (Lepidopus caudatus)								
	WRECKFISH (Polyprion americanus)								

Vb	Species	1988	1989	1990	1991	1992	1993	1994	1995
	ALFONSINOS (Beryx spp.)	0	0	4	0	4	0		
	ARGENTINES (Argentina silus)	278	227	92	60	1443	1062		
	BLACK SCABBARDFISH (Aphanopus carbo)	0	0	419	152	64	287	160	249*
	GREATER FORKBEARD (Phycis blennoides)	2	1	38	52	49	22		
	MORIDAE	0	0	0	5	0	0		
	ORANGE ROUGHY (Hoplostethus atlanticus)	0	0	5	48	13	37	170	
	ROUGHHEAD GRENADIER (Macrourus berglax)								
	ROUNDNOSE GRENADIER (Coryphaenoides rupestris)	1	193	1208	1424	2038	688	499	
	RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)								
	SHARKS, VARIOUS	0	0	0	3	41	387	43	
	SILVER SCABBARDFISH (Lepidopus caudatus)								
	WRECKFISH (Polyprion americanus)								

VI+VII	Species	1988	1989	1990	1991	1992	1993	1994	1995
	ALFONSINOS (Beryx spp.)	0	12	8	0	3	0		
	ARGENTINES (Argentina silus)	10438	25523	7294	5197	5906	0		
	BLACK SCABBARDFISH (Aphanopus carbo)	0	41	1060	59	2488	3481	3904	3
	GREATER FORKBEARD (Phycis blennoides)	799	369	549	621	903	53		
	MORIDAE	0	0	0	1	25	0		
	ORANGE ROUGHY (Hoplostethus atlanticus)	0	0	3	3781	4462	2146	1925	
	ROUGHHEAD GRENADIER (Macrourus berglax)								
	ROUNDNOSE GRENADIER (Coryphaenoides rupestris)	32	2440	5975	8166	8379	8433	8564	
	RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)	252	189	134	123	40	15	9.3	
	SHARKS, VARIOUS	106	125	426	1421	3233	945	1137	1317
	SILVER SCABBARDFISH (Lepidopus caudatus)	0	0	0	0	703	2		
	WRECKFISH (Polyprion americanus)	7	0	2	10	15	0		

Table 3.2.1 Continued

VIII+IX	Species	1988	1989	1990	1991	1992	1993	1994	1995
	ALFONSINOS (Beryx spp.)	0	0	1	0	1	0		
	ARGENTINES (Argentina silus)								
	BLACK SCABBARDFISH (Aphanopus carbo)	2602	3473	3274	3979	4399	4513	3428	4025
	GREATER FORKBEARD (Phycis blennoides)	57	7	16	22	17	8		
	MORIDAE								
	ORANGE ROUGHY (Hoplostethus atlanticus)					34	32	31	
	ROUGHHEAD GRENADIER (Macrourus berglax)								
	ROUNDNOSE GRENADIER (Coryphaenoides rupestris)	0	0	5	1	12	14	5	
	RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)	507	532	478	243	140	175	277	
	SHARKS, VARIOUS	3545	0	1318	1433	1556	1517		
	SILVER SCABBARDFISH (Lepidopus caudatus)	2666	1385	584	808	2211	2397	1054	5949*
	WRECKFISH (Polyprion americanus)	198	284	163	194	269	338	406	

X	Species	1988	1989	1990	1991	1992	1993	1994	1995
	ALFONSINOS (Beryx spp.)	225	260	338	371	450	533	728	100
	ARGENTINES (Argentina silus)								
	BLACK SCABBARDFISH (Aphanopus carbo)	0	0	0	166	370	2		
	GREATER FORKBEARD (Phycis blennoides)	423	476	530	487	442	327		
	MORIDAE	0	0	50	0	0			
	ORANGE ROUGHY (Hoplostethus atlanticus)	0	0	0	0	1	0		
	ROUGHHEAD GRENADIER (Macrourus berglax)								
	ROUNDNOSE GRENADIER (Coryphaenoides rupestris)	0	0	44	0	0	0	0	0
	RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)	637	924	889	874	1110	829	938	
	SHARKS, VARIOUS	549	560	602	896	761	592		
	SILVER SCABBARDFISH (Lepidopus caudatus)	70	91	120	166	2160	264	373	
	WRECKFISH (Polyprion americanus)	191	235	224	170	237	311	428	

XII	Species	1988	1989	1990	1991	1992	1993	1994	1995
	ALFONSINOS (Beryx spp.)								
	ARGENTINES (Argentina silus)								
	BLACK SCABBARDFISH (Aphanopus carbo)	0	0	0	0	512	1051	824	75*
	GREATER FORKBEARD (Phycis blennoides)								
	MORIDAE								
	ORANGE ROUGHY (Hoplostethus atlanticus)						24	89	580
	ROUGHHEAD GRENADIER (Macrourus berglax)								
	ROUNDNOSE GRENADIER (Coryphaenoides rupestris)	1060	9495	2838	7206	2051	2215	684	
	RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)								
	SHARKS, VARIOUS								
	SILVER SCABBARDFISH (Lepidopus caudatus)	0	102	20	0	0	0		
	WRECKFISH (Polyprion americanus)								

XIV	Species	1988	1989	1990	1991	1992	1993	1994	1995
	ALFONSINOS (Beryx spp.)								
	ARGENTINES (Argentina silus)	0	0	6	0	0	0		
	BLACK SCABBARDFISH (Aphanopus carbo)								
	GREATER FORKBEARD (Phycis blennoides)								
	MORIDAE								
	ORANGE ROUGHY (Hoplostethus atlanticus)								
	ROUGHHEAD GRENADIER (Macrourus berglax)	0	0	0	0	0	34		
	ROUNDNOSE GRENADIER (Coryphaenoides rupestris)	52	45	47	29	31	4	15	
	RED (=BLACKSPOT) SEABREAM (Pagellus bogaraveo)								
	SHARKS, VARIOUS								
	SILVER SCABBARDFISH (Lepidopus caudatus)								
	WRECKFISH (Polyprion americanus)								

Table 4.1 Black Scabbardfish. Study Group estimates of landings (tonnes).

BLACK SCABBARDFISH (*Aphanopus carbo*) III and IV

Country	1988	1989	1990	1991	1992	1993	1994	1995
France		0	57	0	0	0	13	
Germany							3	
TOTAL		0	57	0	0	0	16	

BLACK SCABBARDFISH (*Aphanopus carbo*) Va

Country	1988	1989	1990	1991	1992	1993	1994	1995
Iceland						0	1	+
TOTAL	0	0	0	0	0	0	1	+

BLACK SCABBARDFISH (*Aphanopus carbo*) Vb

Country	1988	1989	1990	1991	1992	1993	1994	1995
Faroes			12	1	35	202	114	249
France			407	151	29	76	45	
Germany, F.R.						9	1	
TOTAL	0	0	419	152	64	287	160	249

BLACK SCABBARDFISH (*Aphanopus carbo*) VI and VII

Country	1988	1989	1990	1991	1992	1993	1994	1995
Faroes		46			3	62		
France			1060	2759	2495	3411	3856	
Germany, F.R.							46	3
Ireland						8	3	
UK (Scotland)							2	
TOTAL		46	1060	2759	2498	3481	3907	3

BLACK SCABBARDFISH (*Aphanopus carbo*) VIII and IX

Country	1988	1989	1990	1991	1992	1993	1994	1995
France			0	1	0	0	0	
Portugal	2602	3473	3274	3978	4399	4513	3428	4025
TOTAL	2602	3473	3274	3979	4399	4513	3428	4025

BLACK SCABBARDFISH (*Aphanopus carbo*) X

Country	1988	1989	1990	1991	1992	1993	1994	1995
Faroes					370			
Portugal				166		2		
TOTAL	0	0	0	166	370	2		

continued

Table 4.1 (continued)

BLACK SCABBARDFISH (*Aphanopus carbo*) XII

Country	1988	1989	1990	1991	1992	1993	1994	1995
Faroes						1051	779	75#
France					512			
Germany							45	
TOTAL	0	0	0	0	512	1051	824	
ALL AREAS	2602	3519	4810	7056	7779	9334	8336	4352*

\# includes VIb Hatton Bank
* preliminary

Table 4.2 Argentines. Study Group estimates of landings (tonnes).

ARGENTINES (*Argentina silus*) I and II

Country	1988	1989	1990	1991	1992	1993	1994	1995
Germany, F.R.								357
Netherlands			5					
Norway	11332	8367	9118	7741	8234	7913	6217	6319
Poland	5							
Portugal								
Russia/USSR	14	23						
UK (Scotland)							590	
TOTAL	11351	8390	9123	7741	8234	7913	6807	6676

ARGENTINES (*Argentina silus*) III and IV

Country	1988	1989	1990	1991	1992	1993	1994	1995
Denmark		1322	737	1421	3565	2353	1118	2149
Faroes	1062							
France				1				
Germany, F.R.	1		13	0	1			
Netherlands		335		3	70	298		
Norway	1655	2128	1572	1123	698	800	300	100
UK (Scotland		1		6	101	56	24	
TOTAL	2718	3786	2322	2554	4434	3507	1442	2249

ARGENTINES (*Argentina silus*) Va

Country	1988	1989	1990	1991	1992	1993	1994	1995
Iceland	206	9	113	247	657	1255	756	589
TOTAL	206	9	113	247	657	1255	756	589

ARGENTINES (*Argentina silus*) Vb

Country	1988	1989	1990	1991	1992	1993	1994	1995
Faroes	278	111	2885	59	1439	1063	960	6752
Russia/USSR		116	3		4			6752
UK (Scotland)				1				
TOTAL	278	227	2888	60	1443	1063	960	6752

continued

Table 4.2 (continued)

ARGENTINES (*Argentina silus*) VI and VII

Country	1988	1989	1990	1991	1992	1993	1994	1995
Faroes		188	689					
France				7	1			
Germany, F.R.			37				43	365
Ireland	5454	6103	585	453	320		150	
Latvia								
Netherlands		3715	5871	4723	5118	1168	6256	5440
Norway	4984	12184						
UK (England)		198						
UK (Scotland)		3171	112	10	467	409	1377	
UK (NI)				4				
TOTAL	10438	25559	7294	5197	5906	1577	7826	5440

ARGENTINES (*Argentina silus*) XIV

Country	1988	1989	1990	1991	1992	1993	1994	1995
Norway			6					
TOTAL			6					
ALL AREAS	24991	37971	21746	15799	20674	15315	17791	21706

Table 4.3 Alfonsinos. Study Group estimates of landings (tonnes).

ALFONSINOS (*Beryx* spp.) IV

Country	1988	1989	1990	1991	1992	1993	1994	1995
France	0	0	1	0	2	0	0	
TOTAL	0	0	1	0	2	0	0	

ALFONSINOS (*Beryx* spp.) Vb

Country	1988	1989	1990	1991	1992	1993	1994	1995
France			5	0	4	0		
TOTAL	0	0	5	0	4	0		

ALFONSINOS (*Beryx* spp.) VI and VII

Country	1988	1989	1990	1991	1992	1993	1994	1995
France		12	8		3			
TOTAL	0	12	8	0	3	0		

ALFONSINOS (*Beryx* spp.) VIII and IX

Country	1988	1989	1990	1991	1992	1993	1994	1995
France			1		1			
TOTAL	0	0	1	0	1	0		

ALFONSINOS (*Beryx* spp.) X

Country	1988	1989	1990	1991	1992	1993	1994	1995
Norway						195	0	0
Portugal	225	260	338	371	450	533	635	
Russia							864	100
TOTAL	225	260	338	371	450	728	1499	100
ALL AREAS	225	272	353	371	460	728	1499	100

Table 4.4 Roundnose Grenadier. Study Group estimates of landings (tonnes).

ROUNDNOSE GRENADIER (*Coryphaenoides rupestris*) I and II

Country	1988	1989	1990	1991	1992	1993	1994	1995
Denmark					1			
France		3	26	39	11	33	3	
Germany, F.R.		2	2	3	0	0	12	
Norway				28	29	2		
Russia/USSR		16	12					
GDR		3	3					
TOTAL	0	24	43	70	41	35	15	

ROUNDNOSE GRENADIER (*Coryphaenoides rupestris*) III and IV

Country	1988	1989	1990	1991	1992	1993	1994	1995
Denmark	612	884	785	1214	2856	1591	1910	2149
France		164	462	538	421	218	14	
Germany, F.R.	1	1	2	4		4	2	1
Norway			280	304	211	55		
Sweden	5	1	2	10	755		42	
UK (Scotland		2			4			
TOTAL	618	1052	1531	2070	4247	1868	1968	2150

ROUNDNOSE GRENADIER (*Coryphaenoides rupestris*) Va

Country	1988	1989	1990	1991	1992	1993	1994	1995
Faroes		2						
Iceland*	2	2	7	48	210	276	210	221*
TOTAL	2	4	7	48	210	276	210	221*

* includes other grenadiers

ROUNDNOSE GRENADIER (*Coryphaenoides rupestris*) Vb

Country	1988	1989	1990	1991	1992	1993	1994	1995
Faroes		20	75	22	551	339	286	405*
France		166	1129	1394	1480	335	209	
Norway				7	1			
Germany, F.R.	1	5	4	1	6	14	1	
Russia/USSR		52						
TOTAL	1	243	1208	1424	2038	688	499	405

ROUNDNOSE GRENADIER (*Coryphaenoides rupestris*) VI and VII

Country	1988	1989	1990	1991	1992	1993	1994	1995
Faroes	27	2	29		99	263		
France		2433	5944	8159	8019	8169	8525	
Germany, F.R.	4	3	2	7	142	1	15*	2
Ireland							14	
Norway					5			
UK (England)	1				113			
UK (Scotland)		2			1			
TOTAL	32	2490	5975	8166	8379	8433	8554	2

*provisional

continued

Table 4.4 (continued)

ROUNDNOSE GRENADIER (*Coryphaenoides rupestris*) VIII and IX

Country	1988	1989	1990	1991	1992	1993	1994	1995
France			5	1	12	14	5	
TOTAL	0	0	5	1	12	14	5	

ROUNDNOSE GRENADIER (*Coryphaenoides rupestris*) X

Country	1988	1989	1990	1991	1992	1993	1994	1995
France		0	0	44	0	0	0	0
TOTAL		0	0	44	0	0	0	0

ROUNDNOSE GRENADIER (*Coryphaenoides rupestris*) XII

Country	1988	1989	1990	1991	1992	1993	1994	1995
Faroes							457	182*
France				10	72	0	0	
Germany, F.R.						39	9	
Latvia				4296	1684	2176	675	
Russia/USSR	1060	9495	2838	2900	295			
TOTAL	1060	9495	2838	7206	2051	2215	684	182*

*provisional (includes some from VIb)

ROUNDNOSE GRENADIER (*Coryphaenoides rupestris*) XIV

Country	1988	1989	1990	1991	1992	1993	1994	1995
Faroes		3						
Germany, F.R.	45	42	45	23	19	4	10	13
Greenland	7		1	4	1			
Iceland*					4			
Norway					6			
UK (England)			1	2				
UK (Scotland)					1			
TOTAL	52	45	47	29	31	4	10	13

ALL AREAS	1765	13253	11654	19058	17009	13533	11945	2973*

* includes other grenadiers

Table 4.5 Orange Roughy. Study Group estimates of landings (tonnes).

ORANGE ROUGHY (*Hoplostethus atlanticus*) II

Country	1988	1989	1990	1991	1992	1993	1994	1995
France	0	0	0	0	6	1		
TOTAL	0	0	0	0	6	1		

ORANGE ROUGHY (*Hoplostethus atlanticus*) III and IV

Country	1988	1989	1990	1991	1992	1993	1994	1995
France				10	33			
TOTAL	0	0	0	10	33	0		

ORANGE ROUGHY (*Hoplostethus atlanticus*) Va

Country	1988	1989	1990	1991	1992	1993	1994	1995
Iceland				65	382	717	158	42*
TOTAL	0	0	0	65	382	717	158	42*

ORANGE ROUGHY (*Hoplostethus atlanticus*) Vb

Country	1988	1989	1990	1991	1992	1993	1994	1995
Faroes					1	36	170	419*
France			5	48	12	1	0	
TOTAL	0	0	5	48	13	37	170	419*

*preliminary

ORANGE ROUGHY (*Hoplostethus atlanticus*) VI and VII

Country	1988	1989	1990	1991	1992	1993	1994	1995
France	0	0	3	3781	4462	2146	1925	
TOTAL	0	0	3	3781	4462	2146	1925	

ORANGE ROUGHY (*Hoplostethus atlanticus*) VIII

Country	1988	1989	1990	1991	1992	1993	1994	1995
France	0	0	0	0	34	32	31	
TOTAL	0	0	0	0	34	32	31	

ORANGE ROUGHY (*Hoplostethus atlanticus*) X

Country	1988	1989	1990	1991	1992	1993	1994	1995
Norway						1		
TOTAL	0	0	0	0	0	1	0	0

continued

Table 4.5 (continued)

ORANGE ROUGHY (*Hoplostethus atlanticus*) XII

Country	1988	1989	1990	1991	1992	1993	1994	1995
Faroes						24	89	580
TOTAL	0	0	0	0	0	24	89	580
ALL AREAS	0	0	8	3904	4930	2958	2373	1041

Table 4.6 Silver Scabbardfish. Study Group estimates of landings (tonnes).

SILVER SCABBARDFISH (*Lepidopus caudatus*) VI and VII

Country	1988	1989	1990	1991	1992	1993	1994	1995
France								
Germany, F.R.						2		
TOTAL	0	0	0	0		2		

SILVER SCABBARDFISH (*Lepidopus caudatus*) VIII and IX

Country	1988	1989	1990	1991	1992	1993	1994	1995
France								
Portugal	2666	1385	547	808	1264	2397	1054	5492*
Russia/USSR			37		110			
TOTAL	2666	1385	584	808	1374	2397	1054	5492*

*excl. December

SILVER SCABBARDFISH (*Lepidopus caudatus*) X

Country	1988	1989	1990	1991	1992	1993	1994	1995
Latvia					1905			
Portugal	70	91	120	166	255	264	373	
TOTAL	70	91	120	166	2160	264	373	

SILVER SCABBARDFISH (*Lepidopus caudatus*) XII

Country	1988	1989	1990	1991	1992	1993	1994	1995
Russia/USSR		102	20					
TOTAL	0	102	20	0	0	0		
ALL AREAS	2736	1578	724	974	3534	2663	1427	5492*

*excl. December

Table 4.7 Study Group estimates of landings (tonnes)

ROUGHHEAD GRENADIER (*Macrourus berglax)* I and II

Country	1988	1989	1990	1991	1992	1993	1994	1995
Germany, F.R			9					
Norway			580	829	424	136		
TOTAL	0	0	589	829	424	136		

ROUGHHEAD GRENADIER (*Macrourus berglax)* II and IV

Country	1988	1989	1990	1991	1992	1993	1994	1995
Norway	0	0	0	0	7	0		
TOTAL	0	0	0	0	7	0		

ROUGHHEAD GRENADIER (*Macrourus berglax)* XIV

Country	1988	1989	1990	1991	1992	1993	1994	1995
Greenland						18	5	2
Norway	0	0	0	0	0	34		
TOTAL	0	0	0	0	0	52	5	2
TOTAL ALL AREAS	0	0	589	829	431	188	5	2

Table 4.8 Study Group estimates of landings (tonnes).

MORIDAE Vb

Country	1988	1989	1990	1991	1992	1993	1994	1995
Norway	0	0	0	5	0	0		
TOTAL	0	0	0	5	0	0		

MORIDAE VI and VII

Country	1988	1989	1990	1991	1992	1993	1994	1995
Norway	0	0	0	1	25	0		
TOTAL	0	0	0	1	25	0		

MORIDAE X

Country	1988	1989	1990	1991	1992	1993	1994	1995
Portugal	18	17	23	36	31	33	42	
TOTAL	18	17	23	36	31	33	42	
ALL AREAS	18	17	23	42	56	33	42	

Table 4.9 Study Group estimates of landings (tonnes).

RED (=BLACKSPOT) SEABREAM (*Pagellus bogaraveo*) VI and VII

Country	1988	1989	1990	1991	1992	1993	1994	1995
France	52	44	22	13	6	5		
Ireland	0	0	3	10	16	0		
Spain	47	69	73	30	18	10*	9*	
UK (England)	153	76	36	56	0	0		
UK (Chan. Isles)	0	0	0	14	0	0		
TOTAL	252	189	134	123	40	15	9	

RED (=BLACKSPOT) SEABREAM (*Pagellus bogaraveo*) VIII

Country	1988	1989	1990	1991	1992	1993	1994	1995
France	37	31	15	10	5	3		
Spain	91	234	280	124	119	172	131	
UK (England)	9	7	17	0	0	0		
TOTAL	137	272	312	134	124	175	131	

RED (=BLACKSPOT) SEABREAM (*Pagellus bogaraveo*) IX

Country	1988	1989	1990	1991	1992	1993	1994	1995
Portugal	370	260	166	109	166		146	
TOTAL	370	260	166	109	166		146	

RED (=BLACKSPOT) SEABREAM (*Pagellus bogaraveo*) X

Country	1988	1989	1990	1991	1992	1993	1994	1995
Portugal	637	924	889	874	1110	829	983	
TOTAL	637	924	889	874	1110	829	983	
ALL AREAS	1396	1645	1501	1240	1440	1019	1269	

Table 4.10 Study Group estimates of landings (tonnes)

GREATER FORKBEARD (*Phycis blennoides*) I and II

Country	1988	1989	1990	1991	1992	1993	1994	1995
Norway	0	0	23	39	33	1		
TOTAL	0	0	23	39	33	1		

GREATER FORKBEARD (*Phycis blennoides*) III and IV

Country	1988	1989	1990	1991	1992	1993	1994	1995
France	12	12	18	20	13	0		
Norway	0	0	92	161	130	28		
UK (England)	3	0	5	0	0	0		
UK (Scotland)	0	0	0	0	2	0		
TOTAL	15	12	115	181	145	28		

GREATER FORKBEARD (*Phycis blennoides*) Vb

Country	1988	1989	1990	1991	1992	1993	1994	1995
France	2	1	10	8	16	0		
Norway	0	0	28	44	33	22		
TOTAL	2	1	38	52	49	22		

GREATER FORKBEARD (*Phycis blennoides*) VI and VII

Country	1988	1989	1990	1991	1992	1993	1994	1995
France	252	342	454	476	646	0		
Ireland	0	14	0	1	4	0	111	
Norway	0	0	88	126	244	53		
Spain	485	0	0	0	0	0		
UK (England)	62	13	6	13	0	0		
UK (Scotland)	0	0	1	5	9	0		
TOTAL	799	369	549	621	903	53	111	

GREATER FORKBEARD (*Phycis blennoides*) VIII and IX

Country	1988	1989	1990	1991	1992	1993	1994	1995
France	7	7	16	18	9	0		
Portugal	0	0	0	4	8	8		
Spain	50	0	0	0	0	0		
TOTAL	57	7	16	22	17	8		

GREATER FORKBEARD (*Phycis blennoides*) X

Country	1988	1989	1990	1991	1992	1993	1994	1995
Portugal	29	42	50	68	81	115	135	
TOTAL	29	42	50	68	81	115	135	

ALL AREAS	902	431	791	983	1228	227	246	

Table 4.11 Study Group estimates of landings (tonnes).

WRECKFISH (*Polyprion americanus*) VI and VII

Country	1988	1989	1990	1991	1992	1993	1994	1995
France	7	0	2	10	15	0		
TOTAL	7	0	2	10	15	0		

WRECKFISH (*Polyprion americanus*) VIII and IX

Country	1988	1989	1990	1991	1992	1993	1994	1995
France	1	1	2	3	1	0		
Portugal	188	283	161	191	268	338	406	
Spain	9	0	0	0	0	0		
TOTAL	198	284	163	194	269	338	406	

WRECKFISH (*Polyprion americanus*) X

Country	1988	1989	1990	1991	1992	1993	1994	1995
France	0	0	0	0	3	0		
Portugal	191	235	224	170	234	308	428	
Norway	0	0	0	0	0	3		
TOTAL	191	235	224	170	237	311	428	
ALL AREAS	396	519	389	374	521	649	834	

Table 4.12 Study Group estimates of landings (tonnes).

SHARKS VARIOUS I and II

Country	1988	1989	1990	1991	1992	1993	1994	1995
Russia/USSR	37	15	0	0	0	0		
TOTAL	37	15	0	0	0	0		

SHARKS VARIOUS III and IV

Country	1988	1989	1990	1991	1992	1993	1994	1995
France	1	0	0	0	0	0		
Germany, F.R.	0	0	0	5	0	4	2	1
UK (England)	4	2	1	4	2	2	3	2
UK (Scotland)	0	14	10	8	0	0		
TOTAL	5	16	11	17	2	2	5	3

SHARKS VARIOUS Va

Country	1988	1989	1990	1991	1992	1993	1994	1995
Iceland	0	0	0	0	2	52	34	97*
TOTAL	0	0	0	0	2	52	34	97*

*preliminary

SHARKS VARIOUS Vb

Country	1988	1989	1990	1991	1992	1993	1994	1995
Faroes	0	0	0	3	36	376		
Germany, F.R.	0	0	0	0	0	2	43	
UK (England)	0	0	0	0	5	9		
TOTAL	0	0	0	3	41	387	43	

SHARKS VARIOUS VI and VII

Country	1988	1989	1990	1991	1992	1993	1994	1995
Faroes	0	0	0	0	3	0		
France	21	21	383	1167	2727	0		
Germany, F.R.	0	0	0	0	0	124	395	2
Spain	66	0	0	0	0	0		
UK (England)	19	32	38	201	503	821	742	1315
UK (Scotland)	0	8	5	53	0	0		
TOTAL	106	125	426	1421	3233	945	1137	1317

SHARKS VARIOUS VIII and IX

Country	1988	1989	1990	1991	1992	1993	1994	1995
Portugal	0	0	1318	1433	1556	1517		
Spain	3545	0	0	0	0	0		
TOTAL	3545	0	1318	1433	1556	1517		

continued

Table 4.12 (continued)

SHARKS VARIOUS X

Country	1988	1989	1990	1991	1992	1993	1994	1995
Portugal	549	560	602	896	761	592		
TOTAL	549	560	602	896	761	592		
ALL AREAS	4242	716	2357	3770	5595	3495	1219	1417

Table 4.13 Study Group estimates of landings (tonnes).

RABBIT FISH (*Chimaera monstrosa*) Va

Country	1988	1989	1990	1991	1992	1993	1994	1995
Iceland				499	106	7	76	118*
TOTAL	0	0	0	499	106	7	76	118*
*preliminary								

RABBIT FISH (*Chimaera monstrosa*) VI and VII

Country	1988	1989	1990	1991	1992	1993	1994	1995
Ireland							2	
TOTAL	0	0	0	0	0	0	2	0
ALL AREAS	0	0	0	499	106	7	78	118*

Table 4.14 Study Group estimates of landings (tonnes).

SMOOTHHEAD (*Alepocephalus* spp.)

Country	1988	1989	1990	1991	1992	1993	1994	1995
Iceland					10	3	0.4	0.4*
TOTAL	0	0	0	0	10	3	0.4	0.4*

*preliminary

Table 4.15 Ling. Study Group estimates of landings (tonnes).

LING IIa

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Faroe Islands	3	2	14	17	3	-	101	16
France	29	19	20	12	9	9		
Germany, Fed. Rep.	10	11	17	5	6	13	9	8
Norway	6,070	7,326	7,549	7,755	6,495	7,032*	6,169*	5,921
UK (England & Wales)	4	10	25	4	8	39	30	3
UK (Scotland)	3	-	3	+	+	-	-	...
United Kingdom								6
Total	6,119	7,368	7,628	7,793	6,521	7,093	6,309	5,954

*Preliminary

LING IIb

Country	1988	1989	1990	1991	1992	1993	1994	1995*
U K (E & W)	7	-	-	-	-	-	13	-
Total	7	-	-	-		-	13	-

LING III

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Belgium	2	1	4	1	4	3	2	-
Denmark	165	246	375	278	323	343	-	-
Germany, Fed. Rep.	-	-	3	-	-	-	+	-
Netherland	-	-	-	-	-	-	-	-
Norway	135	140	131	161	120	150	116	-
Sweden	29	35	30	44	100	131	112	-
UK (E & W)	-	-	-	-	-	15	-	-
Total	331	422	543	484	547	642	230	-

N.B. United Kingdom does not include Isle of Man

Table 4.15 (Continued)

LING IVa

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Belgium	3	1	1	4	9	9	20	2
Denmark	408	578	610	609	613	629	528	
Faroe Islands	13	3	9	6	2	14	25*	
France[1]	1,143	751	655	847	414	395		
Germany, Fed. Rep.	262	217	241	223	200	726	770	425
Netherlands	4	16	-	-	-	-	-	-
Norway	6,473	7,239	6,290	5,799	5,945	6,522*	5,355*	6,148
Sweden[1]	5	29	13	24	28	13	3	
UK (England & Wales)	55	136	213	197	330	363	148	179
UK (N. Ireland)	1	14	-	+	4	-	+	...
UK (Scotland)	2,856	2,693	1,995	2,260	3,208	4,138	4,645	...
United Kingdom								5,712
Total	11,223	11,677	10,027	9,969	10,753	12,809	11,494	12,516

*Preliminary. [1] Includes IVb 1988-1993.

LING IVb,c

Country	1988	1989	1990	1991	1992	1993	1994	1995*
U K (E & W)	172	234	255	284	385	412	433	300
Germany	-	-	-	-	-	-	-	23
Total	172	234	255	284	385	412	433	323

LING Va

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Belgium	134	95	42	69	34	20	3	-
Faroe Islands	619	614	399	530	526	501	548*	430
Germany, Fed. Rep.	-	-	-	-	-	-	+	+
Iceland	5,098	4,898	5,157	5,206	4,556	4,333	4,053	3,530
Norway	10	5	-	-	-*	-*	-	-
Total	5,861	5,612	5,598	5,805	5,116	4,854	4,604	3,960

*Preliminary.

N.B. United Kingdom does not include Isle of Man

Table 4.15 (Continued)

LING Vb_1

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Denmark	4[2]	-	-	-	-	-	-	
Faroe Islands	1,383	1,498	1,575	1,828	1,218	1,242	1,541*	2,985[3]
France	53	44	36	37	3	5*		
Germany, Fed. Rep.	4	2	1	2	+	1	1[3]	1[3]
Norway	884	1,415	1,441	1,594	1,153	921	1,017*	446
UK (England & Wales)	1	-	+	-	15	62	20	2
UK (Scotland)[1]	...	...	...	...	...	...	...	...
United Kingdom								34[4]
Total	2,329	2,959	3,053	3,461	2,389	2,231	2,579	3,468

*Preliminary. [1]Included in Vb_2. [2]Includes 1 t reported as Division Vb. [3]Includes Vb_2. [4]Reported as Vb.

LING Vb_2

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Faroe Islands	832	362	162	492	577	282	479*	[1]
Norway	1,284	1,328	633	555	637	332	486	503
UK (England & Wales)	-	-	-	-	-		10	...[2]
UK (Scotland)[1]	5	3	9	4	11	11	20	...[2]
Total	2,121	1,693	804	1,051	1,225	625	995	503

*Preliminary. [1]Includes Vb_1. [2]See Vb_1.

LING VIa

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Belgium	4	6	-	3	-	+	1	-
Denmark	+	1	+	+	1	+	1	-
Faroe Islands	-	6	8	3	-	-	-*	-
France[1]	5,381	3,417	2,568	1,777	1,297	1,492		
Germany, Fed. Rep.	6	11	1	2	2	92	134	130
Ireland	196	138	41	57	38	171	133	
Norway	3,392	3,858	3,263	2,029	2,305	1,937*	2,034*	3,156
Spain	580							
UK (England & Wales)	1,075	307	111	260	259	442	551	547
UK (Isle of Man)	-	+	-	-	+	-	-	
UK (N. Ireland)	53	6	2	10	6	13	10	...
UK (Scotland)	874	881	736	654	680	1,133	1,126	...
United Kingdom								2,552
Total	11,561	8,631	6,730	4,795	4,588	5,280	3,990	6,385

*Preliminary. [1]Reported for area, not divisions.

N.B. United Kingdom does not include Isle of Man

Table 4.15 (Continued)

LING VIb

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Faroe Islands	196	17	3	-	35	4	104	71[1]
France[2]	8	2*	-*	2*	690*	-*		
Germany, Fed. Rep.	-	-	-	-	+	+	-	+
Ireland	-	-	26	31	23	60	44	
Norway	1,253	3,616	1,315	2,489	1,713	1,179*	2,116*	1,308
Spain	2,995							
UK (England & Wales)	93	26	10	29	28	43	52	81
UK (N. Ireland)	-	-	+	2	2	4	4	...
UK (Scotland)	223	84	151	111	90	232	220	...
United Kingdom								206
Total	4,768	3,745	1,505	2,664	2,581	1,522	2,540	1,666

*Preliminary. [1]Includes XII. [2]See Ling VIa.

LING VII

Country	1988	1989	1990	1991	1992	1993	1994	1995*
France	5,057	5,261	4,575	3,977	2,552	2,123	-	-
Total	5,057	5,261	4,575	3,977	2,552	2,123	-	-

LING VIIa

Country	1988	1989	1990	1991	1992	1993	1994	1995*
France[1]								
Belgium	14	10	11	4	4	10	8	12
Ireland	100	138	8	10	7	51	136	
UK (England & Wales)	49	112	63	31	43	81	46	46
UK (Isle of Man)	-	1	1	2	1	2	2	
UK (N. Ireland)	38	43	59	60	40	60	76	...
UK (Scotland)	10	7	27	18	10	15	16	...
United Kingdom								139
Total	294	391	251	178	133	250	284	197

*Preliminary. [1]French catches in VII not split into sub-areas

N.B. United Kingdom does not include Isle of Man

Table 4.15 (Continued)

LING VIIb,c

Country	1988	1989	1990	1991	1992	1993	1994	1995*
France[1]								
Germany, Fed. Rep.	-	+	-	-	-	97	98	161
Ireland	50	43	51	62	44	224	225	
Norway	57	368	463	326	610	145*	306*	295
Spain	1,231							
UK (England & Wales)	750	161	133	294	485	550	530	606
UK (N. Ireland)	-	-	-	8	4	9	2	...
UK (Scotland)	8	5	31	59	143	409	434	...
United Kingdom								905
Total	2,348	795	829	959	1,383	1,525	1,595	1,967

*Preliminary. [1]See Ling VII.

LING VIId,e

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Belgium	36	52	31	7	10	15	14	10
Denmark	+	-	-	-	+	-	+	
France[1]								
Ireland	-	-	22	25	16	-	-	
UK (England & Wales)	743	644	743	647	493	421	437	497
UK (Scotland)	-	4	3	1	+	+		...
United Kingdom								488
Total	2,991	2,623	2,371	2,226	1,670	1,487	451	995

*Preliminary. [1]See Ling VII.

LING VIIf

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Belgium	77	42	23	34	9	8	21	35
France[1]								
Ireland	-	-	3	5	1	-	-	
UK (England & Wales)	367	265	207	259	127	215	379	454
UK (Scotland)	-	3	-	4	-	+	-	...
United Kingdom								455
Total	701	481	380	599	283	355	400	944

*Preliminary. [1]See Ling VII

N.B. United Kingdom does not include Isle of Man

Table 4.15 (Continued)

LING VIIg-k

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Belgium	35	23	20	10	10	9	19	34
Denmark	1	-	+	+	-	+	-	
France[1]								
Germany, Fed. Rep.	-	-	-	-	-	35	10	40
Ireland	286	301	356	454	323	374	620	
Norway	-	163	260	-	-	-*	-*	-
Spain	1,421							
UK (England & Wales)	1,439	518	434	830	1,130	1,551	2,143	3,228
UK (Isle of Man)	-	-	+	-	-	-	-	
UK (N. Ireland)	-	+	-	-	+	1	1	...
UK (Scotland)	2	7	7	100	130	364	277	...
United Kingdom								3,663
Total	6,238	4,526	4,333	3,577	3,124	3,711	3,070	6,965

*Preliminary. [1]See Ling VII

LING VIII

Country	1988	1989	1990	1991	1992	1993	1994	1995*
U K (E & W)	10	7	1	12	1	2	8	46
France	1,018	1,214	1,371	1,127	801	508	-	-
Total	1,028	1,221	1,372	1,139	802	510	8	46

LING XII

Country	1988	1989	1990	1991	1992	1993	1994	1995*
U K (E & W)	-	-	3	10	-	-	5	3
Total	-	-	3	10	-	-	5	3

LING XIV

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Germany, Fed. Rep.	3	1	1	+	9	-	+	-
Iceland	-	-	-	-	-	+	-	
Norway	-	-	2	+	7	1*	4*	14
UK (England & Wales)	-	-	6	1	1	8	1	3
UK (Scotland)	-	-	-	-	-	-	1	...
United Kingdom								3
Total	3	1	9	1	17	9	6	20

*Preliminary.

N.B. United Kingdom does not include Isle of Man

Table 4.15 (Continued)

TUSK IIa

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Faroe Islands	115	75	153	38	33	-	281*	
France	32	55	63	32	21	23		
Germany, Fed. Rep.	13	10	13	6	2	2	2	2
Greenland	-	-	-	-	-	1[1]	-	
Norway	14,241	19,206	18,387	18,227	15,908	17,545	12,266	11,229
UK (England & Wales)	2	4	12	3	10	3	3	...
UK (Scotland)	-	-	+	+	-	+	-	...
United Kingdom								1
Total	14,403	19,350	18,628	18,306	15,974	17,574	12,552	11,320

*Preliminary. [1]Includes IIb.

TUSK IIb

Country	1988	1989	1990	1991	1992	1993	1994	1995*
U K (E & W)	-	-	-	-	-	1	-	-
Total	-	-	-	-	-	1	-	-

N.B. United Kingdom does not include Isle of Man

Table 4.16 Blue ling. Study Group estimates of landings (tonnes).

BLUE LING IIa+b

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Faroe Islands	77	126	228	47	28	-	-	
France	37	43	49	24	19	12*	N/A	N/A
Germany, Fed. Rep.	5	5	4	1	+	2	2	1
Greenland	-	-	-	-	3[1]	3[1]	-	
Norway	3,416	1,883	1,128	1,408	987	1,003*	399*	342
UK (England & Wales)	2	2	4	-	2	+	9	-
UK (Scotland)	-	-	-	-	-	+	-	...
United Kingdom								1
Total	3,537	2,059	1,413	1,480	1,039	1,020	410	344

*Preliminary. [1]Includes IIb.

BLUE LING III

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Denmark	10	7	8	9	29	16	-	-
Norway	11	15	12	9	8	6	4	-
Sweden	1	1*	1	3	1	1	-	-
Total	22	23	21	21	38	23	4	-

BLUE LING IVa

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Denmark	1	1	+	1	1	2	+	-
Faroe Islands	13	-	-	31	-	101	-*	105
France IV	223	245	319	370	237	74*	-	-
Germany, Fed. Rep.	6	4	8	7	9	2	3	+
Norway	116	196	162	178	263	186*	241*	201
UK (England & Wales)	2	12	4	2	8	1	15	8
UK (Scotland)	2	+	+	32	36	44	19	...
United Kingdom								200
Total	363	458	493	621	554	410	278	514

*Preliminary.

BLUE LING IVb

Country	1988	1989	1990	1991	1992	1993	1994	1995*
U K (E & W)	-	-	-	-	-	3	-	-
Total	-	-	-	-		3	-	-

N.B. United Kingdom does not include Isle of Man

Table 4.16 (Continued)

BLUE LING IVc

Country	1988	1989	1990	1991	1992	1993	1994	1995*
U K (E & W)	-	-	-	-	-	-	3	-
Total	-	-	-	-		-	3	-

BLUE LING Va

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Faroe Islands	271	403	1,029	241	321	40	89	104
Germany, Fed. Rep.	-	-	-	-	-	-	1	2
Iceland	1,893	2,125	1,992	1,582	2,558	2,193	1,542	1,490
Norway	7	5	-	1	1	-*	-*	-
Total	2,171	2,533	3,021	1,824	2,880	2,233	1,632	1,596

*Preliminary.

BLUE LING Vb_1

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Faroe Islands	3,487	2,468	946	1,573	1,918	2,088	1,065*	1,764[2]
France V	3,038	1,802	1,707	562	315	151	-	-
Germany, Fed. Rep.	49	51	71	36	21	24	3[2]	2
Norway	94	228	450	196	390	218*	173*	38
UK (England & Wales)	-	-	-	1	4	19	-	4
UK (Scotland)	-	-	-	...[1]	...[1]	...[1]	...[1]	...
United Kingdom								8[3]
Total	6,668	4,549	3,174	2,368	2,648	2,500	1,241	1,816

*Preliminary. [1]Included in Vb_2. [2]Includes Vb_2. [3]Reported as Vb.

BLUE LING Vb_2

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Faroe Islands	2,788	622	68	71	1,705	182	239*	[2]
Norway	72	95	191	51	256	22*	16*	36
UK (Scotland)	-	-	-	2[1]	+[1]	9[1]	1[1]	...[2]
Total	2,860	717	259	124	1,961	213	256	36

*Preliminary. [1]Includes Vb_1. [2]See Vb_1.

Table 4.16 (Continued)

BLUE LING VIa

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Faroe Islands	14	6	-	8	4	-	-	-
France	6,616	7,383	4,487	3,226	3,330	3,116		
Germany, Fed. Rep.	2	2	44	18	4	48	24	+
Ireland	-	-	-	-	-	3	73	
Norway	29	143	54	63	129	27*	90*	96
UK (England & Wales)	2	-	-	1	-	13	1	34
UK (Scotland)	1	+	1	35	24	42	91	...
United Kingdom								744
Total	6,664	7,534	4,586	3,351	3,491	3,249	279	874

*Preliminary.

BLUE LING VIb

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Faroe Islands	2,000	1,292	360	111	231	51	5*	373[1]
France	499	60*	1,125	3,531	1,272	840		
Germany, Fed. Rep.	37	22	-	6	2	109	104	160
Norway	42	217	127	102	50	50	33*	12
UK (England & Wales)	9	-	-	5	2	66	3	11
UK (Scotland)	14	16	2	15	14	57	25	...
United Kingdom								49
Total	2,601	1,607	1,614	3,775	1,571	1,173	170	605

*Preliminary. [1] includes XII.

BLUE LING VIIa

Country	1988	1989	1990	1991	1992	1993	1994	1995*
France[1]	-	-	-	-	-	-		
UK (Scotland)	-	-	-	1	-	-	-	-
Total	-	-	-	1	-	-	-	-

*Preliminary. [1] Not reported by divisions.

BLUE LING VIIb,c

Country	1988	1989	1990	1991	1992	1993	1994	1995*
France VII [1]	22	279	159	152	116	102		
Germany, Fed. Rep.	1	-	-	-	-	-	-	-
Ireland	-	-	-	-	-	-	1	
Norway	-	2	-	-	3	2	1	-
UK (England & Wales)	-	-	-	-	-	11	6	3
UK (Scotland)	-	-	-	-	6	28	22	...
United Kingdom								12
Total	23	281	159	152	125	143	30	15

*Preliminary. [1] See VIIa

N.B. United Kingdom does not include Isle of Man

Table 4.16 (Continued)

BLUE LING VIId,e

Country	1988	1989	1990	1991	1992	1993	1994	1995*
France[1]	-	-	-	-	-	-		
Total	-	-	-	-	-	-		

*Preliminary. [1]See VIIa.

BLUE LING VIIg-k

Country	1988	1989	1990	1991	1992	1993	1994	1995*
France [1]	-	-	-	-	-	-		
UK (England & Wales)	-	-	-	-	-	5	3	...
UK (Scotland)	-	-	-	-	-	2	4	...
United Kingdom								44
Total						7	7	44

*Preliminary.[1] See VIIa

BLUE LING X

Country	1988	1989	1990	1991	1992	1993	1994	1995*
France	-	-	-	33	-	-		
Total	-	-	-	33	-	-		

BLUE LING XII

Country	1988	1989	1990	1991	1992	1993	1994	1995*
France	263	70	5	1,147	971	2,591		
Total	263	70	5	1,147	971	2,591		

BLUE LING XIV

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Faroe Islands	21	13	-	-	-	-	1	-
France	-	-	-	-	-	390	-	-
Germany, Fed. Rep.	218	58	64	105	27	16	15	4
Greenland	3	-	5	5	2	-	-	
Iceland	-	-	-	-	-	3,124	289	60
Norway	-	-	-	+	50	173*	11*	-
UK (England & Wales)	-	-	10	45	27	21	57	...
UK (Scotland)	-	-	-	-	4	1	-	...
United Kingdom								19
Total	242	71	79	155	110	3,725	373	83

*Preliminary.

Table 4.17 Tusk. Study Group estimates of landings (tonnes).

TUSK III

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Denmark	8	18	9	14	22	19	-	-
Norway	51	71	45	43	46	48	33	-
Sweden	2	4	6	27	15	12	12	-
Total	61	93	60	84	83	79	45	-

TUSK IVa

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Denmark	83	86	136	142	167	102	82	6
Faroe Islands	1	1	1	12	-	4	4*	-
France	201	148	144	212	119	82	-	-
Germany, Fed. Rep.	62	53	48	47	42	29	27	20
Norway	3,998	6,050	3,838	4,008	4,435	4,768	3,001	2,988
Sweden[1]	-	+	1	1	2	+	+	
UK (England & Wales)	12	18	29	26	34	9	24	10
UK (N. Ireland)	-	+	-	-	-	-	-	...
UK (Scotland)	72	62	57	89	131	147	151	...
United Kingdom								180
Total	4,429	6,418	4,254	4,537	4,930	5,141	3,289	3,204

*Preliminary. [1]Includes IVb 1988-1993.

TUSK IVb

Country	1988	1989	1990	1991	1992	1993	1994	1995*
U K (E & W)	-	1	-	-	1	-	2	3
Germany, (Fed.Rep.)	-	-	-	-	-	-	-	1
Total	-	1	-	-	1	-	2	4

TUSK Va

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Faroe Islands	3,757	3,908	2,475	2,286	1,567	1,329	1,212*	897
Germany	-	-	-	-	-	-	-	1
Iceland	3,078	3,143	4,816	6,446	6,442	4,746	4,612	5,446
Norway	20	10	-	-	-	-	-	-
Total	6,855	7,061	7,291	8,732	8,009	6,075	5,824	6,344

*Preliminary.

N.B. United Kingdom does not include Isle of Man

Table 4.17 (Continued)

TUSK Vb_1

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Denmark	+	-	-	-	-	-	-	
Faroe Islands	2,827	1,828	3,065	3,829	2,796	1,647	2,649*	3,280[2]
France	81	64	66	19	11	9		
Germany, Fed. Rep.	8	2	26	1	2	2	1[2]	1[2]
Norway	1,143	1,828	2,045	1,321	1,590	1,202*	747*	270
UK (England & Wales)	-	-	-	-	-	2	2	1
UK (Scotland)[1]	...	...	...	...	...	...	...	...
United Kingdom								3[3]
Total	4,059	3,722	5,202	5,170	4,399	2,862	3,399	3,555

*Preliminary. [1]Included in Vb_2. [2]Includes Vb_2. [3]Reported as Vb.

TUSK Vb_2

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Faroe Islands	545	163	128	375	541	292	445	
Norway	1,061	1,237	851	721	450	285	462	404
UK (England & Wales)	-	-	-	-	-	-	+	...[2]
UK (Scotland)[1]	+	+	+	+	1	+	2	...[2]
Total	1,606	1,400	979	1,096	992	577	909	404

*Preliminary. [1]Includes Vb_1. [2]See Vb_1.

TUSK VIa

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Denmark	-	+	-	-	-	-	+	
Faroe Islands	-	6	9	5	-	-	-*	-
France[1]	766	694	723	514	532	386		
Germany, Fed. Rep.	1	3	+	+	+	4	6	+
Ireland	-	2	-	-	-	3	1	
Norway	1,310	1,583	1,506	998	1,124	783	865	990
UK (England & Wales)	30	3	7	9	5	2	5	1
UK (N. Ireland)	-	-	+	+	-	+	-	...
UK (Scotland)	13	6	11	17	21	31	40	...
United Kingdom								81
Total	2,120	2,297	2,256	1,543	1,682	1,209	917	1,072

*Preliminary. [1]Reported for Division VI. Not allocated to Sub-areas.

N.B. United Kingdom does not include Isle of Man

Table 4.17 (Continued)

TUSK VIb

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Faroe Islands	217	41	6	-	63	12	70*	86[2]
France	4	1*	3*	6*	1*	2*		
Germany, Fed. Rep.	-	-	-	+	+	+	+	+
Ireland	-	-	-	5	5	32	30	
Norway	601	1,537	738	1,068	763	899	1,673*	1,415
UK (England & Wales)	8	2	2	3	3	3	6	1
UK (N. Ireland)	-	-	+	-	1	+	-	...
UK (Scotland)	34	12	19	25	30	54	66	...
United Kingdom								36
Total	864	1,593	768	1,107	866	1,002	1,845	1,538

*Preliminary. [1]See VIa. [2]Includes XII.

TUSK VII

Country	1988	1989	1990	1991	1992	1993	1994	1995*
France	15	22	20	15	16	9	-	-
Total	15	22	20	15	16	9	-	-

TUSK VIIa

Country	1988	1989	1990	1991	1992	1993	1994	1995*
France[1]								
UK (England & Wales)	-	-	+	-	+	+	-	...
UK (Scotland)	+	+	+	1	2	+	+	...
United Kingdom								1
Total	+	1	4	1	2	+	+	1

*Preliminary. [1]French catches not split into Sub-areas. [1]See Tusk VII

TUSK VIIb,c

Country	1988	1989	1990	1991	1992	1993	1994	1995*
France[1]								
Ireland	-	-	3	7	8	15	9	
Norway	12	91	138	30	167	70	63	18
UK (England & Wales)	5	-	1	2	33	17	9	7
UK (N. Ireland)	-	-	-	1	1	+	-	...
UK (Scotland)	+	-	2	1	3	12	8	...
United Kingdom								7
Total	29	108	154	51	218	119	89	32

*Preliminary. [1]French catches not split into Sub-areas. [1]See Tusk VII.

N.B. United Kingdom does not include Isle of Man

Table 4.17 (Continued)

TUSK VIIg-k

Country	1988	1989	1990	1991	1992	1993	1994	1995*
France[1]								
Ireland	-	-	-	-	-	17	12	
Norway	-	82	27	-	-	-	-	-
UK (England & Wales)	5	1	0	8	38	7	12	16
UK (Scotland)	-	-	+	2	-	3	3	...
United Kingdom								26
Total	6	85	32	12	45	30	27	42

*Preliminary. [1]French catches not split into Sub-areas. [1]See Tusk VII

TUSK VIIIa

Country	1988	1989	1990	1991	1992	1993	1994	1995*
U K (E & W)	1	-	-	-	-	-	-	-
Total	1	-	-	-	-	-	-	-

TUSK XII

Country	1988	1989	1990	1991	1992	1993	1994	1995*
France	1	1	0	1	1	12	-	-
Total	1	1	0	1	1	12	-	-

TUSK XIV

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Faroe Islands	19	13	-	-	-	-	-*	
Germany, Fed. Rep.	2	1	2	2	+	+	-	-
Iceland	-	-	-	-	4	1	+	-
Norway	-	-	7	68	120	53	16	30
UK (England & Wales)	-	-	-	1	+	+	+	
Total	21	14	9	71	124	54	16	30

*Preliminary.

N.B. United Kingdom does not include Isle of Man

Table 4.18 Spanish landings (in tonnes) of Phycis sp., Molva sp. and Pagellus sp., obtained in Sub-Areas VI+VII, Divisions VIIIa,b,d, and Division VIIIc, in the period 1985-1994. Main catches of Pagellus sp. might be considered as P. bogaraveo. (* Preliminary data).

	Phycis sp.				
VI+VII	Trawl	Long Line	Gillnet	Total	
1985	1823.3	444.3		2267.6	
1986	919.4	207.2		1126.6	
1987	1178.6	421.4		1599.9	
1988	1223.7	360.0		1583.7	
1989	1007.5	438.2		1445.7	
1990	903.4	468.2		1371.6	
1991	636.6	316.4		953.0	
1992	387.4	357.1		744.5	
1993	363.2	460.6		823.8	*
1994	618.2	383.8		1002.0	

	Molva sp.				
VI+VII	Trawl	Long Line	Gillnet	Total	
1985	1798.6	1763.8		3562.5	
1986	1190.8	3196.1		4386.9	
1987	1277.0	4068.1		5345.1	
1988	1547.8	2084.0		3631.8	
1989	806.3	2246.2		3052.5	
1990	1358.4	2164.0		3522.4	
1991	964.2	1250.2		2214.4	
1992	926.1	977.1		1903.2	
1993	457.8	819.8		1277.5	*
1994	678.7	969.7		1648.4	

	Pagellus sp.				
VI+VII	Trawl	Long Line	Gillnet	Total	
1985	92.7	62.6		155.3	
1986	42.3	47.2		89.5	
1987	22.3	28.5		50.8	
1988	18.6	27.9		46.5	
1989	17.1	51.5		68.6	
1990	14.7	58.7		73.4	
1991	8.6	21.3		29.9	
1992	3.1	14.9		18.0	
1993	1.3	9.0		10.3	
1994	0.8	8.5		9.3	

VIIIabd	Trawl	Long Line	Gillnet	Total	
1985					
1986					
1987					
1988					
1989	4.2	16.0		20.1	
1990	45.6	10.5		56.1	
1991	4.6	17.2		21.8	
1992	21.0	21.1		42.1	
1993	44.4	5.4		49.8	*
1994	85.1	15.8		100.9	

VIIIabd	Trawl	Long Line	Gillnet	Total	
1985					
1986					
1987					
1988					
1989	64.7	119.1		183.8	
1990	147.2	115.4		262.6	
1991	60.7	89.9		150.6	
1992	29.8	141.6		171.4	
1993	1.5	92.8		94.2	*
1994	19.6	4.6		24.2	

VIIIabd	Trawl	Long Line	Gillnet	Total	
1985					
1986					
1987					
1988					
1989	19.2	33.8		53.1	
1990	13.8	45.6		59.4	
1991	2.4	25.7		28.1	
1992	1.4	11.3		12.6	
1993	1.1	33.0		34.2	
1994	1.6	1.4		3.0	

VIIIc	Trawl	Long Line	Gillnet	Total	
1985	17.5	33.9	0.5	52.0	
1986	6.5	28.4	0.3	35.3	
1987	4.5	19.9	0.9	25.3	
1988	52.2	19.8	1.4	73.5	
1989	96.3	21.3	0.7	118.3	
1990	88.1	68.4	5.2	161.7	
1991	26.7	58.5	0.7	85.8	
1992	60.9	58.3	0.7	119.9	
1993	255.7	79.4	1.7	336.8	*
1994	178.7	37.9	2.4	219.1	

VIIIc	Trawl	Long Line	Gillnet	Total	
1985					
1986					
1987					
1988					
1989	0.1			0.1	
1990	0.5			0.5	
1991	30.7	121.5		152.2	
1992	4.0	119.9		123.9	
1993	0.6	44.3	0.1	45.0	*
1994	0.0	0.1	0.0	0.1	

VIIIc	Trawl	Long Line	Gillnet	Total	
1985	32.1	211.8	45.7	289.6	
1986	31.8	113.8	32.4	178.0	
1987	25.5	57.9	30.8	114.2	
1988	33.5	36.9	20.2	90.6	
1989	36.6	121.0	23.2	180.8	
1990	67.1	126.8	27.0	220.8	
1991	9.6	66.3	20.3	96.2	
1992	7.7	70.8	27.8	106.4	
1993	7.4	98.2	31.8	137.3	
1994	5.3	83.6	38.8	127.7	

Table 6.3.1 Ling in IIa Available data for assessment						
	Norw.	Norw.	Norw.	Norw.	Norw.	Total
Year	CPUE	lengths	Weigths	Maturity	ALK	Catch
1974						x
1975						x
1976						x
1977						x
1978						x
1979						x
1980						x
1981						x
1982						x
1983						x
1984						x
1985	x					x
1986	x					x
1987						x
1988	x					x
1989		x		x	x	x
1990		x	x	x		x
1991		x				x
1992	x					x
1993	x	x	x	x	x	x
1994		x	x	x	x	x
1995		x	x	x	x	x

Table 6.3.2 Ling in IVa. Available data for assessment						
	Norw.	Norw.	Norw.	Norw.	Norw.	Total
Year	CPUE	lengths	Weigths	Maturity	ALK	Catch
1974	x					x
1975	x					x
1976	x	x				x
1977	x					x
1978	x					x
1979	x					x
1980	x					x
1981	x					x
1982	x					x
1983	x					x
1984	x					x
1985	x					x
1986	x					x
1987	x					x
1988	x	x				x
1989	x	x	x	x	x	x
1990	x	x				x
1991	x					x
1992	x	x	x	x	x	x
1993	x	x	x	x	x	x
1994	x	x	x	x	x	x
1995		x	x	x	x	

Table 6.3.3 Ling in Va Available data for assessment						
	Icel.	Icel.	Icel.	Icel.	Icel.	Total
Year	CPUE	lengths	Weigths	Maturity	ALK	Catch
1973						x
1974						x
1975						x
1976		x				x
1977						x
1978		x				x
1979		x				x
1980		x				x
1981		x			x	x
1982		?			x	x
1983		?			?	x
1984		x			?	x
1985		x			x	x
1986		x			x	x
1987		x			x	x
1988		x			x	x
1989		x			x	x
1990		x			x	x
1991	x[1,2,3]	x			x	x
1992	x[1,2,3]	x			x	x
1993	x[1,2,3]	x	x	x	x	x
1994	x[1,2,3]	x	x	x	x	x
1995	x[1,2,3]	x	x	x	x	x
1) Longline						
2) Bottom trawl						
3) Gillnets						

Table 6.3.4. Ling in Vb Available data for assessment											
	Norw.	Faroe	Norw.	Faroe	Norw.	Faroe	Norw.	Faroe	Norw.	Faroe	Total
Year	CPUE	CPUE	lengths	lengths	Weigths	Weigths	Maturity	Maturity	ALK	ALK	Catch
1973	x										x
1974	x										x
1975	x										x
1976	x		x								x
1977											x
1978	x										x
1979	x										x
1980	x										x
1981	x										x
1982	x										x
1983	x			x							x
1984	x			x							x
1985	x	x		x							x
1986	x	x		x							x
1987	x	x		x							x
1988	x	x		x							x
1989	x	x	x	x	x		x		x		x
1990	x	x	x	x							x
1991	x	x	x	x							x
1992	x	x		x							x
1993	x	x	x	x	x		x		x		x
1994		x		x					x	x	x
1995				x							x

Table 6.3.5 Ling in VIa. Available data for assessment										
	Norw.	Norw.	French	Norw.	French	Norw.	Norw.	French	French	Total
Year	CPUE	lengths	lengths	Weigths	Weigths	Maturity	ALK	ALK	Catch.nr	Catch
1974	x									x
1975	x									x
1976	x	x								x
1977	x									x
1978	x									x
1979	x									x
1980	x									x
1981	x									x
1982	x									x
1983	x									x
1984	x									x
1985	x		x							x
1986	x									x
1987	x									x
1988	x	x		x		x	x			x
1989	x	x		x		x	x			x[1]
1990	x	x		x		x	x			x[1]
1991	x		x		x				x	x[1]
1992	x	x	x	x	x	x	x		x	x[1]
1993	x	x	x	x	x	x	x		x	x[1]
1994	x	x		x		x	x			x[1]
1995		x		x		x	x			x[1]
1) Spanish landings incomplete.										

Table 6.3.6 Ling in VIb. Available data for assessment						
	Norw.	Norw.	Norw.	Norw.	Norw.	Total
Year	CPUE	lengths	Weigths	Maturity	ALK	Catch
1974	x					x
1975	x					x
1976	x	x				x
1977	x					x
1978	x					x
1979	x					x
1980	x					x
1981	x					x
1982	x					x
1983	x					x
1984	x					x
1985	x					x
1986	x					x
1987	x					x
1988	x					x[1]
1989	x	x	x	x	x	x[1]
1990	x	x				x[1]
1991	x					x[1]
1992	x					x[1]
1993	x	x	x	x	x	x[1]
1994	x	x	x	x	x	x[1]
1995		x	x	x	x	x[1]
1) Spanish landings incomplete.						

Table 7.3.1 Blue Ling in Vb Available data for assessment							
	Faroe	Faroe	Faroe	Faroe	French	Faroe	Total
Year	CPUE	lengths	Weigths	Maturity	CPUE	ALK	Catch
1973							x
1974							x
1975							x
1976							x
1977							x
1978							x
1979							x
1980		x	x	x		x	x
1981		x	x	x		x	x
1982		x	x	x		x	x
1983		x	x	x	x	x	x
1984	x	x	x	x	x	x	x
1985	x	x	x	x	x	x	x
1986	x	x	x	x	x	x	x
1987	x	x	x	x	x	x	x
1988	x	x	x	x	x	x	x
1989	x	x	x	x	x	x	x
1990	x	x	x	x	x	x	x
1991	x	x	x	x	x	x	x
1992	x	x	x	x	x	x	x
1993	x	x	x	x	x	x	x
1994	x	x	x	x		x	x
1995		x	x	x		x	x

Table 7.3.2 Blue ling in Va. Available data for assessment							
	Icel.	Icel.	Icel.	Icel.	Icel.	Total	
Year	CPUE	lengths	Weigths	Maturity[1]	ALK	Catch	
1973		x				x	
1974		x			x	x	
1975		x			x	x	
1976		x			x	x	
1977		x			x	x	
1978		x			x	x	
1979		x			x	x	
1980		x			x	x	
1981		x			x	x	
1982		x			x	x	
1983		?			x	x	
1984		?			x	x	
1985		x			x	x	
1986		x			x	x	
1987		x			x	x	
1988	x	x			x	x	
1989	x	x		x	x	x	
1990	x	x		x	x	x	
1991	x	x		x	x	x	
1992	x	x	x	x	x	x	
1993	x	x	x	x	x	x	
1994	x	x	x	x	x	x	
1995	x	x	x	x	x	x	
1) Data might be available for some more years							

Table 7.3.3 Blue ling in VIa. Available data for assessment					
	French	French	French	French	Total
Year	CPUE	lengths	Weigths	Agedistr.	Catch
1983	x				x
1984	x				x
1985	x				x
1986	x				x
1987	x				x
1988	x	x	x	x	x
1989	x	x	x	x	x
1990	x	x	x	x	x
1991	x	x	x	x	x
1992	x	x	x	x	x
1993	x	x	x	x	x
1994					x
1995					x

Table 7.3.4 Blue ling in VIb. Available data for assessment					
	French	French	French	French	Total
Year	CPUE	lengths	Weigths	Agedistr.	Catch
1983	x				x
1984	x				x
1985	x				x
1986	x				x
1987	x				x
1988	x	x	x	x	x
1989	x	x	x	x	x
1990	x	x	x	x	x
1991	x	x	x	x	x
1992	x	x	x	x	x
1993	x	x	x	x	x
1994					x
1995					x

Table 7.3.5 BLUE LING. Effort, total catch and CPUE in the French trawl fishery in Sub-areas Vb, VI and VII.

	ICES SUBAREA Vb			ICES SUBAREA VI			ICES SUBAREA VII		
Years	Effort (h)	Total catch (T)	CPUE (kg/h)	Effort (h)	Total catch (T)	CPUE (kg/	Effort (h)	Total catch (T)	CPUE (kg/h)
1983	0	0	0	27171	5134	18.90	850	2	0.24
1984	30	100	333.33	28543	6014	21.07	2630	20	0.76
1985	6377	2307	36.18	44338	11850	26.73	2984	26	0.87
1986	3647	2622	71.89	41858	9762	23.32	6312	29	0.46
1987	6222	3246	52.17	42724	9379	21.95	9048	16	0.18
1988	7353	3038	41.32	41493	7061	17.02	4101	14	0.34
1989	6816	1800	26.41	62538	7210	11.53	4823	262	5.43
1990	8584	1608	18.73	73580	4545	6.18	4673	171	3.66
1991	3470	417	12.02	84322	5734	6.80	6594	140	2.12
1992	2079	171	8.23	92645	3694	3.99	8766	107	1.22
1993	1054	91	8.63	91111	3671	4.03	8744	91	1.04

Table 8.3.1 Tusk in IIa Available data for assessment						
	Norw.	Norw.	Norw.	Norw.	Norw.	Total
Year	CPUE	lengths	Weigths	Maturity	ALK	Catch
1974						x
1975						x
1976						x
1977						x
1978						x
1979						x
1980						x
1981						x
1982						x
1983						x
1984						x
1985	x					x
1986	x					x
1987						x
1988	x					x
1989		x		x	x	x
1990		x	x	x		x
1991		x				x
1992	x					x
1993	x	x	x	x	x	x
1994		x	x	x	x	x
1995		x	x	x	x	x

Table 8.3.2 Tusk in IVa. Available data for assessment						
	Norw.	Norw.	Norw.	Norw.	Norw.	Total
Year	CPUE	lengths	Weigths	Maturity	ALK	Catch
1974	x					x
1975	x					x
1976	x	x				x
1977	x					x
1978	x					x
1979	x					x
1980	x					x
1981	x					x
1982	x					x
1983	x					x
1984	x					x
1985	x					x
1986	x					x
1987	x					x
1988	x	x				x
1989	x	x	x	x	x	x
1990	x	x				x
1991	x					x
1992	x	x	x	x	x	x
1993	x	x	x	x	x	x
1994	x	x	x	x	x	x
1995		x	x	x	x	

Table 8.3.3 Tusk in Va. Available data for assessment							
	Icel.	Icel.	Faroe	Icel.	Icel.	Icel.	Total
Year	CPUE	lengths	lengths	Weigths	Maturity1	ALK	Catch
1976		x					x
1977							x
1978		x					x
1979		x					x
1980		x					x
1981		x					x
1982		x					x
1983		?				x	x
1984		?				?	x
1985		x				?	x
1986		x				x	x
1987		x				x	x
1988	x	x				x	x
1989	x	x			x	x	x
1990	x	x			x	x	x
1991	x	x			x	x	x
1992	x	x		x	x	x	x
1993	x	x		x	x	x	x
1994	x	x		x	x	x	x
1995	x	x	x	x	x	x	x
1) Data migth be available for some more years							

Table 8.3.4. Tusk in Vb Available data for assessment											
	Norw.	Faroe	Norw.	Faroe	Norw.	Faroe	Norw.	Faroe	Norw.	Faroe	Total
Year	CPUE	CPUE	lengths	lengths	Weigths	Weigths	Maturity	Maturity	ALK	ALK	Catch
1973	x										x
1974	x										x
1975	x										x
1976	x		x								x
1977											x
1978	x										x
1979	x										x
1980	x										x
1981	x										x
1982	x										x
1983	x			x							x
1984	x			x							x
1985	x	x		x							x
1986	x	x		x							x
1987	x	x		x							x
1988	x	x		x							x
1989	x	x	x	x	x		x		x		x
1990	x	x	x	x							x
1991	x	x		x							x
1992	x	x		x							x
1993		x	x	x	x		x		x		x
1994		x	x	x						x	x
1995				x						x	x

Table 8.3.5 Tusk in VIa. Available data for assessment						
	Norw.	Norw.	Norw.	Norw.	Norw.	Total
Year	CPUE	lengths	Weigths	Maturity	ALK	Catch
1974	x					x
1975	x					x
1976	x	x				x
1977	x					x
1978	x					x
1979	x					x
1980	x					x
1981	x					x
1982	x					x
1983	x					x
1984	x					x
1985	x					x
1986	x					x
1987	x					x
1988	x	x	x	x	x	x
1989	x	x	x	x	x	x
1990	x	x	x	x	x	x
1991	x					x
1992	x	x	x	x	x	x
1993	x	x	x	x	x	x
1994	x	x	x	x	x	x
1995		x	x	x	x	x
1) Spanish landings incomplete.						

Table 8.3.6 Tusk in VIb. Available data for assessment						
	Norw.	Norw.	Norw.	Norw.	Norw.	Total
Year	CPUE	lengths	Weigths	Maturity	ALK	Catch
1974	x					x
1975	x					x
1976	x	x				x
1977	x					x
1978	x					x
1979	x					x
1980	x					x
1981	x					x
1982	x					x
1983	x					x
1984	x					x
1985	x					x
1986	x					x
1987	x					x
1988	x					x
1989	x	x	x	x	x	x
1990	x	x				x
1991	x					x
1992	x					x
1993	x	x	x	x	x	x
1994	x	x	x	x	x	x
1995		x	x	x	x	x

Table 9.1 Argentina silus. Norwegian research vessel investigations 1980-1994, including acoustic survey estimates of biomass (tonnes).

Year	Area		
	VI, VII and IVa (North)	IIa	IIIa
1980	-	Survey, No estimate	-
1981	-	Survey, No estimate	-
1982	-	Survey, No estimate	-
1983	-	Survey, No estimate	-
1984	-	Survey, No estimate	-
1985	-	Survey, No estimate	-
1986	-	Survey, No estimate	-
1987	-	Survey, No estimate	Trawl surveys
1988	-	Survey, No estimate	-
1989	Survey, No est.	324,000	Survey, No est.
1990	395,000	418,000	-
1991	400,000	450,000	-
1992	No survey	402,000	23,000
1993	208,000	No survey	-
1994	Survey, No est.	No survey	-

Table 10.3.1 Effort and CPUE in ICES area V,VI, VII and VI only, for the French fishery (1994 data provisional).

	1991	1992	1993	1994
Effort (hours)	192545	205095	191483	
CPUE Total (kg/h)	19.9	22.2	11.4	
Effort (hour in VI)	119282	131944	129151	49494
CPUE VI (kg/h)	21.8	12.3	3.7	2.2

Table 11.1.1	Average total length (cm) and weight (kg) for roundnose grenadier in 1974-1984
	in ICES subarea XII (russian data)
Age	LT (cm)	Weight (kg)
6	42.2	0.239
7	48.2	0.29
8	51.9	0.342
9	55.8	0.417
10	60.1	0.52
11	63.3	0.62
12	67.3	0.708
13	70.3	0.799
14	73	0.875
15	75.8	0.951
16	78.4	1.005
17	80.4	1.064
18	83.4	1.159
19	86.1	1.255
20	88.9	1.386
21	90.9	1.467
22	92.3	1.555

Table 11.1.2	Maturation of female roundnose grenadier from ICES subarea XII (russian data)
Age	Adult female %
7	6.1
8	14.1
9	18.8
10	27.1
11	43.9
12	48.3
13	55.5
14	62.8
15	69.6
16	74.8
17	79.4
18	83.1
19	88
20	91.3
21	95.7
22	99
23	100
24	100

Table 11.3.1	Cathes (t)	effort (h) and CPUE for roundnose grenadier of BMRT-type russian trawlers					
	in ICES subaera XII						
years	catches T	Effort h	CPUE				
1974	17067	9088	1.88				
1975	29694	13648	2.18				
1976	4545	3280	1.39				
1977	8735	8688	1.01				
1978	9960	8336	1.19				
1979	4103	4096	1.00				
1980	11946	10000	1.19				
1981	4069	7232	0.56				
1982	670	1168	0.57				
1983	7786	6288	1.24				
1984	4443	4064	1.09				

Table 11.3.2 Effort (A > 10% and B > 100 kg) and CPUE of French trawlers on roundnose grenadier in Sub-areas V, VI, and VII.

YEAR		SUBAREA V	SUBAREA VI	SUBAREA VII
1989	EFFORT A	551	29389	2353
	CPUE A	241.4	60.2	67.6
	EFFORT B	2673	50703	4460
	CPUE B	61.7	43.2	47.8
1990	EFFORT A	3150	52400	3757
	CPUE A	318.4	96.2	47.9
	EFFORT B	4645	81259	5445
	CPUE B	226.5	67.7	38.2
1991	EFFORT A	2925	66079	6716
	CPUE A	396.6	102.4	60.9
	EFFORT B	3202	95738	9291
	CPUE B	365.1	76.5	52.3
1992	EFFORT A	2006	75879	14297
	CPUE A	337.5	79.2	102.5
	EFFORT B	2164	111301	18585
	CPUE B	314.7	58.0	83.4
1993	EFFORT A	1063	71972	24726
	CPUE A	314.2	82.2	67.3
	EFFORT B	1095	112070	30244
	CPUE B	305.9	57.8	56.6

Table 11.4.1	Age composition (%) in 1985-1989 for roundnose grenadier in ICES subarea XII (russian data)				
Age	1985	1986	1987	1988	1989
2					
3					0.1
4					0.3
5			0.1	0.4	1.1
6	0.4	1.9	0.9	4.5	2.9
7	0.8	2.4	0.6	3.5	3.2
8	3.6	4.1	2.4	6.9	4.4
9	2.1	4.3	2	5.9	3.3
10	4.4	6.4	5.4	6.5	6.2
11	6	7.5	5.8	7.2	7.5
12	9.6	10.4	9.4	7.4	8.5
13	12.2	12	14.7	6.2	6.4
14	14.1	12.6	12.3	7.8	10.2
15	14.9	12.4	13.4	6.8	13.1
16	12.8	10.8	12.9	11.2	9.2
17	9.6	7.3	11.4	7.2	9.8
18	5.8	4.4	5	5.4	6.2
19	2.6	2	3.1	3.4	3.1
20	1.2	0.9	0.3	5.7	3.5
21	0.6	0.5	0.4	2.4	0.7
22	0.1	0.1	0.6	1.7	1
23					0.5
Av Age	15.1	13..2	14.2	13.4	16
N aged fish	7025	22647	10214	6676	9197

Table 11.4.2	Length distribution per year of the landings of roundnose grenadier from France for the subarea VI.			
	1990	1991	1992	1993
Preanal Length				
10				
10.5				
11				
11.5				
12				
12.5				
13				
13.5				23459
14				20451
14.5		33447		88534
15	11347	12450	46823	261345
15.5	11347	23093	11706	331658
16	19254	31994	126996	313028
16.5	32964	138631	91853	345298
17	102730	228547	293753	639459
17.5	148943	264450	319388	474769
18	164144	297478	524467	695994
18.5	317590	414811	452684	556379
19	335976	492799	494091	574612
19.5	262546	449093	423330	511112
20	358647	587964	532321	529093
20.5	375950	492697	637647	441068
21	555013	648625	405329	336342
21.5	373343	532468	335357	240210
22	458990	472667	468640	274421
22.5	256980	480991	223344	33699
23	386617	386625	296258	83177
23.5	244607	247670	235045	59003
24	127101	249640	172813	21255
24.5	153829	101279	85337	15778
25	135466	35544	43471	10240
25.5	13910	24901	31936	0
26	13910	0	15968	10240
26.5	0	25772	20348	
27	0		10174	
27.5	11547			
	1990	1991	1992	1993
Total Number	4874741	6675627	6299079	6890624
Total weight (kg	5403000	7341000	6462000	6404000
mean weight kg	1.108	1.099	1.026	0.929
mean length	20.975	20.533	20.154	18.562
standard error	0.726	0.681	0.644	0.624

Table 11.4.3	Roundnose grenadier from French landings in				
	ICES Sub-area V. Estimation of age by year.				
Age	1990	1991	1992	1993	Mean 90-93
10		24901		0	6225
11		83538		0	20885
12	0	156943		0	6225
13	30814	249189	50499	0	82626
14	141747	320631	102176	54171	154681
15	283174	394847	378672	237514	323552
16	414402	623580	376624	225599	410051
17	447442	745724	848283	376141	604398
18	556222	702426	705719	491753	614030
19	710428	743105	692911	670683	704282
20	381874	618715	642994	548722	548076
21	536722	670523	754403	611704	643338
22	482811	571850	808882	784145	661922
23	399347	290150	682391	683670	513890
24	278548	177357	308800	398635	290835
25	123869	145369	268379	281093	204678
26	73806	109826	204989	379659	192070
27		36414	333321	333741	175869
28			12921	212436	56339
29			0	181523	45381
30			17804	86971	26194
31			6460	94966	25357
32				56475	14119
33				56118	14030
34				29152	7288
35				39111	9778
					0
					0
NB. TOTAL	4861206	6665088	6288257	6833982	6162133
	4872751	6673636	6299079	6404000	6062367
					0
	1.00237493	1.0012825	1.00172099	0.93708178	1

Table 12.1 Effort and CPUE in ICES area V, VI, VII and VI only for the French fishery.

	1989	1990	1991	1992	1993	1994
Effort (hour) V-VI-VII Sub-areas	162936	171635	192545	205095	191483	N/A
CPUE (kg/h)	1.8	8.9	15.1	14.8	18.3	
Effort (hour) VI Sub-area	97950	101951	119282	131944	129151	49494
CPUE (kg/h) VI Sub-area	0	10.3	22.3	18.1	22.8	34.9

Table 14.1.1 Red seabream. Catch at age in thousands.

Catch numbers at age

YEAR	1982	1983
AGE		
1	5	74
2	223	352
3	160	299
4	88	118
5	56	100
6	39	106
7	48	86
8	33	36
+gp	60	35
TOTALNUM	712	1206
TONSLAND	359	520
SOPCOF %	100	100

Catch numbers at age

YEAR	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
AGE										
1	20	35	114	6	63	177	16	9	15	6
2	191	332	151	159	574	798	347	312	290	175
3	420	392	262	320	537	519	624	703	741	558
4	221	153	345	290	284	467	347	321	428	374
5	125	171	244	216	186	318	206	200	254	219
6	104	159	164	114	82	98	116	112	144	94
7	99	109	111	75	35	56	83	83	104	85
8	62	51	55	29	18	21	54	45	52	39
+gp	95	43	46	19	9	21	38	35	60	34
TOTALNUM	1336	1444	1491	1228	1786	2476	1831	1820	2088	1583
TONSLAND	701	672	730	631	638	924	889	876	1101	828
SOPCOF %	100	100	100	100	100	101	100	100	100	100

Table 14.1.2 Red seabream. Weight at age in the catch.

Catch weights at age (kg)

YEAR	1982	1983
AGE		
1	0.0982	0.0844
2	0.1602	0.1557
3	0.2435	0.2465
4	0.3936	0.4194
5	0.5711	0.6081
6	0.7326	0.7932
7	0.9440	1.0317
8	1.1445	1.2434
+gp	1.7493	1.6263
SOPCOFAC	1.0000	1.0001

Catch weights at age (kg)

YEAR	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
AGE										
1	0.0821	0.0782	0.0844	0.0751	0.0632	0.0563	0.0621	0.0610	0.0678	0.0617
2	0.1524	0.1464	0.1396	0.1441	0.1278	0.1276	0.1374	0.1431	0.1415	0.1428
3	0.2370	0.2466	0.2507	0.2573	0.2595	0.2673	0.2638	0.2646	0.2683	0.2687
4	0.3985	0.3882	0.3876	0.4336	0.4384	0.4595	0.4441	0.4479	0.4606	0.4513
5	0.5696	0.5878	0.5592	0.6527	0.6909	0.6821	0.6845	0.6957	0.6904	0.6911
6	0.7886	0.7715	0.7399	0.8783	0.9480	0.9420	0.9582	0.9694	0.9631	0.9595
7	1.0096	0.9988	0.9512	1.1152	1.2244	1.1226	1.2399	1.2504	1.2556	1.2541
8	1.2348	1.2182	1.1902	1.4076	1.5484	1.5415	1.5612	1.5825	1.5900	1.5695
+gp	1.6015	1.6577	1.5774	1.8053	2.2660	2.2838	2.1326	2.2560	2.2541	2.2020
SOPCOFAC	0.9999	1.0001	1.0000	1.0001	1.0000	1.0065	1.0001	1.0000	1.0000	1.0000

Table 14.1.3 Red seabream. Maturity at age.

Proportion mature at age

YEAR	1982	1983
AGE		
1	0.0000	0.0000
2	0.0000	0.0000
3	0.1000	0.1000
4	0.4000	0.4000
5	0.7000	0.7000
6	0.9000	0.9000
7	1.0000	1.0000
8	1.0000	1.0000
+gp	1.0000	1.0000

Proportion mature at age

YEAR	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
AGE										
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000
4	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000
5	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
6	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
7	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
8	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
+gp	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table 14.1.4 Red seabream. SVPA.

Initial sum of squared residuals was 206.412 and
final sum of squared residuals is 27.756 after 84
iterations

Matrix of Residuals

Years	1982/83
Ages	
1/ 2	-1.468
2/ 3	0.673
3/ 4	0.517
4/ 5	0.229
5/ 6	-0.423
6/ 7	-0.417
7/ 8	0.272
	0.000
WTS	1.000

Years	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93		WTS
Ages												
1/ 2	1.530	-0.332	1.068	1.810	-2.414	-0.104	1.512	-0.642	-0.838	-0.122	0.000	0.203
2/ 3	0.371	-0.174	0.787	-0.604	-1.019	0.554	0.435	-0.355	-0.244	-0.425	0.000	0.463
3/ 4	0.073	0.767	-0.126	-0.790	-0.495	-0.217	-0.236	0.196	0.291	0.021	0.000	0.617
4/ 5	-0.149	0.152	-0.588	-0.381	-0.034	-0.336	0.320	0.217	0.147	0.122	0.000	1.000
5/ 6	-0.275	-0.494	-0.226	0.048	0.334	0.258	0.343	0.107	0.075	0.262	0.000	0.895
6/ 7	-0.026	-0.169	0.208	0.203	0.665	0.116	0.363	-0.031	-0.071	-0.115	0.000	0.916
7/ 8	-0.148	0.164	0.144	0.346	0.538	-0.140	-0.901	-0.152	-0.062	-0.061	0.000	0.728
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	
WTS	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		

Fishing Mortalities (F)

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
F-values	0.1227	0.2162	0.2602	0.3240	0.4281	0.3788	0.3461	0.4156	0.3844	0.4206	0.6695	0.8000

Selection-at-age (S)

	1	2	3	4	5	6	7	8
S-values	0.0333	0.4258	0.8729	0.8631	1.0000	1.0174	1.2276	1.3000

SEPARABLY GENERATED FISHING MORTALITIES

YEAR	1982	1983
AGE		
1	0.0041	0.0072
2	0.0522	0.0921
3	0.1071	0.1887
4	0.1059	0.1866
5	0.1227	0.2162
6	0.1248	0.2199
7	0.1506	0.2654
8	0.1227	0.2162

SEPARABLY GENERATED FISHING MORTALITIES

YEAR	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
AGE										
1	0.0087	0.0108	0.0142	0.0126	0.0115	0.0138	0.0128	0.0140	0.0223	0.0266
2	0.1108	0.1380	0.1823	0.1613	0.1474	0.1769	0.1637	0.1791	0.2851	0.3407
3	0.2271	0.2828	0.3737	0.3307	0.3021	0.3627	0.3356	0.3671	0.5845	0.6983
4	0.2246	0.2796	0.3695	0.3270	0.2987	0.3587	0.3318	0.3630	0.5779	0.6905
5	0.2602	0.3240	0.4281	0.3788	0.3461	0.4156	0.3844	0.4206	0.6695	0.8000
6	0.2647	0.3296	0.4356	0.3854	0.3521	0.4228	0.3911	0.4279	0.6812	0.8139
7	0.3194	0.3977	0.5256	0.4650	0.4249	0.5101	0.4719	0.5163	0.8219	0.9821
8	0.2602	0.3240	0.4281	0.3788	0.3461	0.4156	0.3844	0.4206	0.6695	0.8000

Table 14.1.5 Red seabream. Tuned VPA.

```
DISAGGREGATED Qs
LOG TRANSFORMATION
NO explanatory variate (Mean used)
Fleet  1 ,HOOK EFFORT          , has terminal q estimated as
the mean
FLEETS COMBINED BY ** VARIANCE **
Terminal Fs estimated using Laurec/Shepherd method

Regression weights
      , 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000
Oldest age F = 1.000*average of 3 younger ages. Fleets combined by variance of predictions

Fishing mortalities
   Age,  1985,  1986,  1987,  1988,  1989,  1990,  1991,  1992,  1993

     1, 0.012, 0.035, 0.002, 0.018, 0.055, 0.005, 0.004, 0.015, 0.019
     2, 0.157, 0.067, 0.062, 0.230, 0.323, 0.146, 0.140, 0.169, 0.250
     3, 0.238, 0.179, 0.195, 0.306, 0.536, 0.452, 0.488, 0.569, 0.561
     4, 0.201, 0.339, 0.309, 0.265, 0.477, 0.394, 0.445, 0.628, 0.637
     5, 0.333, 0.565, 0.370, 0.332, 0.535, 0.399, 0.415, 0.775, 0.786
     6, 0.506, 0.616, 0.567, 0.232, 0.294, 0.380, 0.396, 0.601, 0.750
     7, 0.581, 0.818, 0.642, 0.342, 0.249, 0.431, 0.513, 0.793, 0.897
     8, 0.473, 0.666, 0.526, 0.302, 0.359, 0.403, 0.442, 0.723, 0.811
```

Log catchability estimates

Age 1

Fleet,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993
1 ,	-9.39,	-7.00,	-9.39,	-7.35,	-8.83,	-9.22,	-9.76,	-8.45,	-8.25

SUMMARY STATISTICS

Fleet ,	Pred. q ,	SE(q) ,	Partial F ,	Raised, F ,	SLOPE ,	SE Slope ,	INTERCPT,	SE Intrcpt
1 ,	-8.25 ,	1.292,	0.3194,	0.3194,	0.000E+00,	0.000E+00,	-8.247,	0.409

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
0.019	1.29	0.000	1.29	0.000

Age 2

Fleet,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993
1 ,	-4.42,	-5.35,	-5.39,	-5.08,	-5.06,	-5.02,	-5.15,	-5.04,	-5.39

SUMMARY STATISTICS

Fleet ,	Pred. q ,	SE(q) ,	Partial F ,	Raised, F ,	SLOPE ,	SE Slope ,	INTERCPT,	SE Intrcpt
1 ,	-5.89 ,	0.721,	0.2503,	0.2503,	0.000E+00,	0.000E+00,	-5.889,	0.228

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
0.250	0.721	0.000	0.721	0.000

Age 3

Fleet,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993
1 ,	-4.31,	-5.36,	-5.24,	-4.80,	-5.02,	-4.89,	-4.91,	-4.83,	-4.38

SUMMARY STATISTICS

Fleet ,	Pred. q ,	SE(q) ,	Partial F ,	Raised, F ,	SLOPE ,	SE Slope ,	INTERCPT,	SE Intrcpt
1 ,	-4.38 ,	0.399,	0.5615,	0.5615,	0.000E+00,	0.000E+00,	-4.381,	0.126

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
0.561	0.399	0.000	0.399	0.000

Age 4

Fleet,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993
1 ,	-4.18,	-4.72,	-4.79,	-4.34,	-4.87,	-5.03,	-5.00,	-4.72,	-4.76

SUMMARY STATISTICS

Fleet ,	Pred. q ,	SE(q) ,	Partial F ,	Raised, F ,	SLOPE ,	SE Slope ,	INTERCPT,	SE Intrcpt
1 ,	-4.76 ,	0.267,	0.6367,	0.6367,	0.000E+00,	0.000E+00,	-4.756,	0.084

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
0.637	0.267	0.000	0.267	0.000

Continued

Table 14.1.5 (Continued)

Age 5

Fleet	1985	1986	1987	1988	1989	1990	1991	1992	1993
1	-3.87	-4.21	-4.61	-4.71	-4.36	-5.01	-5.07	-4.32	-4.34

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE slope	INTRCPT	SE Intrcpt
1	-4.54	0.441	0.7861	0.7861	0.000E+00	0.000E+00	-4.545	0.140

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
0.786	0.441	0.000	0.441	0.000

Age 6

Fleet	1985	1986	1987	1988	1989	1990	1991	1992	1993
1	-3.25	-4.12	-4.18	-5.07	-5.16	-5.06	-5.12	-4.77	-4.59

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE slope	INTRCPT	SE Intrcpt
1	-4.59	0.673	0.7499	0.7499	0.000E+00	0.000E+00	-4.592	0.213

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
0.750	0.673	0.000	0.673	0.000

Age 7

Fleet	1985	1986	1987	1988	1989	1990	1991	1992	1993
1	-3.11	-3.84	-4.05	-4.68	-5.32	-4.94	-4.86	-4.49	-4.41

SUMMARY STATISTICS

Fleet	Pred. q	SE(q)	Partial F	Raised F	SLOPE	SE slope	INTRCPT	SE Intrcpt
1	-4.41	0.699	0.3972	0.3972	0.000E+00	0.000E+00	-4.413	0.221

Fbar	SIGMA(int.)	SIGMA(ext.)	SIGMA(overall)	Variance ratio
0.897	0.699	0.000	0.699	0.000

Table 14.1.6 Results of SVPA.

Fishing mortality (F) at age

YEAR	1982	1983
AGE		
1	0.0018	0.0259
2	0.1122	0.1800
3	0.1297	0.2160
4	0.1027	0.1329
5	0.0880	0.1622
6	0.0867	0.2385
7	0.1734	0.2756
8	0.1226	0.1897
+gp	0.1226	0.1897
FBARC	0.1038	0.1743
FBARP	0.0855	0.1390
FBAR 1- 8	0.1021	0.1776

Fishing mortality (F) at age

YEAR	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	FBAR 82-90	FBAR 85-88
AGE												
1	0.0072	0.0121	0.0347	0.0017	0.0173	0.0535	0.0057	0.0049	0.0204	0.0266	0.0178	0.0165
2	0.0861	0.1625	0.0656	0.0620	0.2322	0.3155	0.1410	0.1487	0.2256	0.3531	0.1509	0.1208
3	0.1378	0.2549	0.1863	0.1956	0.3055	0.3402	0.4363	0.4660	0.5184	0.8855	0.2569	0.2256
4	0.2447	0.1973	0.3729	0.3243	0.2655	0.4757	0.4018	0.4209	0.5798	0.7466	0.2798	0.2900
5	0.2038	0.3037	0.5487	0.4239	0.3561	0.5357	0.3973	0.4273	0.7017	0.6721	0.3355	0.4081
6	0.2528	0.4295	0.5338	0.5389	0.2799	0.3229	0.3807	0.2941	0.5309	0.6147	0.3404	0.4455
7	0.3669	0.4595	0.6092	0.4986	0.3168	0.3187	0.4958	0.5152	0.7863	0.9973	0.3905	0.4710
8	0.3244	0.3240	0.4468	0.3165	0.2071	0.3222	0.5803	0.5528	0.7280	0.7954	0.3149	0.3226
+gp	0.3244	0.3240	0.4468	0.3165	0.2071	0.3222	0.5803	0.5528	0.7280	0.7954		
FBARC	0.2490	0.2482	0.3356	0.3097	0.2615	0.3422	0.3581	0.3778	0.4984	0.6313		
FBARP	0.1496	0.1629	0.1683	0.1493	0.1826	0.2410	0.1970	0.2037	0.2571	0.3117		
FBAR 1- 8	0.2280	0.2679	0.3499	0.2952	0.2476	0.3355	0.3549	0.3662	0.5364	0.6365		

Table 14.1.7 Summary results of SVPA.

	RECRUITS	TOTALBIO	EXPLBIO	TOTSPBIO	SOPCOFAC	FBARC	FBARP	FBAR 1- 8
1982	2876	3877	3459	2145	1.0000	0.1038	0.0855	0.1021
1983	3193	3425	2983	1605	1.0001	0.1743	0.1390	0.1776
1984	2994	3552	2814	1662	0.9999	0.2490	0.1496	0.2280
1985	3202	3099	2708	1277	1.0001	0.2482	0.1629	0.2679
1986	3680	2911	2176	1031	1.0000	0.3356	0.1683	0.3499
1987	3722	2955	2038	1004	1.0001	0.3097	0.1493	0.2952
1988	4023	3082	2438	1104	1.0000	0.2615	0.1826	0.2476
1989	3745	3306	2700	1236	1.0065	0.3422	0.2410	0.3355
1990	3054	3166	2482	1188	1.0001	0.3581	0.1970	0.3549
1991	1939	2950	2319	1118	1.0000	0.3778	0.2037	0.3662
1992	803	2662	2208	997	1.0000	0.4984	0.2571	0.5364
1993	257	1739	1311	675	1.0000	0.6313	0.3117	0.6365
Units	(Thousands)	(Tonnes)	(Tonnes)	(Tonnes)				

Table 14.2.1 Official international catches, in tonnes, of "seabreams", by Sub-areas in the Northeastern Atlantic, in the period 1979-1985. (Source: ICES Fisheries Statistics, quoted by Castro, 1990).

Year	VI	VII	VIII	Total VI-VII	IX	X	Total IX-X	Others	TOTAL VI-X
1979	573	986	5,451	7,010	1,282	597	1,879	5	8,894
1980	393	1,289	4,784	6,466	1,354	366	1,760	11	8,197
1981	28	163	3,707	3,898	1,174	416	1,590	0	5,488
1982	80	59	3,931	4,070	1,026	371	1,397	0	5,467
1983	148	590	3,010	3,748	1,121	505	1,626	2	5,376
1984	187	435	2,009	2,631	1,386	642	2,028	6	4,665
1985	219	283	1,598	2,100	1,168	624	1,792	1	3,893

Table 14.2.2 Official international catches, in tonnes, of "seabreams" in the Northeastern Atlantic, by countries, in the period 1979-1985. (Source: ICES Fisheries Statistics, quoted by Castro, 1990).

Year	France	Portugal	Spain	U.K.	Others	TOTAL
1979	2,214	1,393	5,252	17	18	8,894
1980	2,090	1,127	5,064		6	8,287
1981	927	1,075	4,413			6,415
1982	1,235	999	4,468			6,702
1983	1,012	1,185	3,178	1		5,376
1984	654	1,312	2,699			4,665
1985	570	1,166	2,146	12		3,894

Table 14.2.3 Evolution of the official French and Spanish catches of "seabreams" in the North-Eastern Atlantic, for the period 1950–1986. (Source for French catches: Dardignac, 1988. Source for Spanish Catches: Anuarios de Pesca Maritima (quoted by Castro, 1990)).

Year	France	Spain
1950	8,370	
.....	.....	.....
1960	5,600	8,342
1961		8,300
1962		9,635
1963		6,901
1964		6,587
1965	5,014	6,519
1966		7,619
1967		8,209
1968		9,586
1969		7,971
1970	4,840	8,443
1971		8,772
1972		9,121
1973		7,509
1974		10,217
1975	3,667	9,169
1976		9,098
1977		7,338
1978		4,986
1979		5,860
1980	1,906	4,783
1981	1,401	3,188
1982		4,410
1983	864	3,136
1984	579	2,698
1985		2,146
1986		1,811

Table 16.1 Stock summary for species analysed by ICES Deep Sea Study Group.

Species	ICES sub-area/division	Assessment type and final year of data	Salient features	State of stock[1]	Concerns / comments
Ling *(Molva molva)*	IIa,IVa,V,VI and VII.	Catch curve + CPUE. 1995	Strong decline in CPUE, average Z in recent years is about 0.6 for all areas .	Stock declining. Probably over-exploited	Length and age data series still inadequate for analytical assessment
Blue ling *(Molva dypterygia)*	IIa, IVa, V, VII, XII and XIV	CPUE only. 1995	Strong decline in CPUE	Stock declining. Probably over-exploited	CPUE should be treated with caution - fishing on spawning conc. Still major difficulty with age determination
Tusk *(Brosme brosme)*	IIa,IVa,V,VI.	Catch curve + CPUE only. 1995	Strong decline in CPUE, particularly in Vb and VI. Average Z is 0.6 for all areas .	Stock declining. Probably over-exploited	Length and age data series still inadequate for analytical assessment
Greater Argentine *(Argentina silas)*	Mainly IIa,III,V,VI,VII	Acoustic survey in VI,VII & IVa (1993), IIa (1992) & IIIa (1992)	Estimated biomass for IIa stable at about 400kt Biomass for VI,VII & IVa down from 408kt (1990) to 208kt in 1993.	Fishery in IIa considered to be sustainable. Possible collapse of local Irish fisheries in 1990	Problem with target strengths. Conflicting information for fishery in VI and VII. Dutch fishery has remained stable whilst Irish fishery collapsed in 1990
Orange Roughy *(Hoplostethus atlanticus)*	Mainly V, VI, and VII.	CPUE only. 1994	Very strong decline in CPUE	Stock declining Probably over- exploited	CPUE trends can be masked because fishery exploits localised aggregations. Hence,declining CPUE is a major concern.
Roundnose Grenadier *(Coryphaenoides rupestris)*	Mainly III,V, VI and XII.	CPUE only. 1993	CPUE difficult to interpret	Unknown	CPUE difficult to interpret because of changes in directivity. Major problem with age determination. Limited length data.
Black Scabbardfish *(Aphanopus carbo)*	Mainly V,VI,VII,VIII and IX	Catch curves and length based cohort analysis for VIII and IX only. 1993.	Slight decline in effort since 1990. Landings steady. F= 0.53	Uncertain. Probably sustainable in IX.	
Golden Eye Perch *(Beryx splendens)*	Mainly X	No information		Unknown	New annual longline survey started in Azorean waters in 1995.
Red (blackspot) Seabream *(Pagellus bogaraveo)*	X, IX, VI, VII and VIII	Analytical VPA for Azorean fishery only. 1993	Increasing trend in F to 0.8 in 1993. Similar increase in effort	Preliminary assessment for sub-area X suggests that F may be four times as high as Fmax. Historical trend of landings for other areas indicates a collapse of stock	New annual longline survey started in Azorean waters in 1995.

[1] The Study Group acknowledges that stock units are not well defined for the above species.

Figure 3.1 A. Development of efficiency as measured in hooks per day (HPD, circles) and weeks (dots), compared to total effort (EFFORT) as measured in hooks per year ($*10^{-5}$, squares. B. CPUE calculated from total catch and effort from official statistics (triangles) compared to CPUE measures from the private log book circles). CPUE after adjustments for changes in fleet efficiency are indicated (squares). See text for explanations.

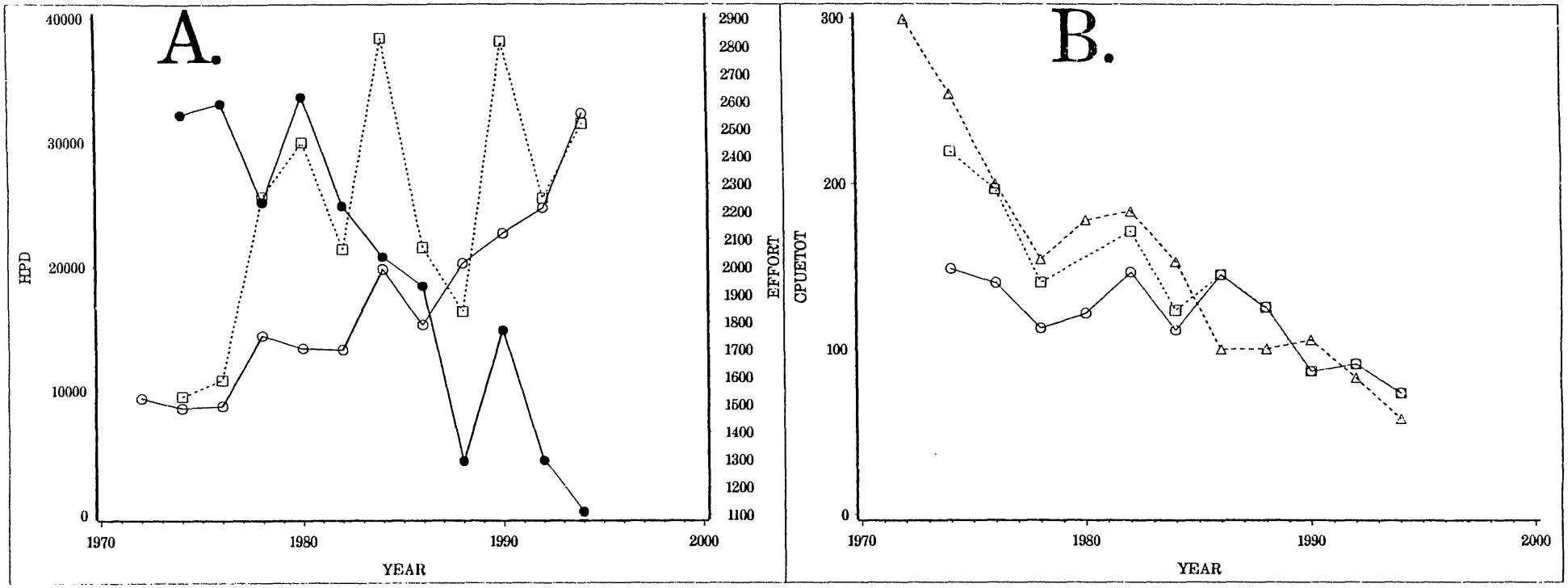


Figure 3.2 CPUE by area in the Norwegian fishery for ling and tusk (modified from Hareide and Godo, 1996).

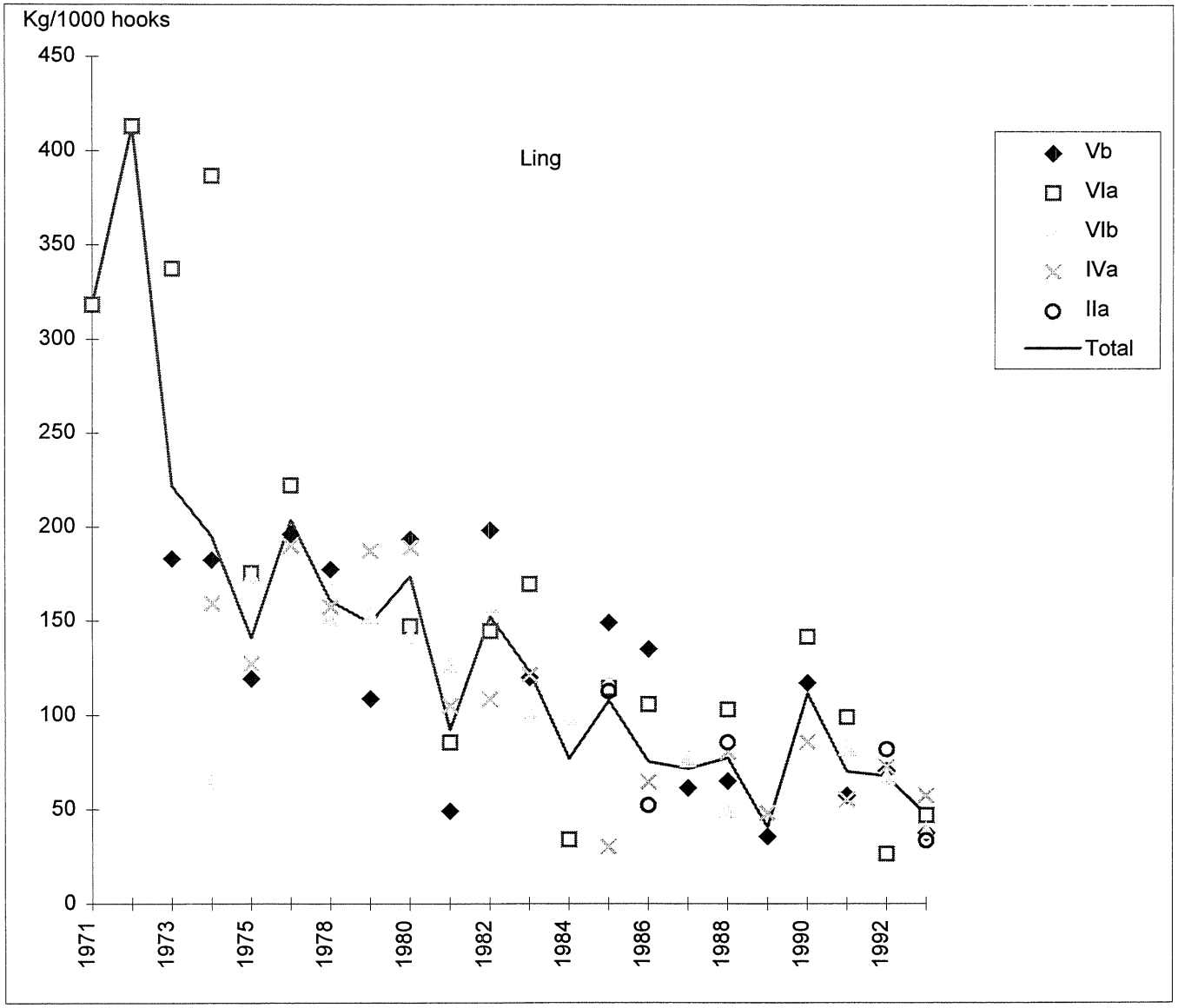


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Figure 5.2.4.1 Limits of geographical area and localisation of fishing operation.

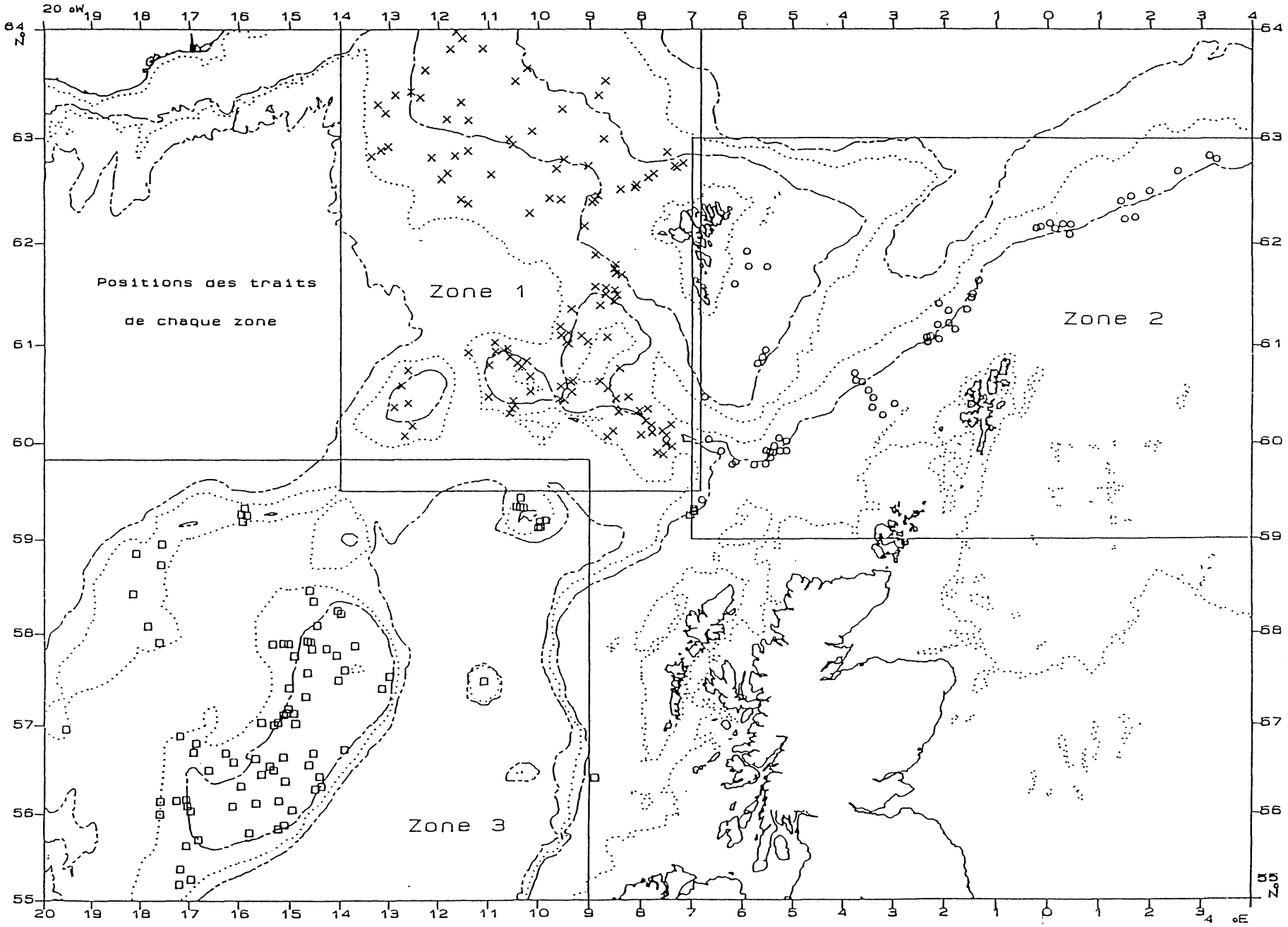


Figure 5.2.4.2 Mean catch rate for species or group in area 1.

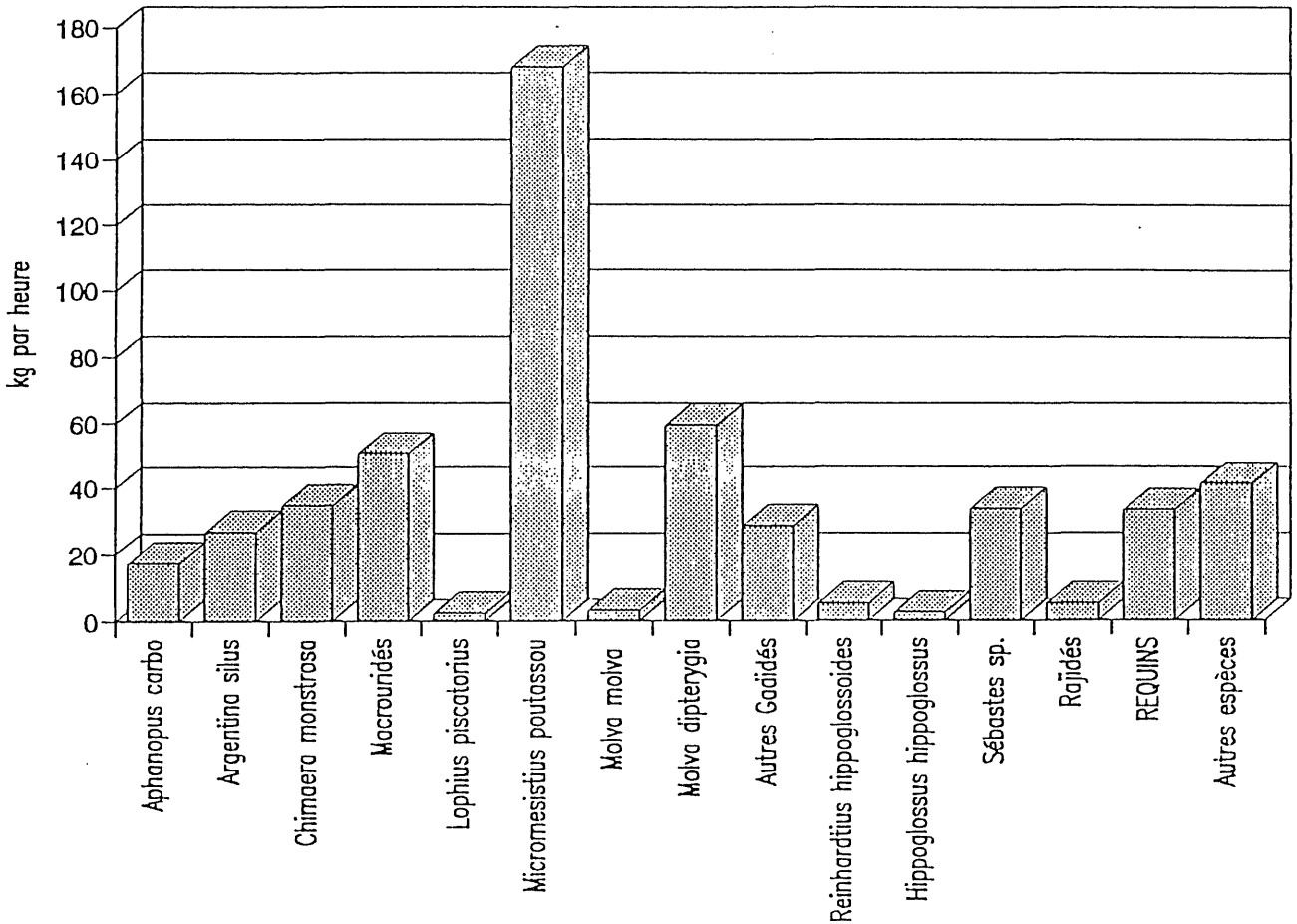


Figure 5.2.4.3 Mean catch rate for species or group in area 2.

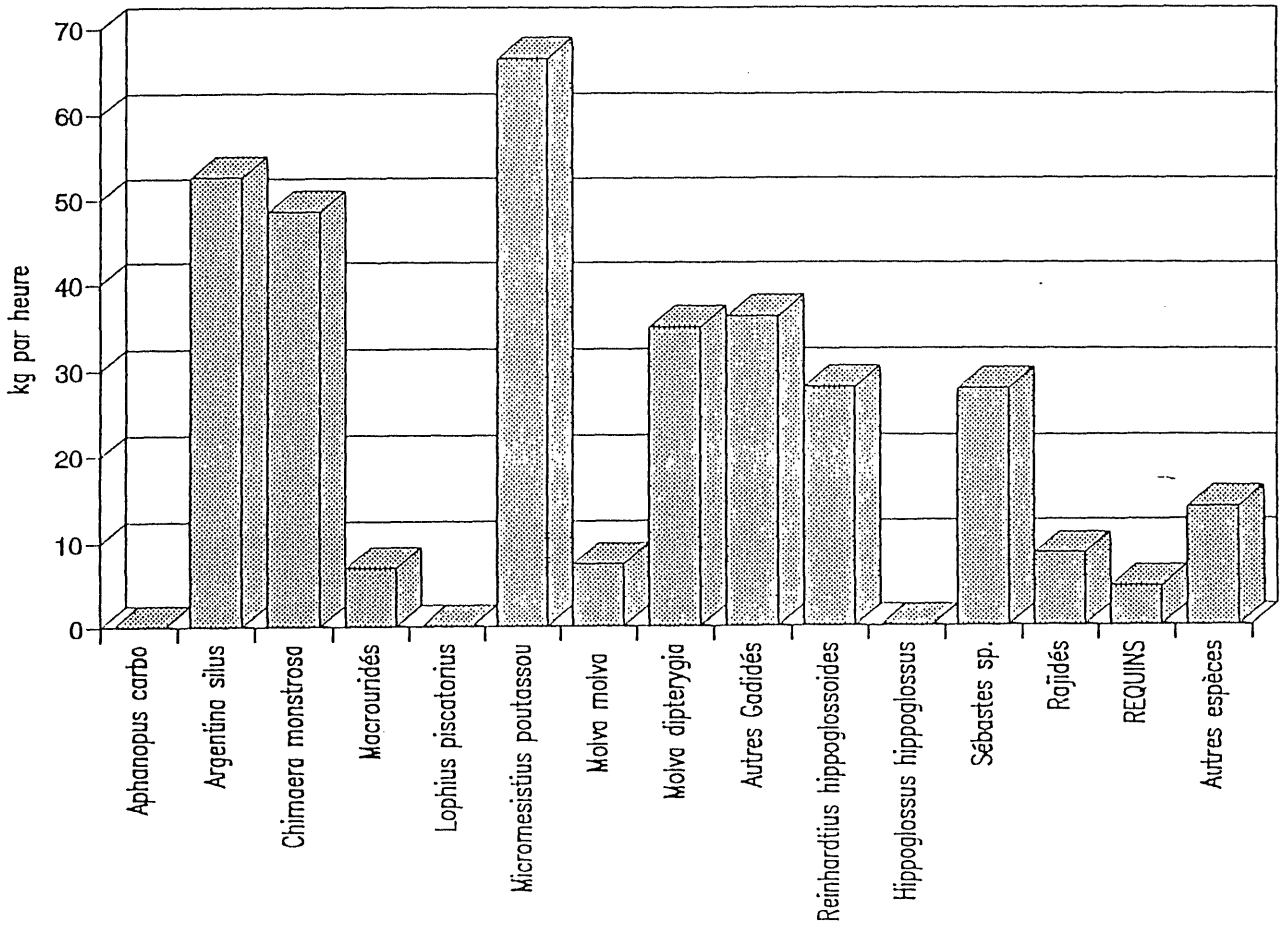


Figure 5.2.4.4 Mean catch rate for species or group in area 3.

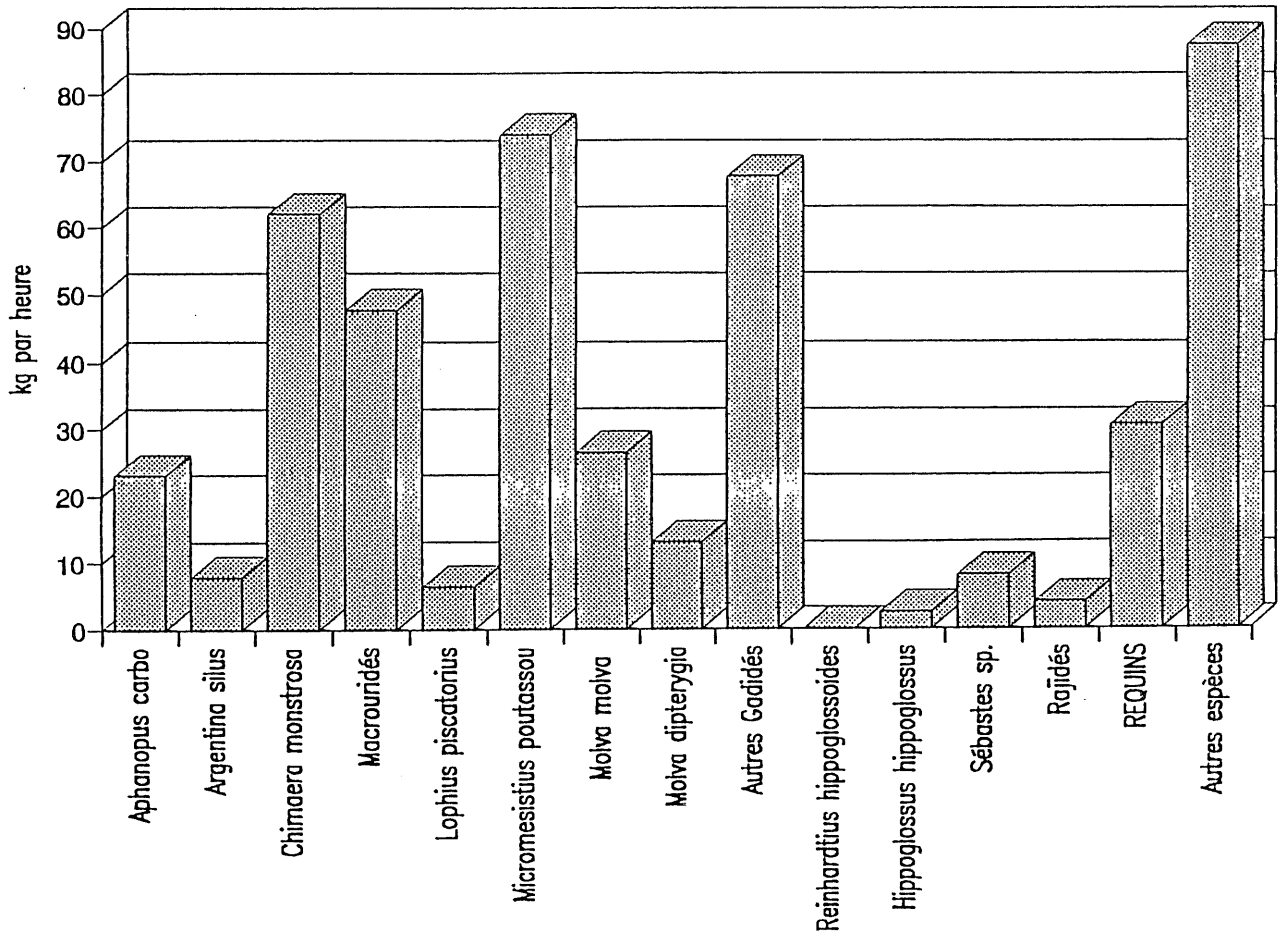


Figure 6.4.1 CPUE of ling smaller than72 cm in the Norwegian longline fisheries, all Sub-areas combined (Ref. Figure 3.1). Data for 1980, 1981, 1984, 1985 and 1987 were not available. Methods for deriving the CPUE data were described in working document by Hareide and Godø (1996).

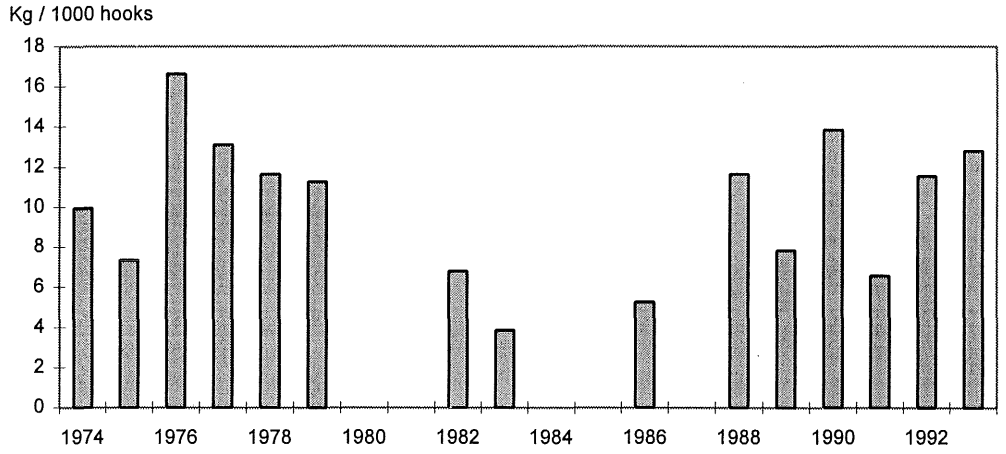
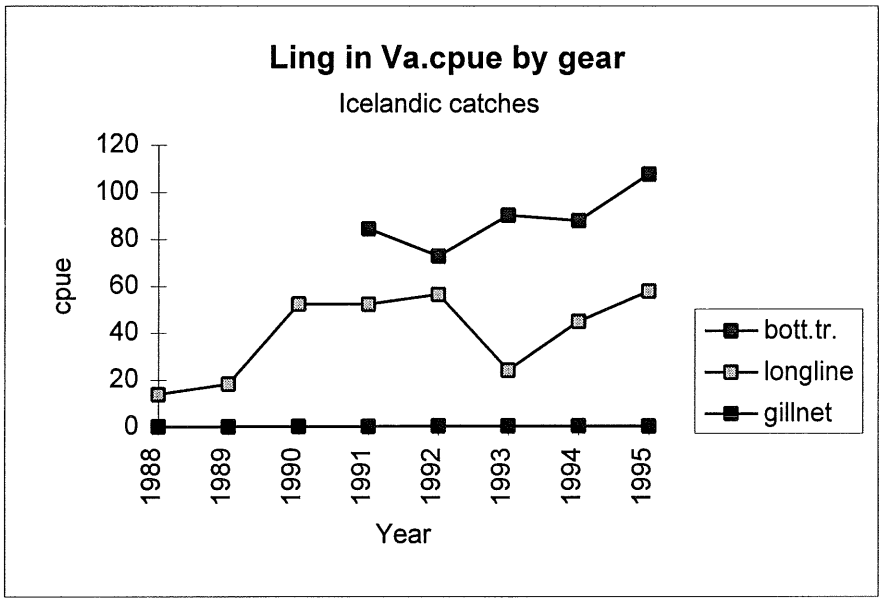


Figure 6.4.2 Catch per unit of effort (upper) and catch by gear type. Icelandic catches in Division Va.



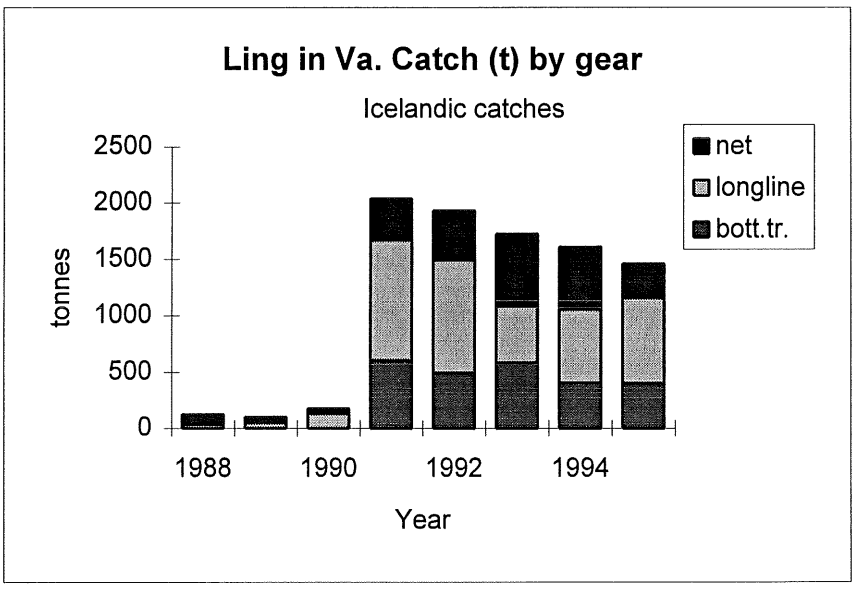


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Figure 6.4.3 Ling. Length distribution in the Icelandic annual groundfish surveys 1985–1995. (Number per 1 n.m. towed).

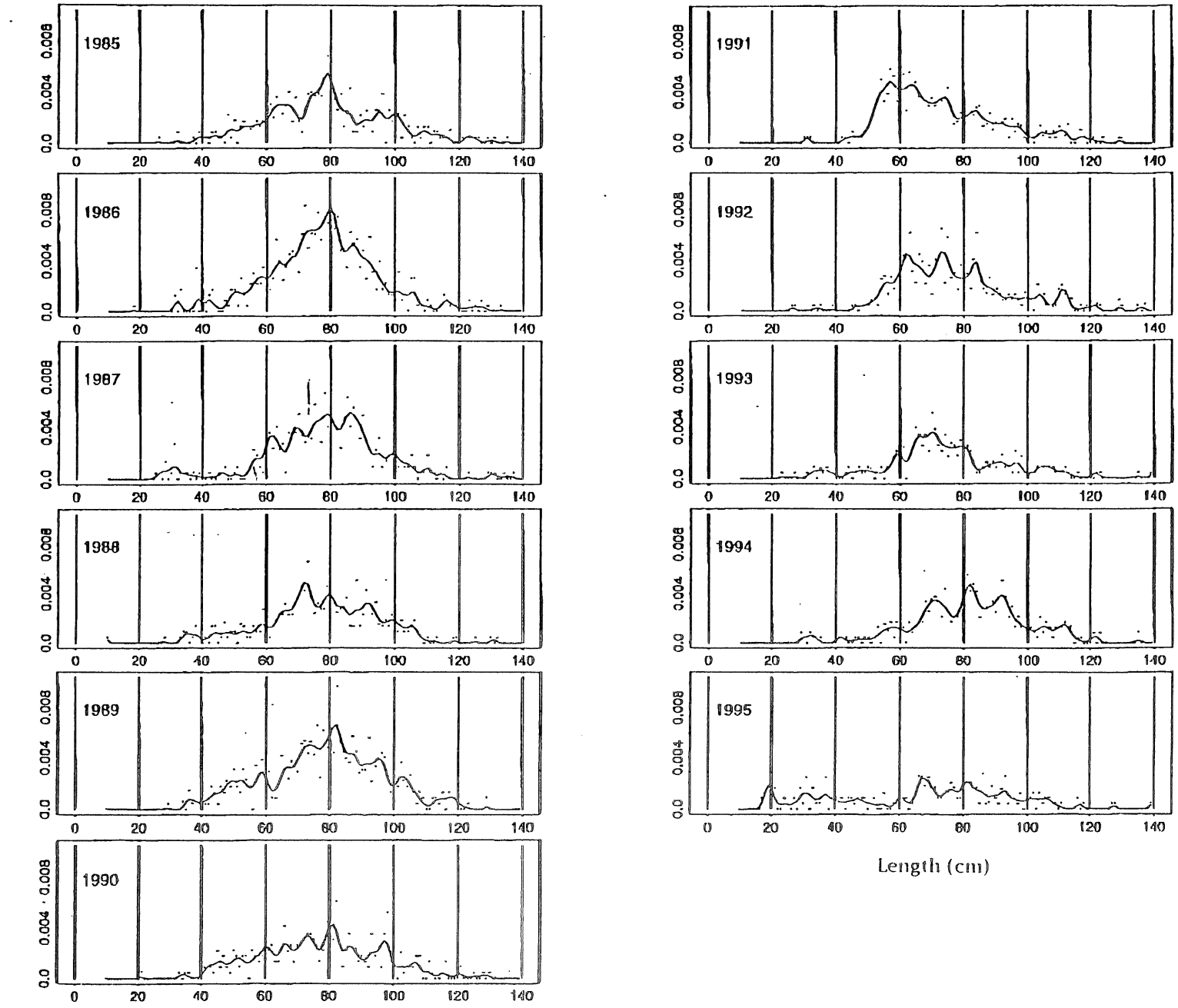


Figure 6.4.4 Estimates of CPUE of ling in the French trawl fishery. Effort directed at ling was estimated as number of hours fishing when (pr. statistical square) the ling catch exceeded 100 kg (upper) or when it exceeded 10% of the catch.

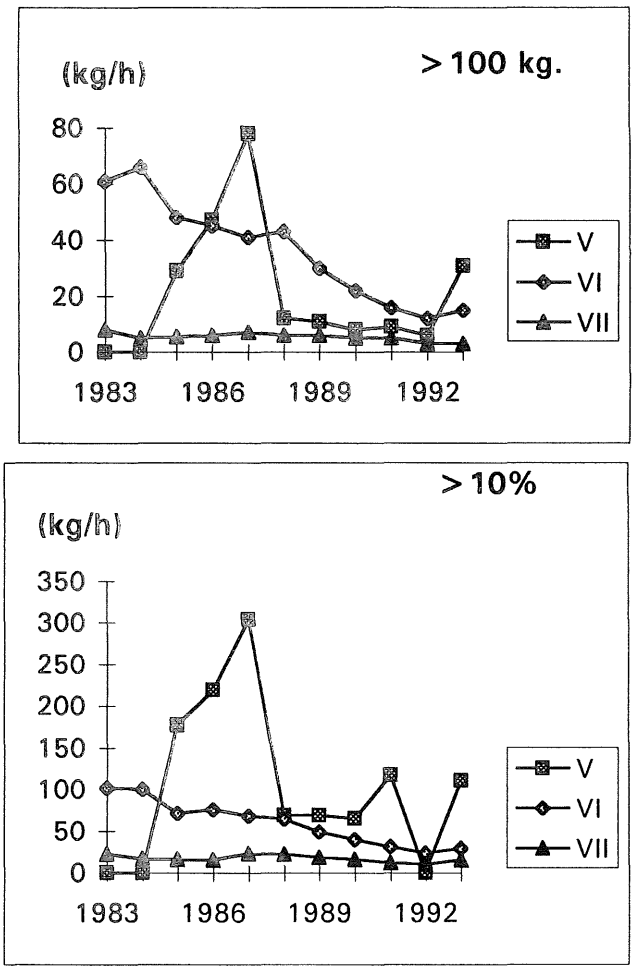
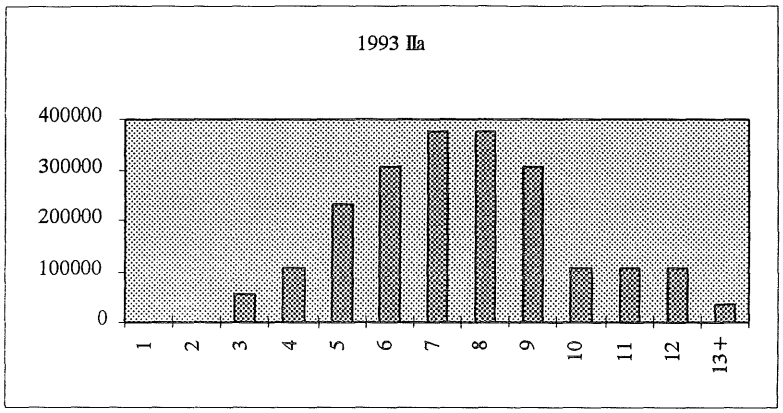


Figure 6.5.1 Age distributions of Norwegian longline catches of ling by year and area.



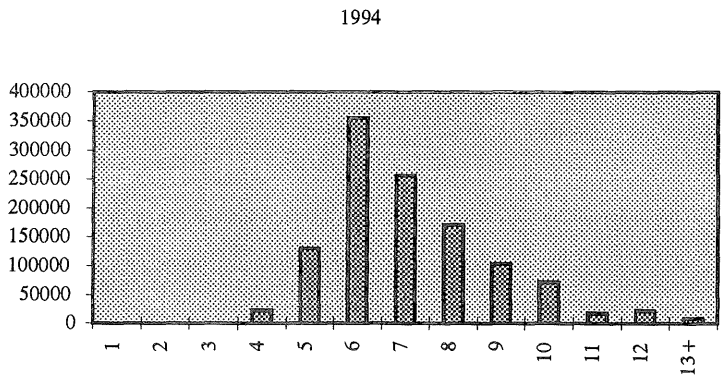
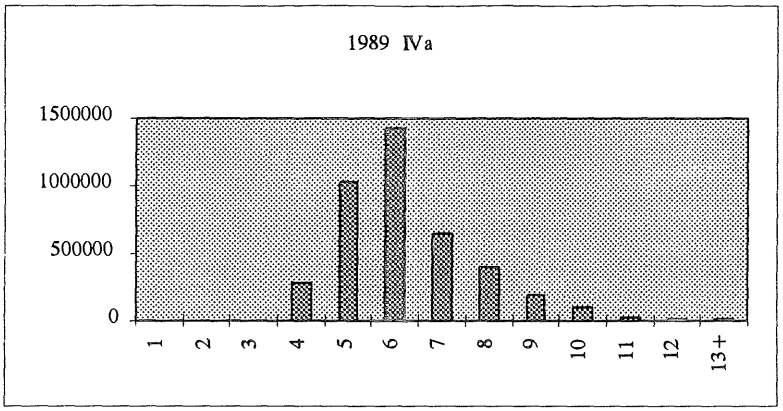
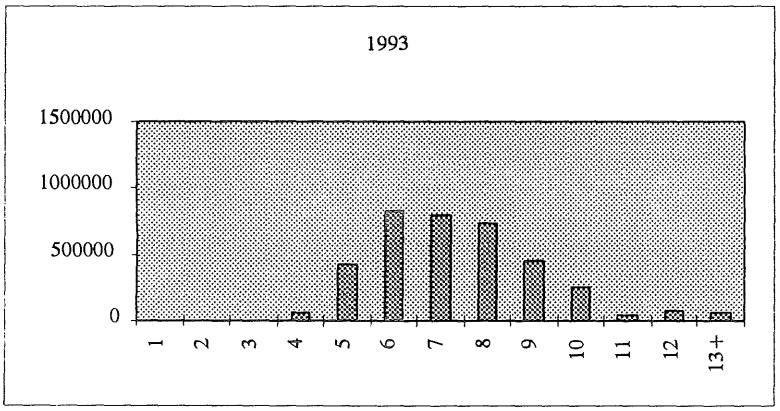


Figure 6.5.1 (Continued)





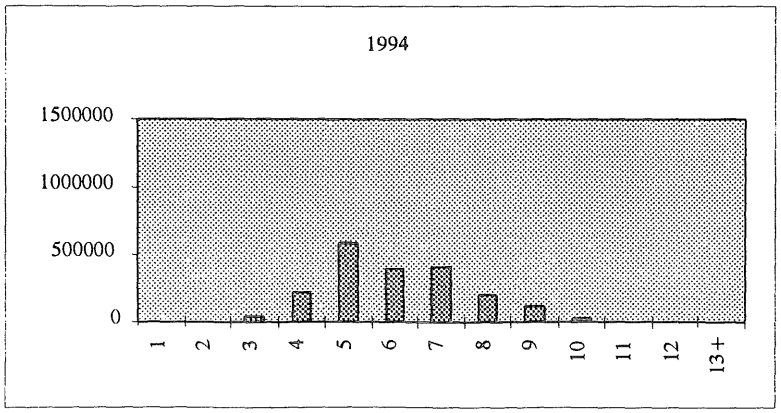
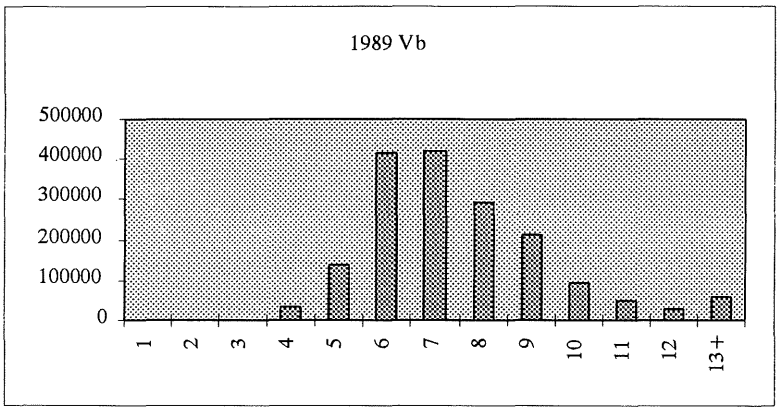


Figure 6.5.1 (Continued)



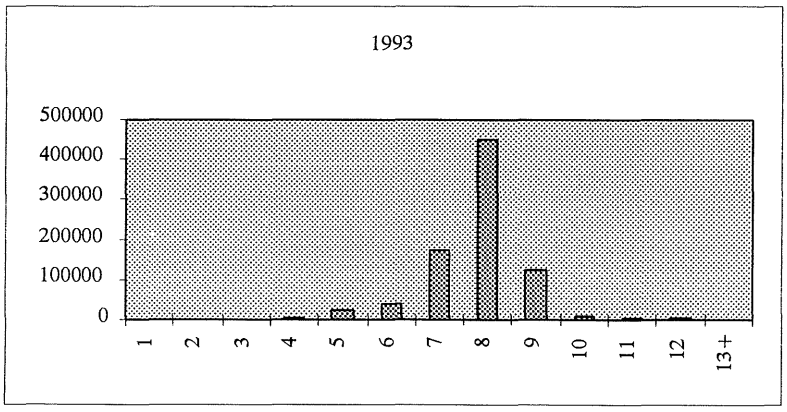
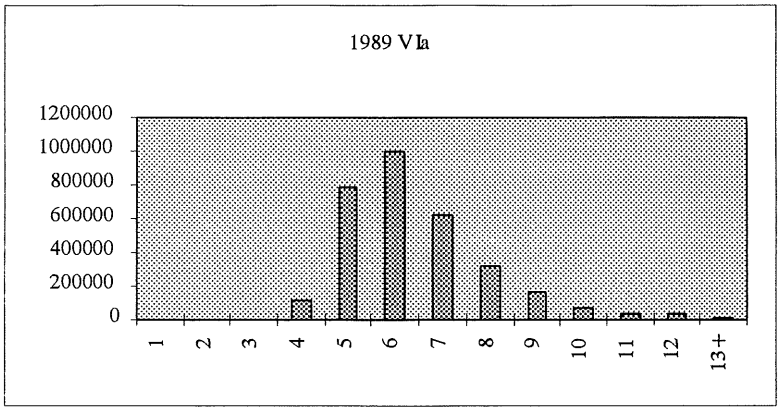
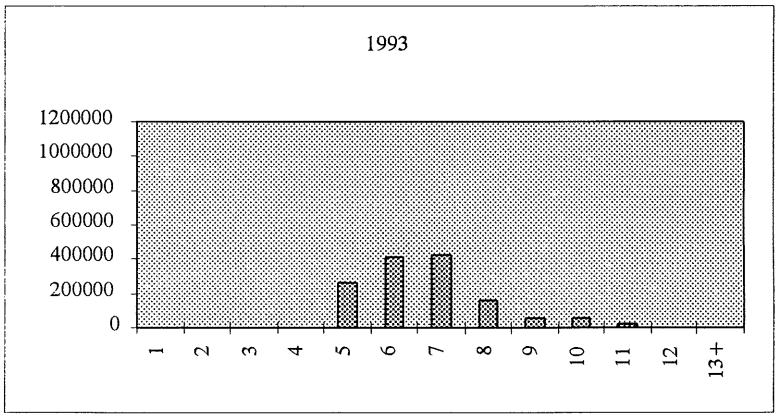


Figure 6.5.1 (Continued)





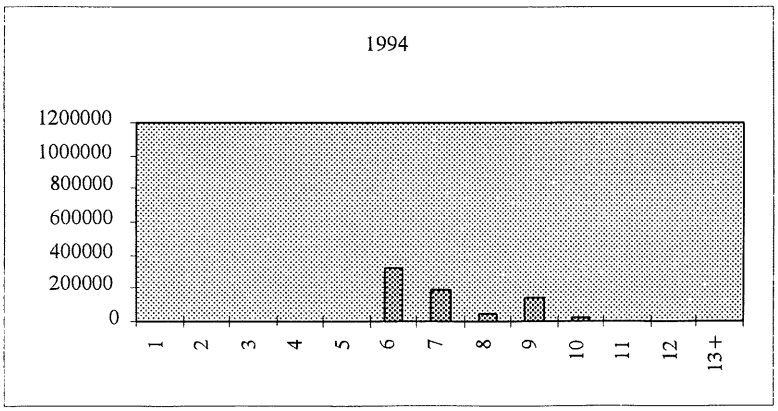
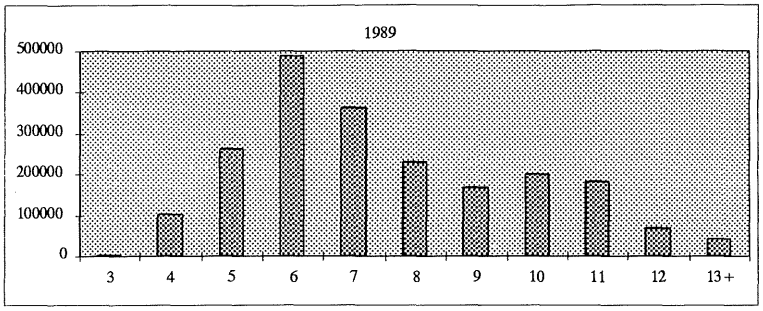
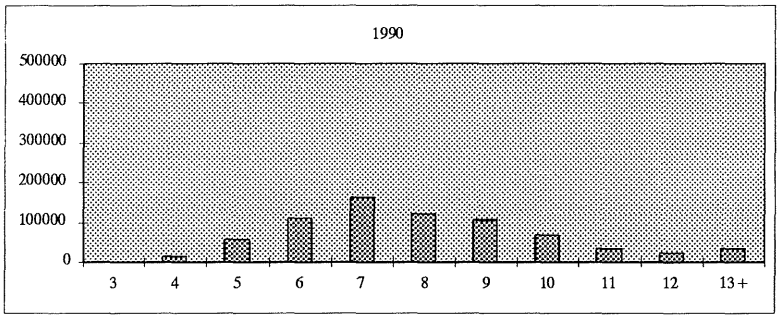
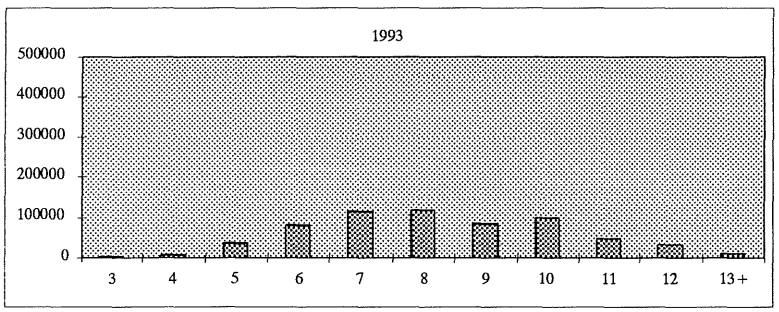
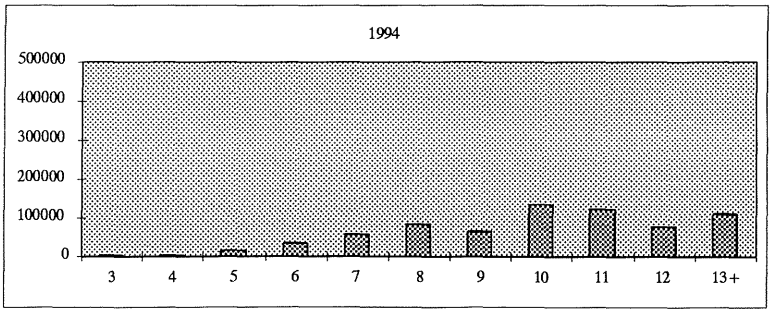


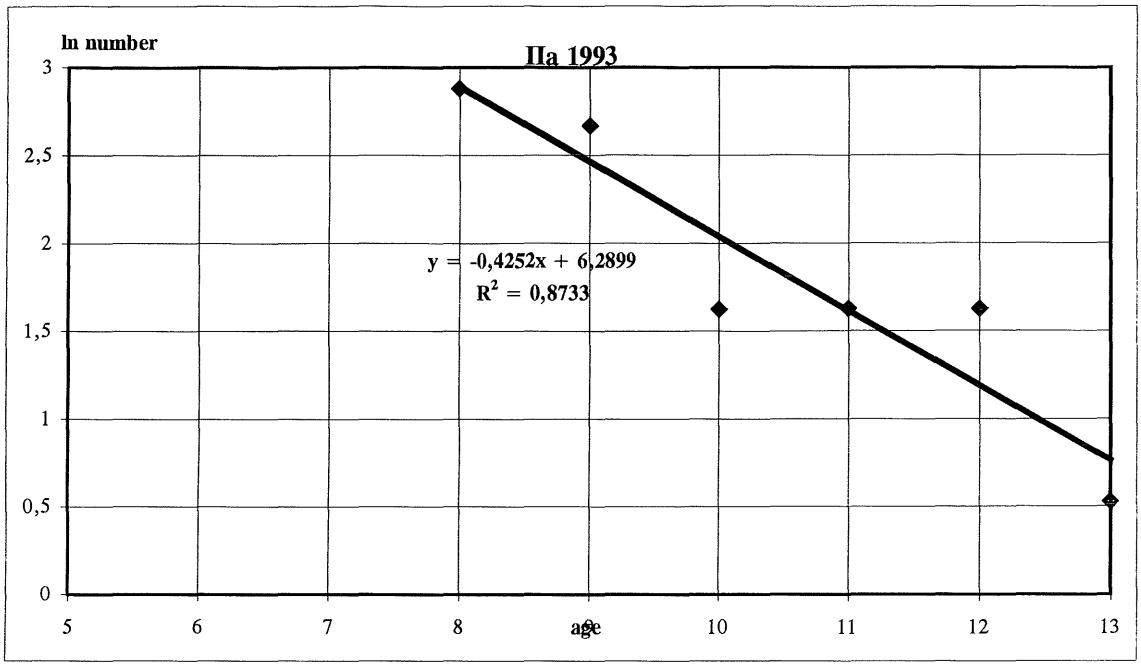
Figure 6.5.1 (Continued)

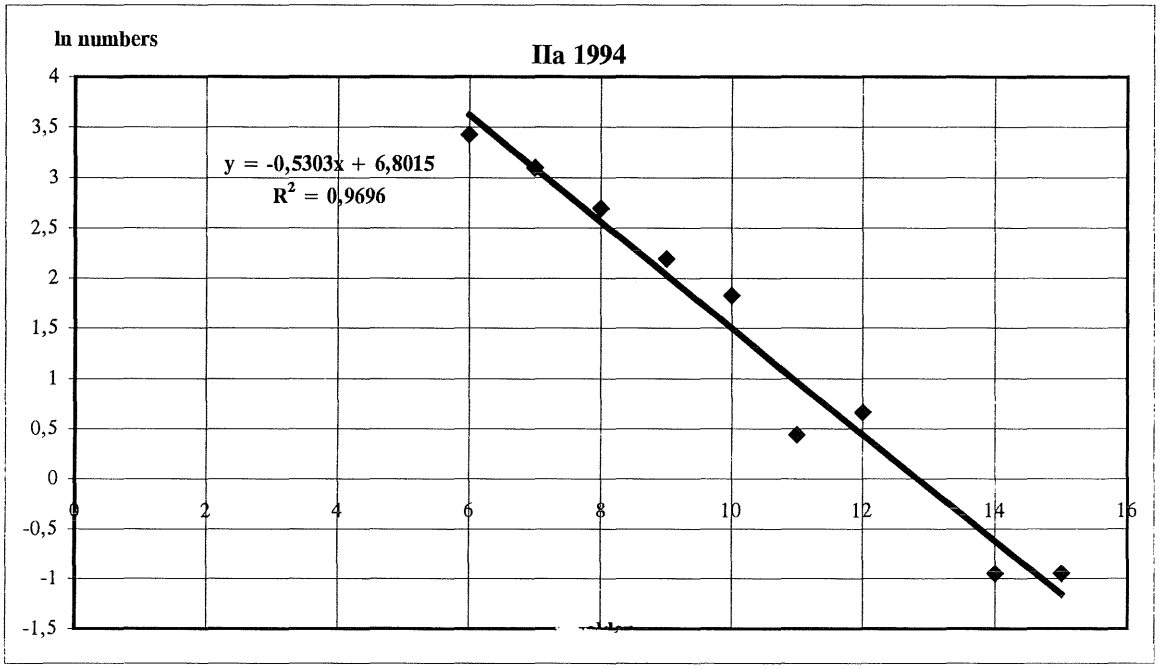












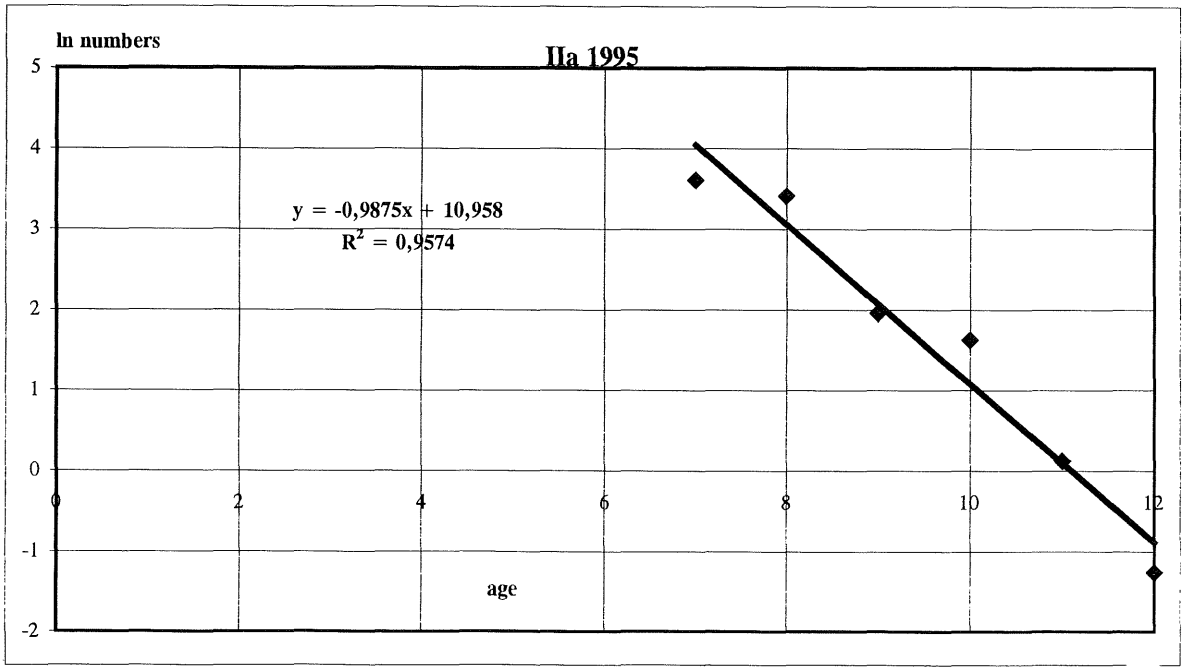
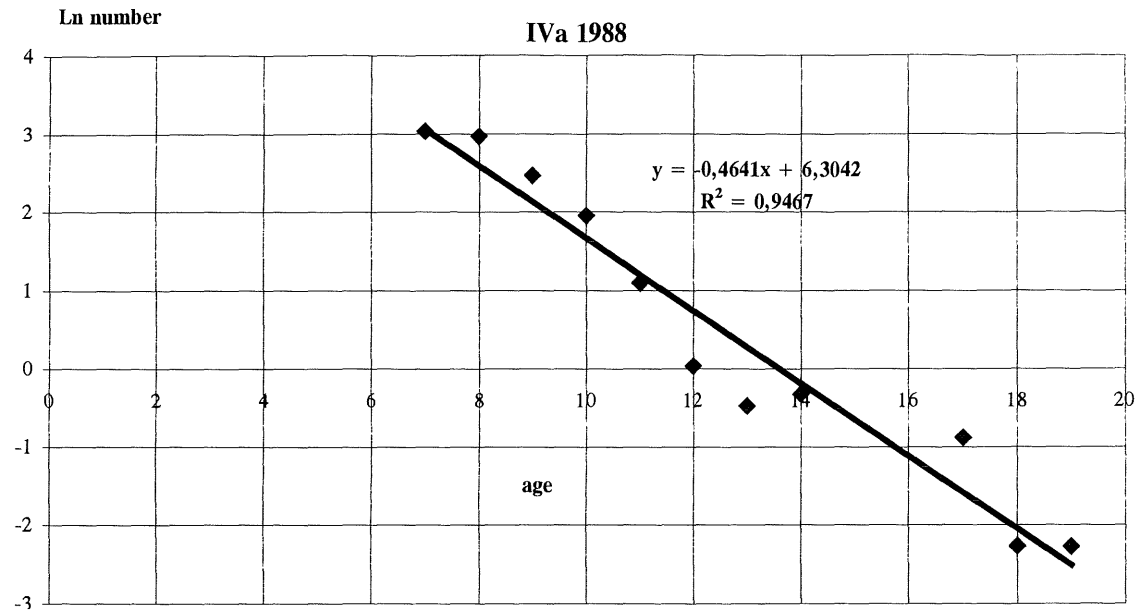
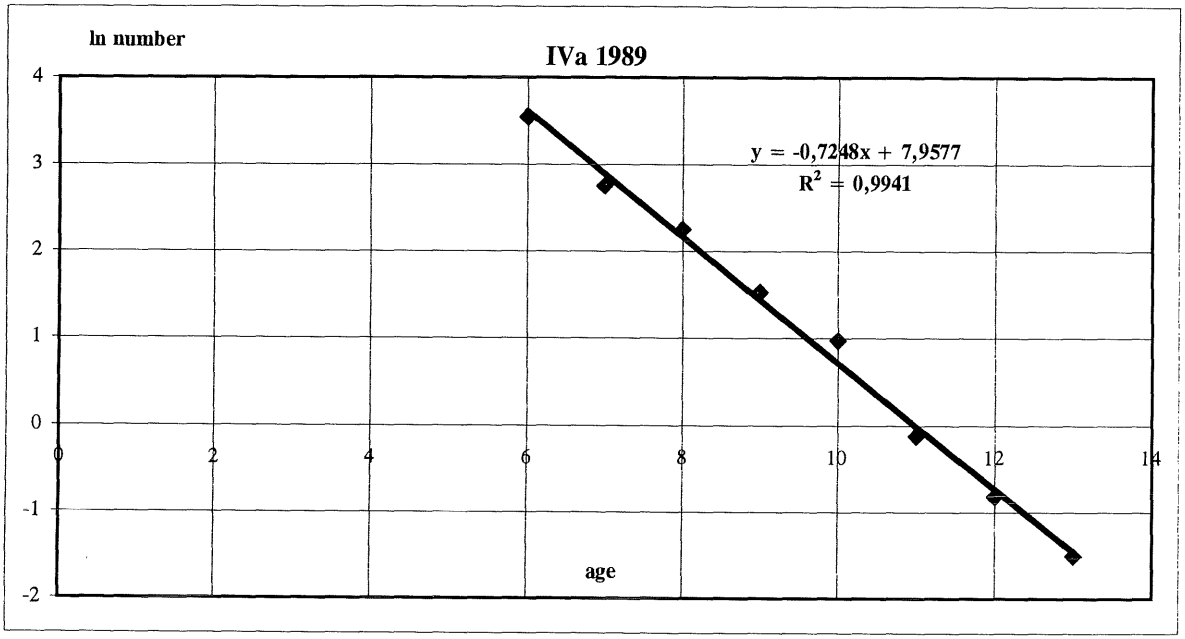


Figure 6.5.2. Catch curves based on age distributions from Norwegian longline catches.





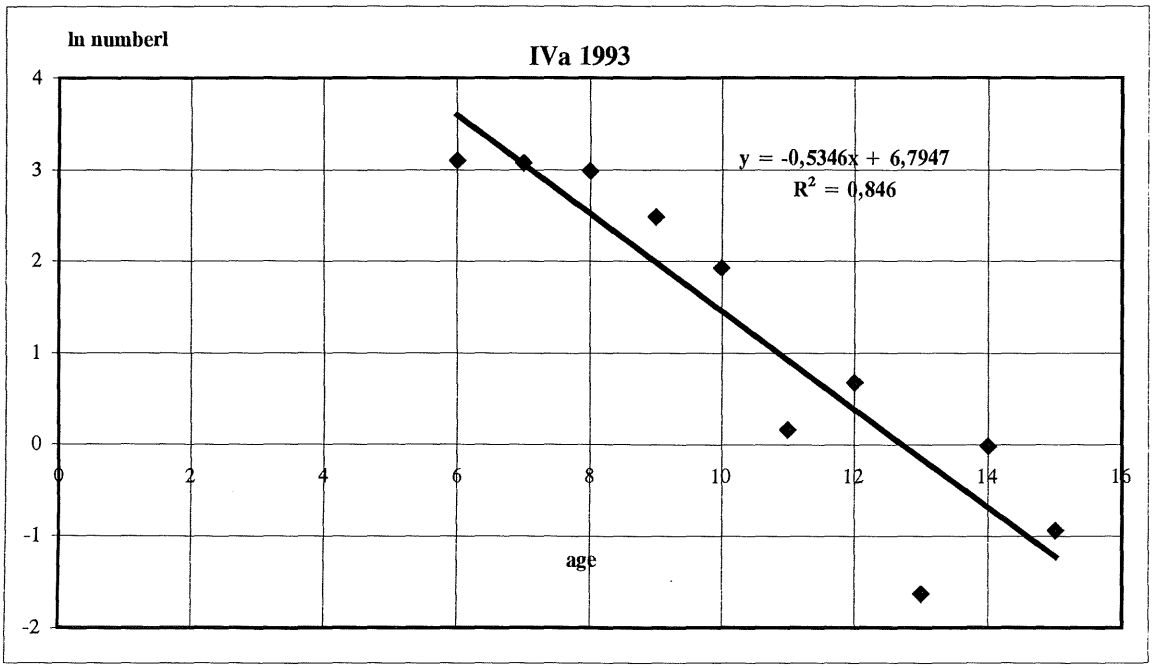
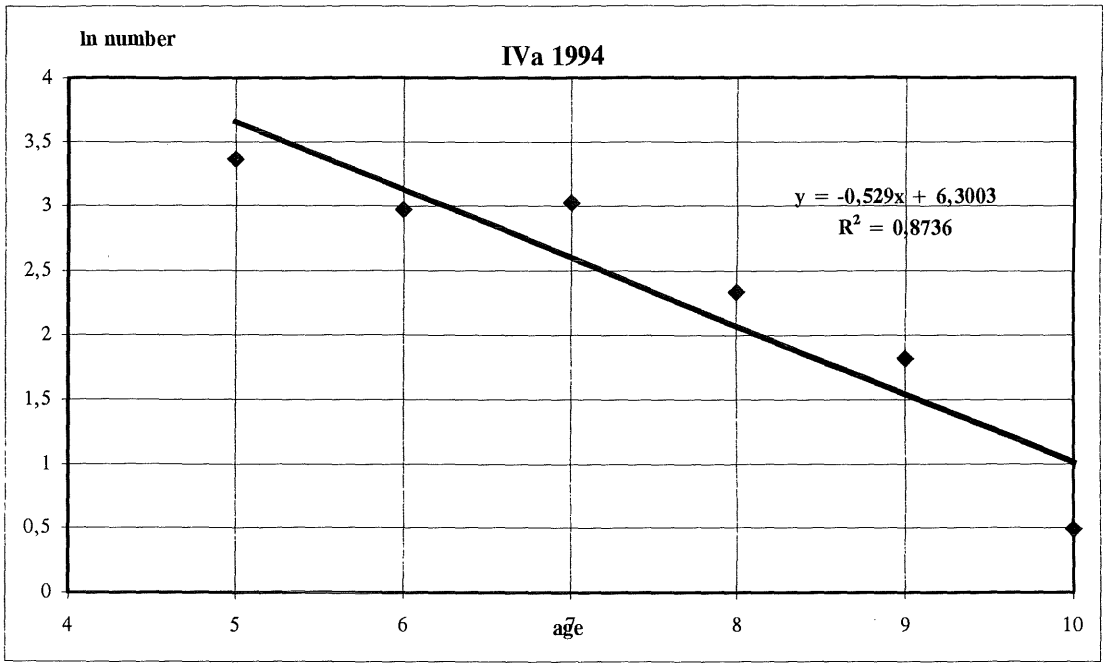
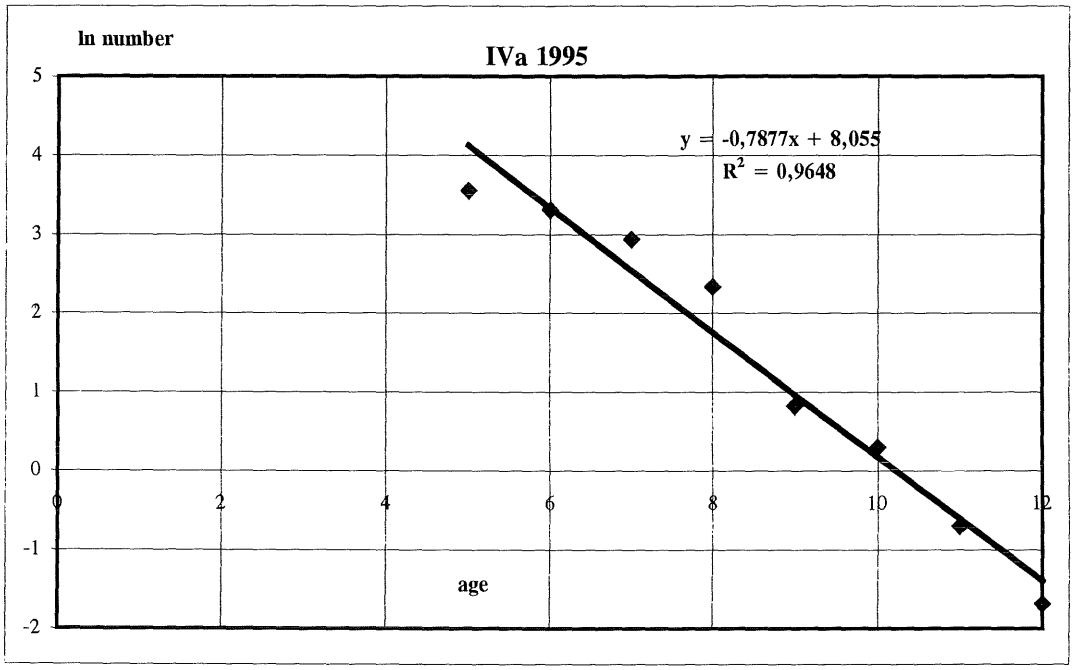


Fig. 6.5.2. Continued





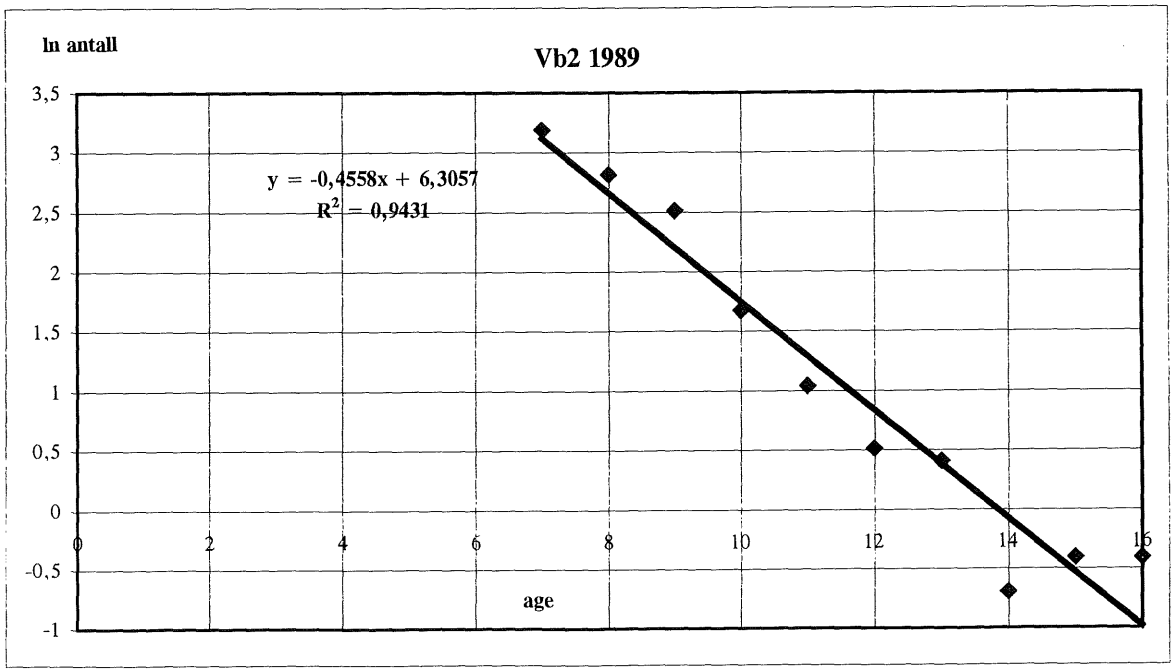
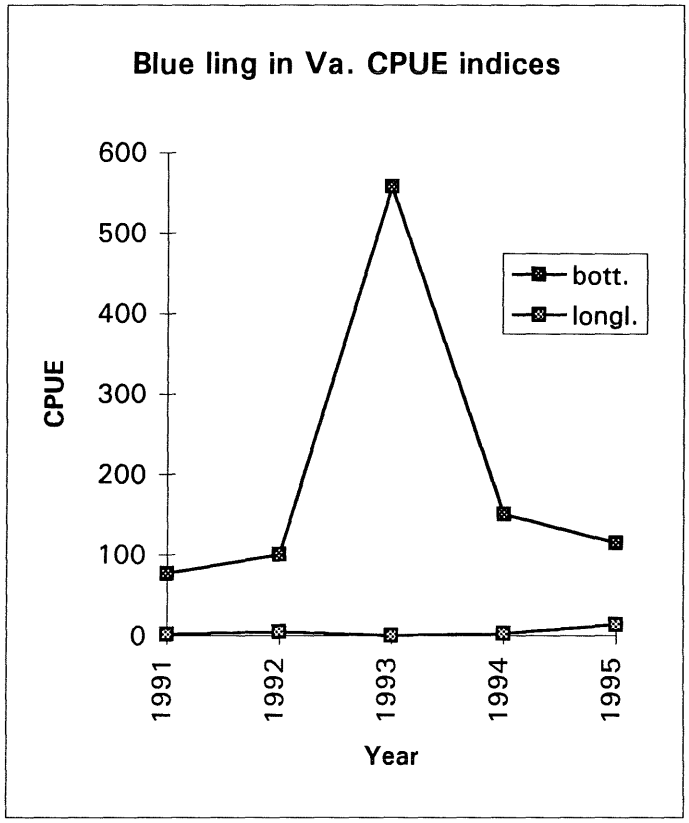


Fig. 6.5.2. Continued

Figure 7.4.1 Blue ling in Va. CPUE indices and landings in the Icelandic longline and trawl fishery.



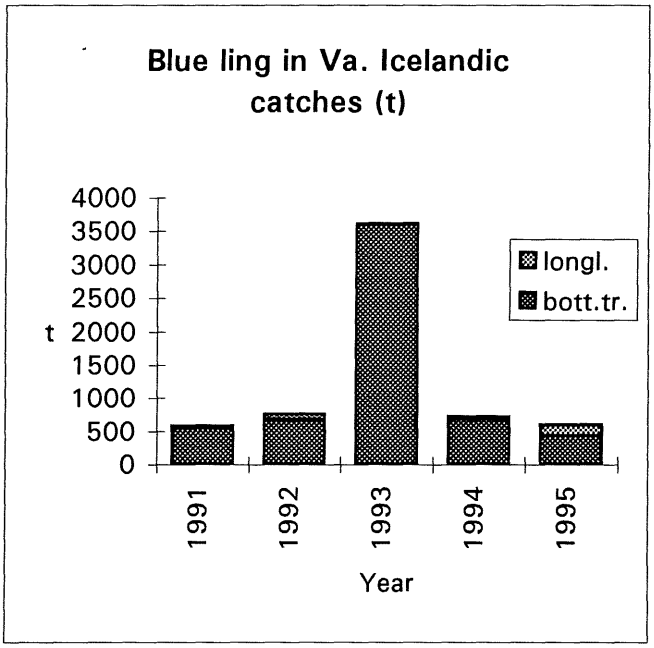


Figure 8.4.1 Tusk in Va. Icelandic longline CPUE (upper) and landings (lower).

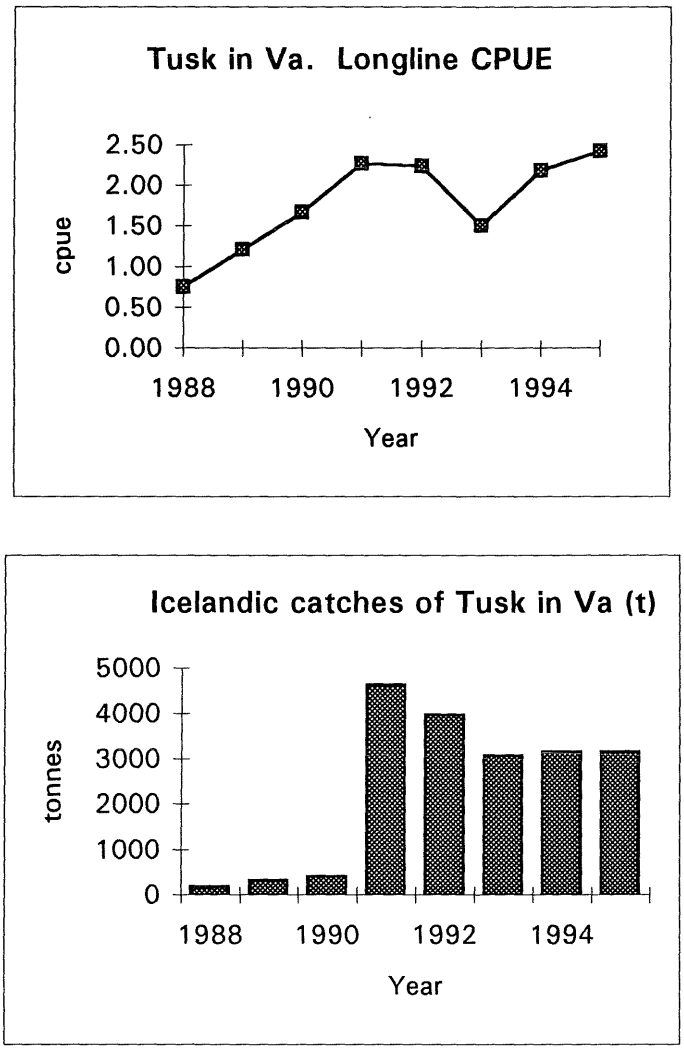


Figure 8.4.2 Tusk in Va. Abundance indices from groundfish surveys.

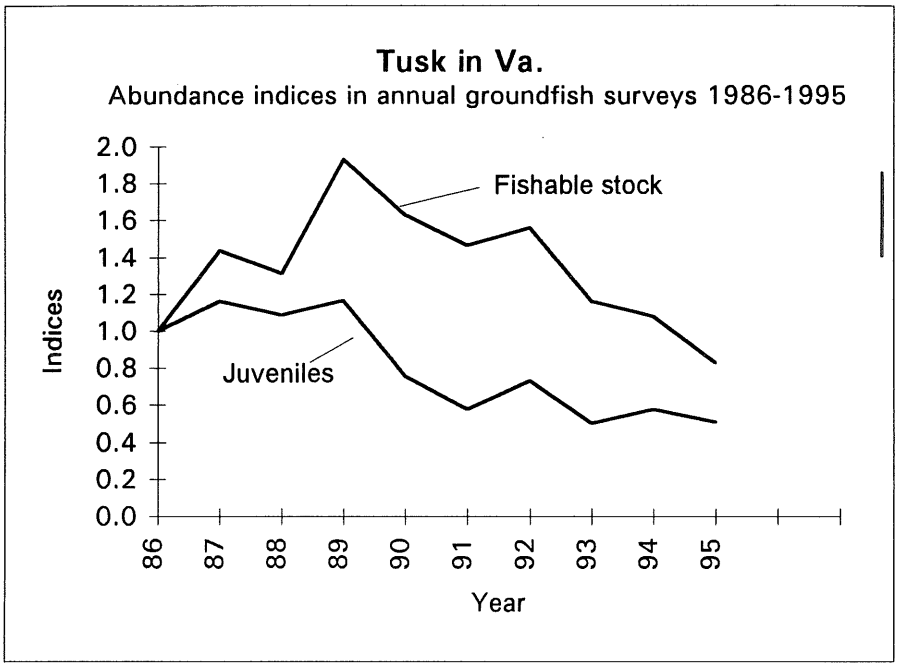


Figure 8.4.3 Tusk. Length distribution in the Icelandic annual groundfish surveys 1985–1995. (Number per 1 n.m. towed).

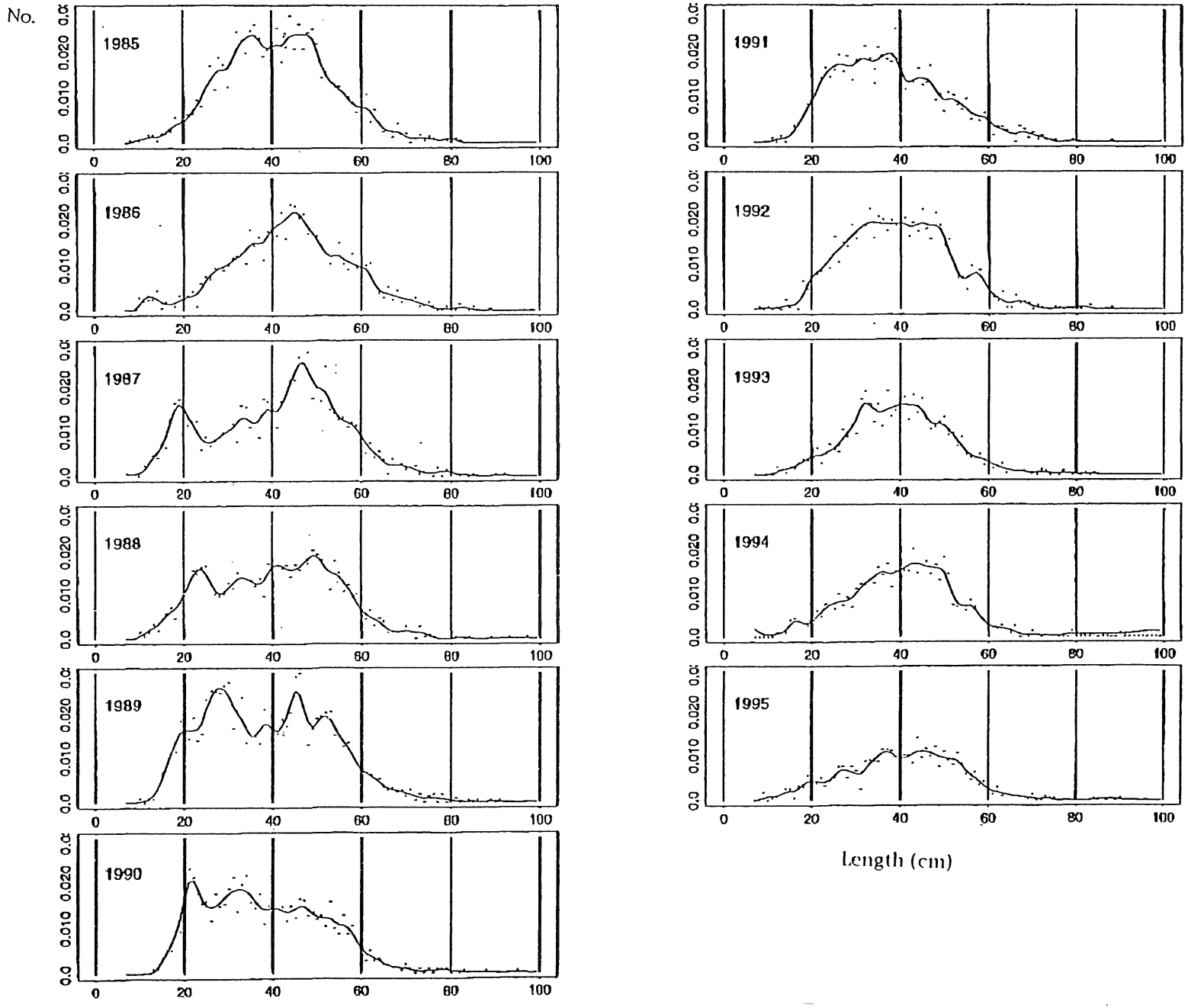


Figure 10.4.1.a Length frequency distribution of orange roughy in French landings 1991.

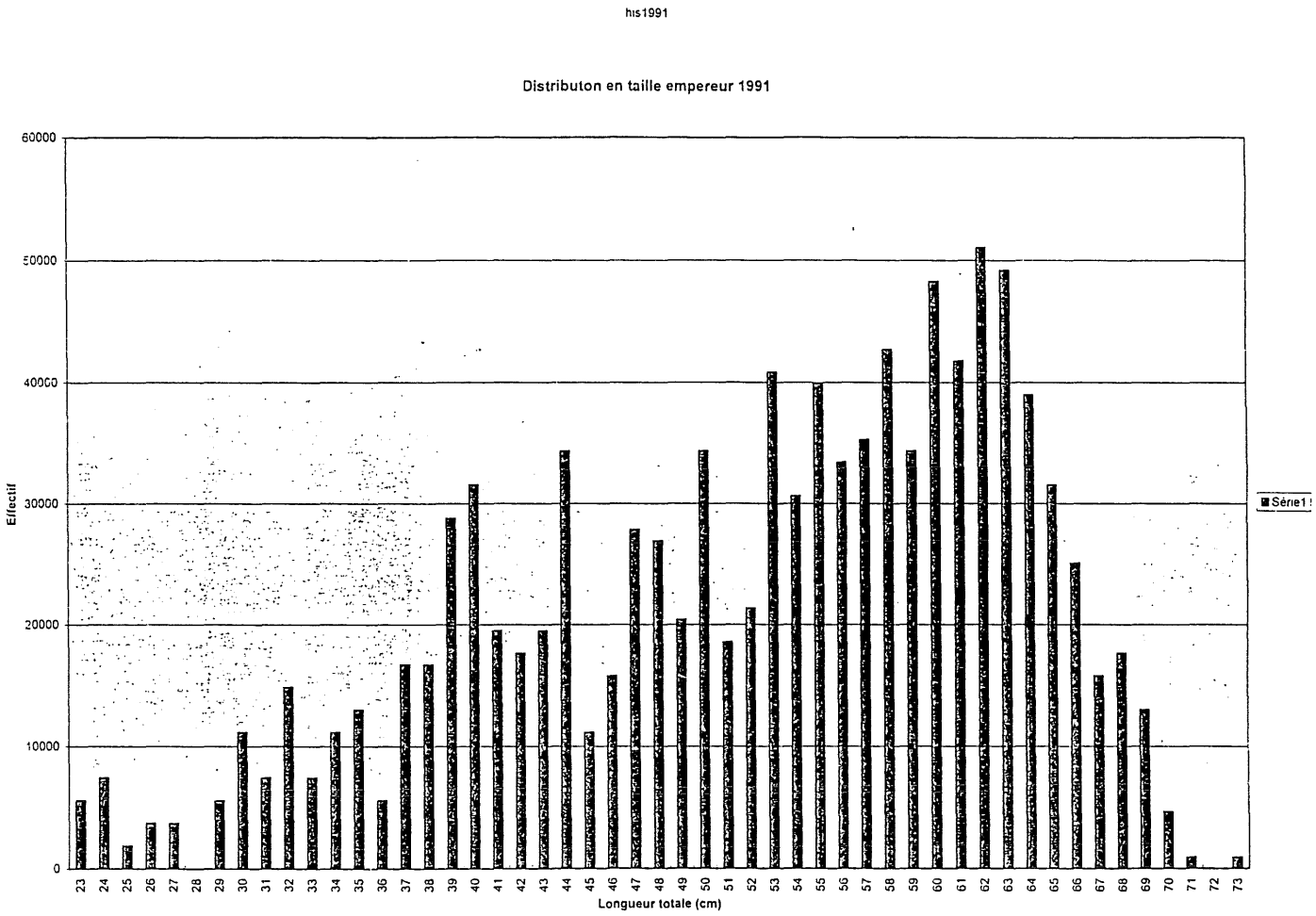


Figure 10.4.1.b Length frequency distribution of orange roughy in French landings 1992.

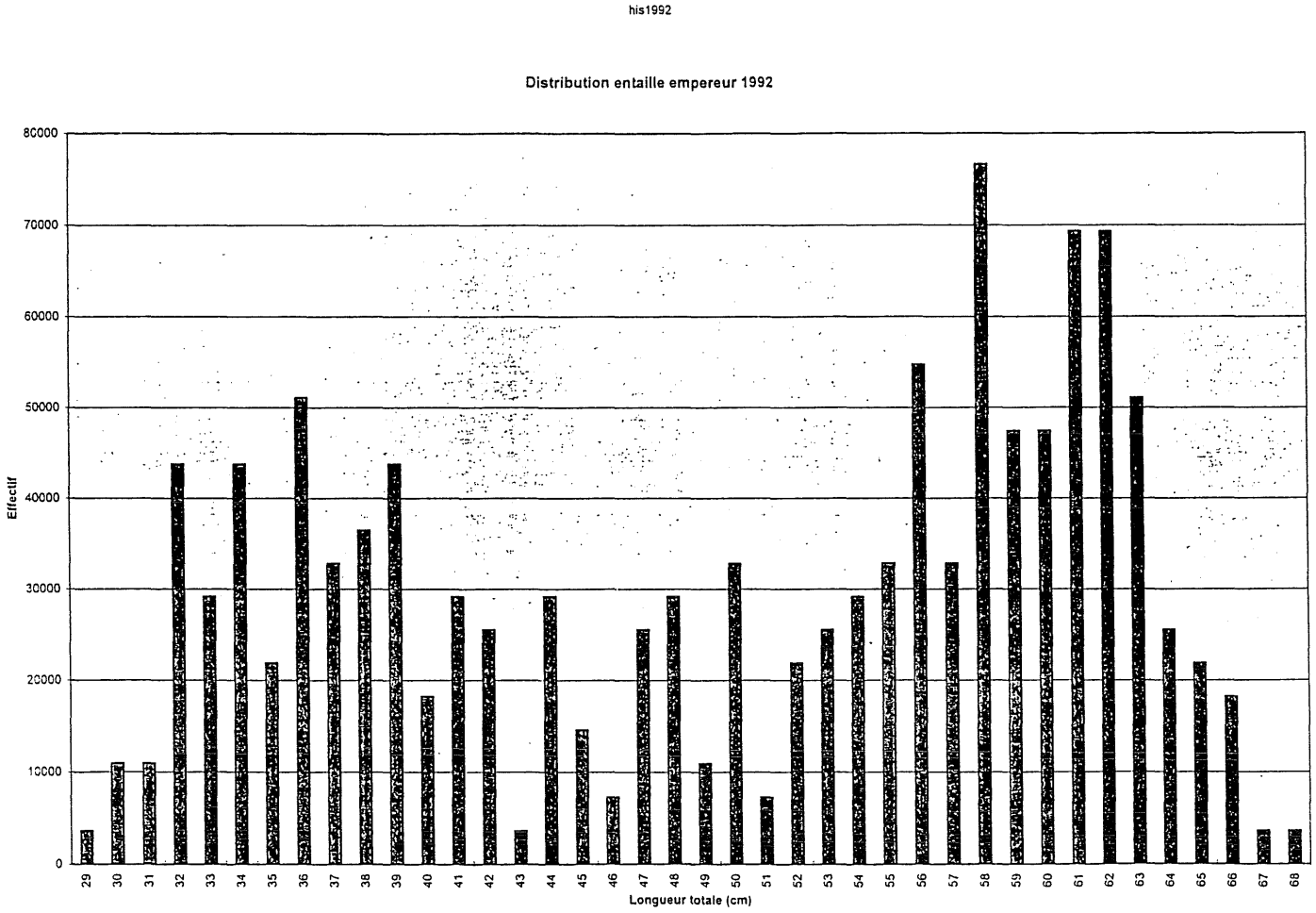


Figure 10.4.1.c Length frequency distribution of orange roughy in French landings 1993.

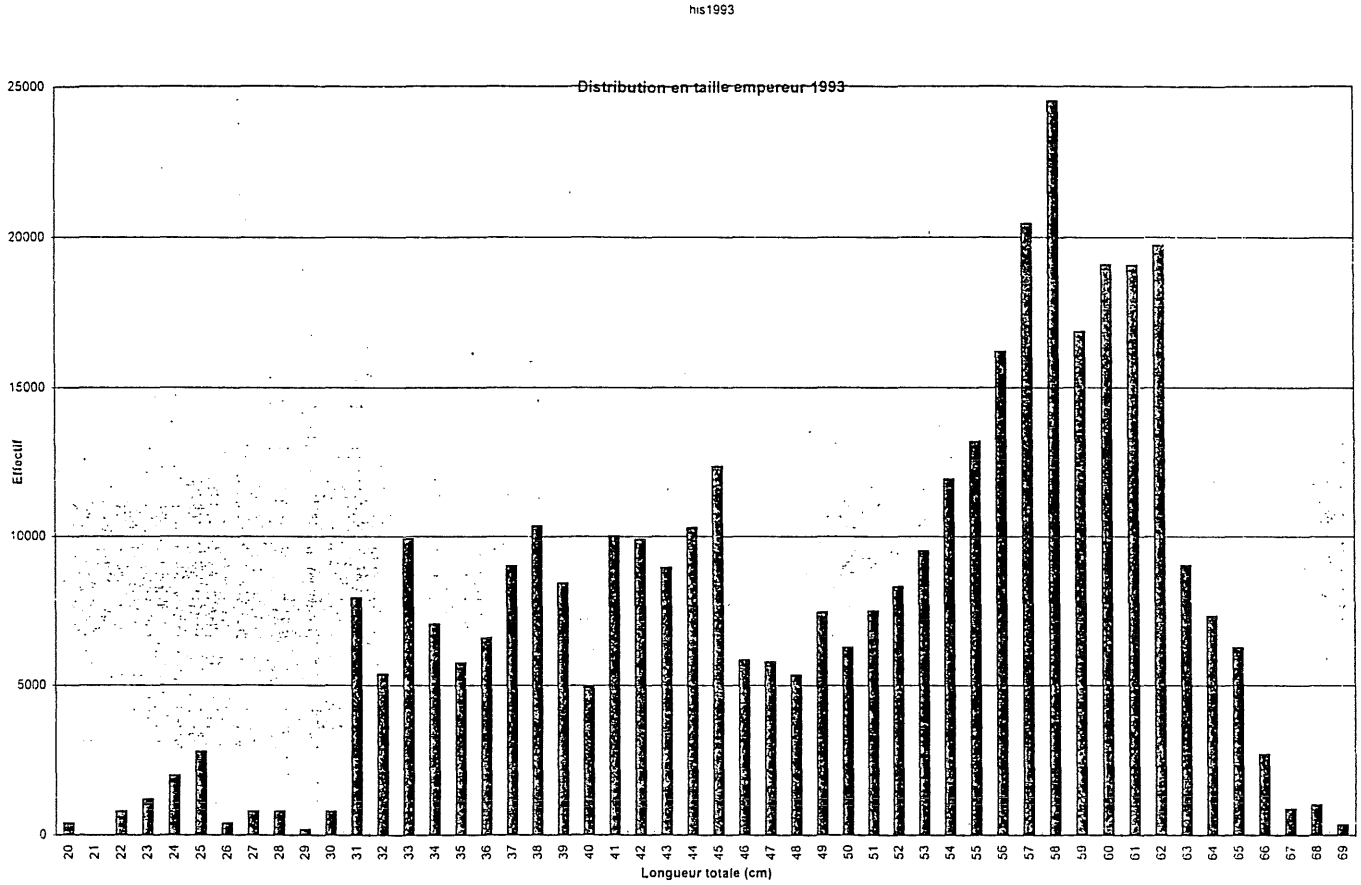


Figure 10.4.2 Length frequency distribution of orange roughy in French landings 1994.

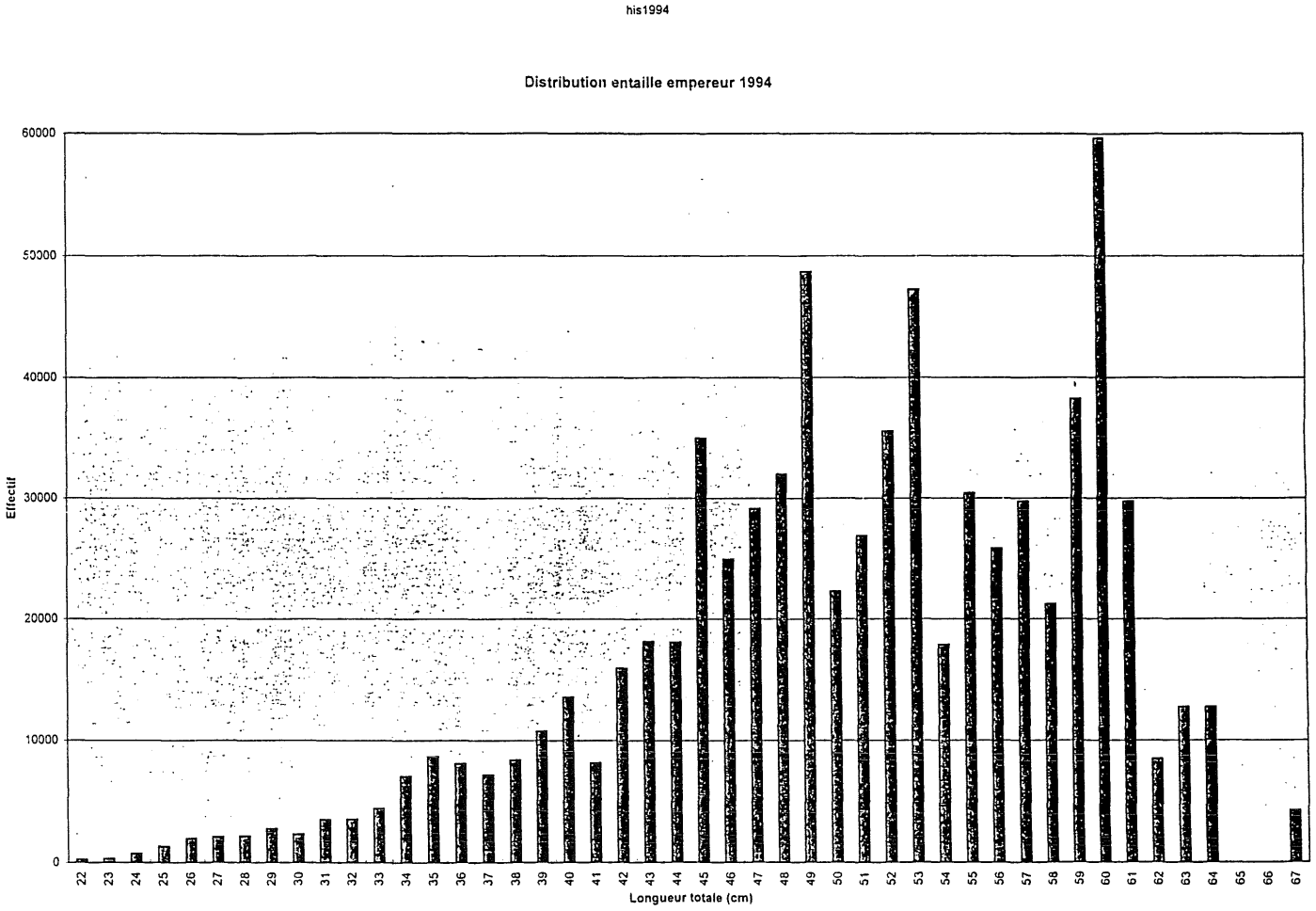


Figure 10.4.3 Length frequency distribution of orange roughy in Icelandic landings 1991–1995.

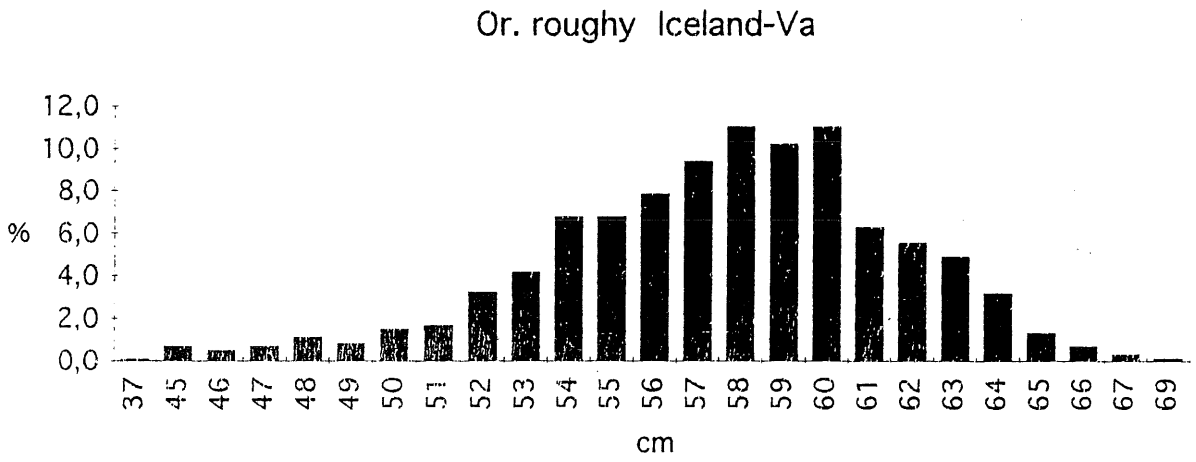


Figure 13.1 Annual landings of golden eye perch (*Beryx splendens*) in Azores.

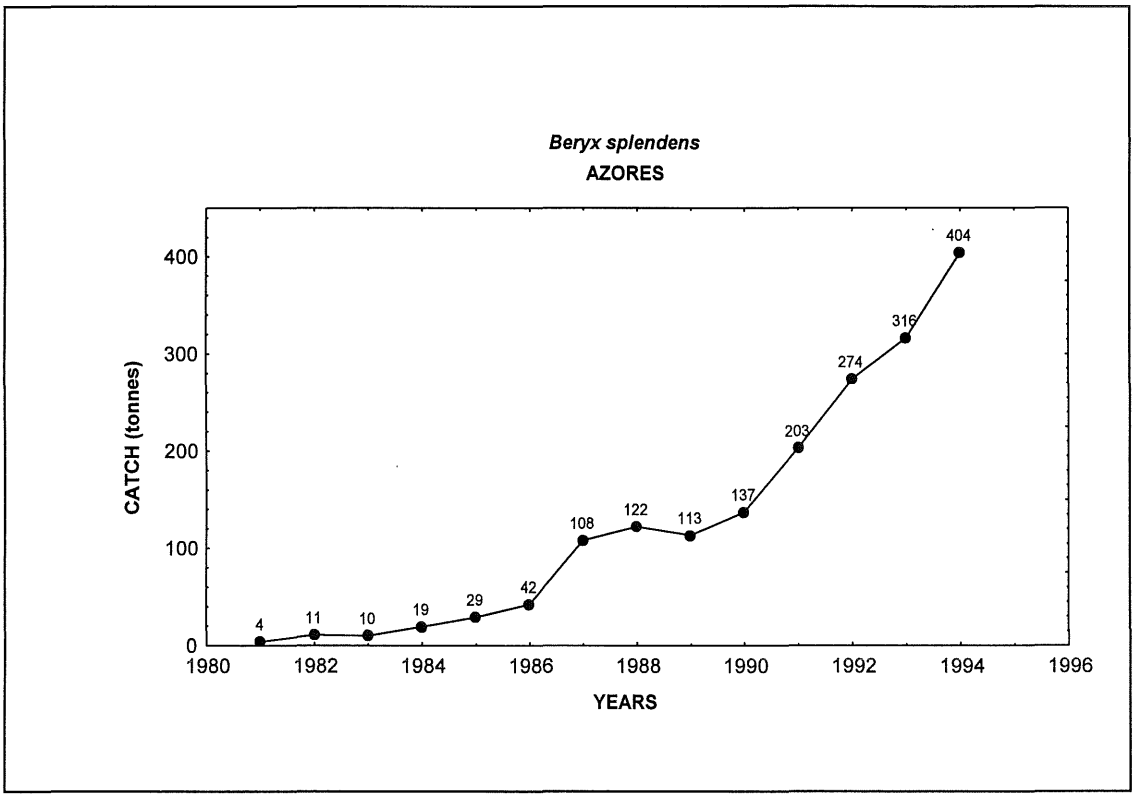


Figure 13.2 Von Bertalanfy growth curve of *Beryx splendens* for both females and males from ICES Area X (Azores).

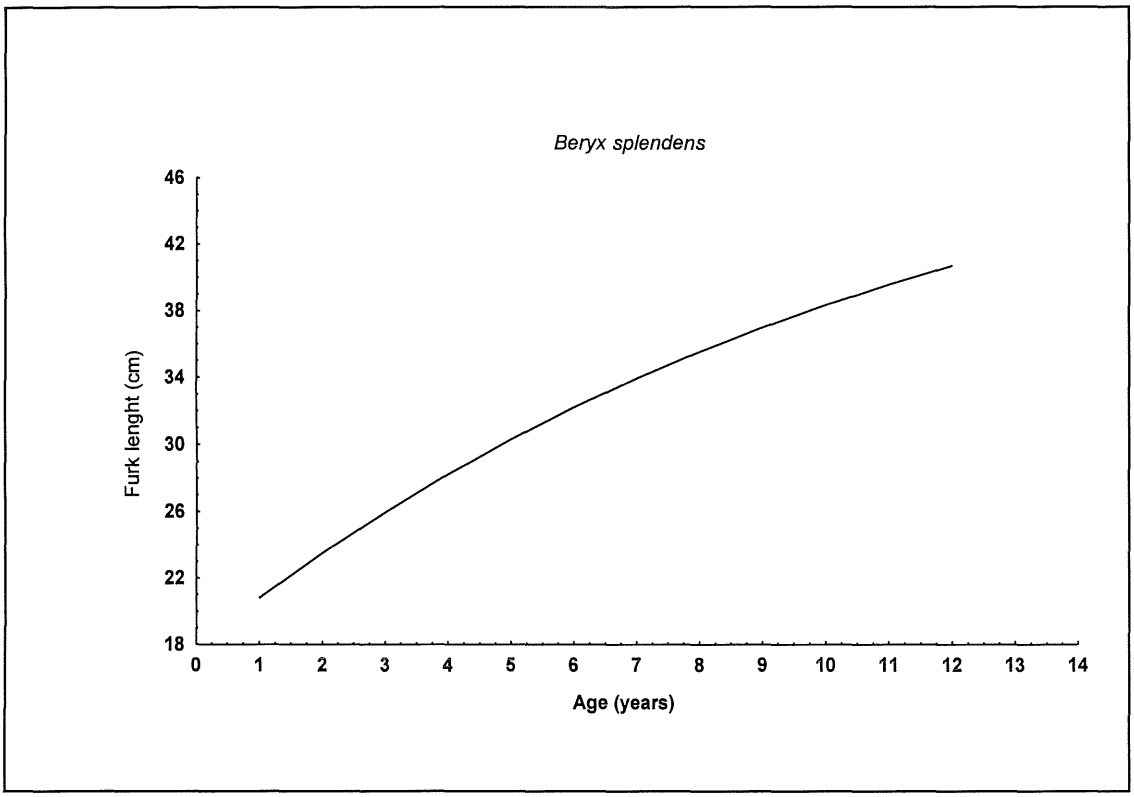


Figure 13.3 *Beryx splendens* length composition in the area to the North of Azores in June 1994.

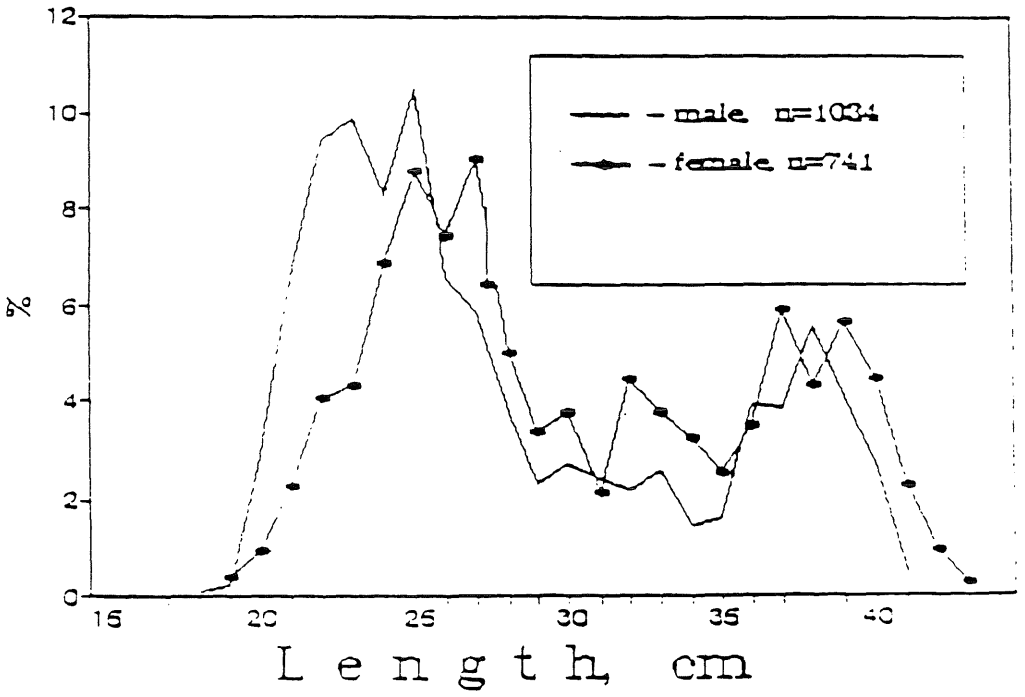


Figure 13.4 Recordings of Alfonsino aggregations on "Agat" Bank in September 1993.

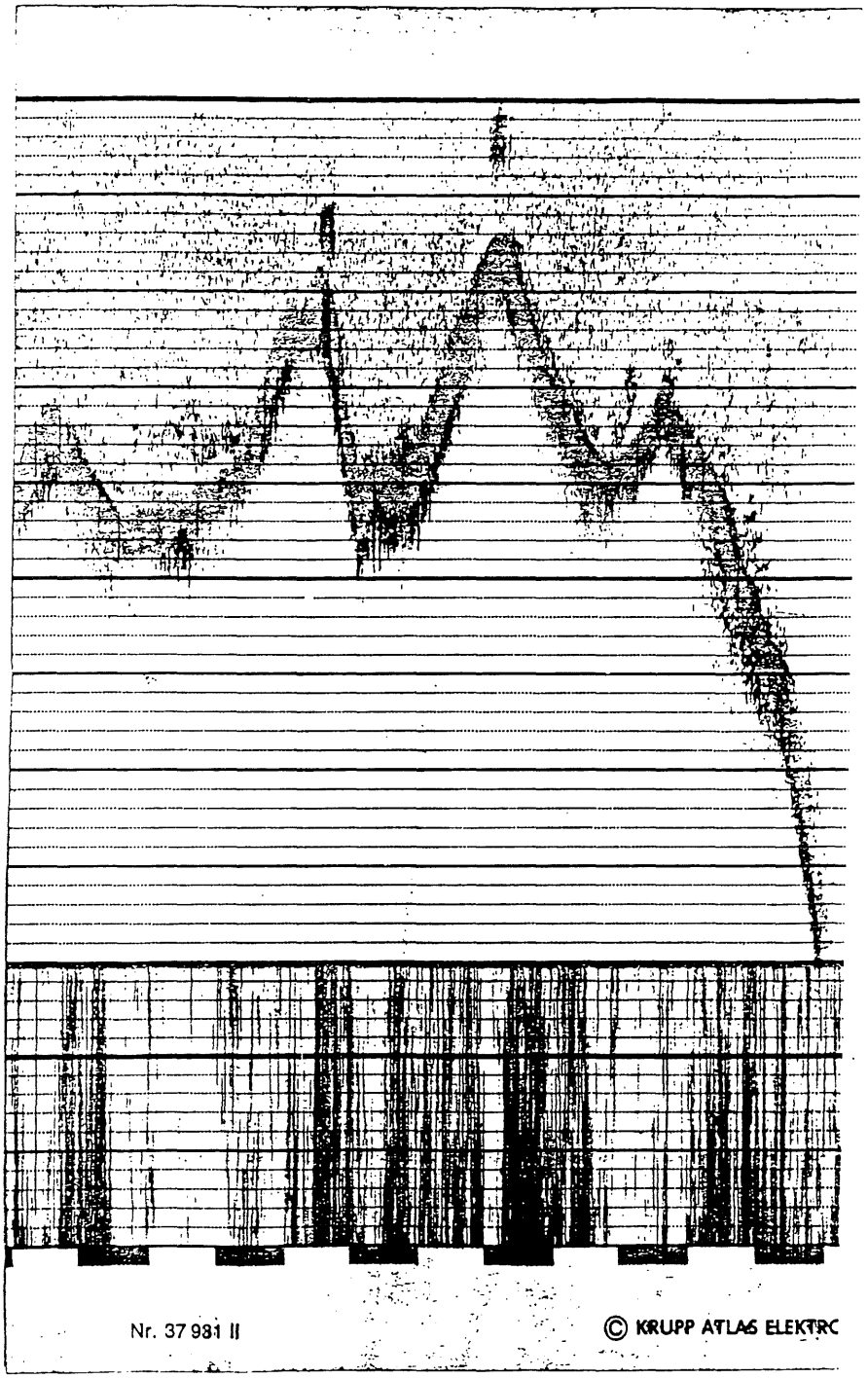


Figure 13.5 Length frequencies of *Beryx splendens* for ICES Area X (Azores) from 1995 cruise surveys.

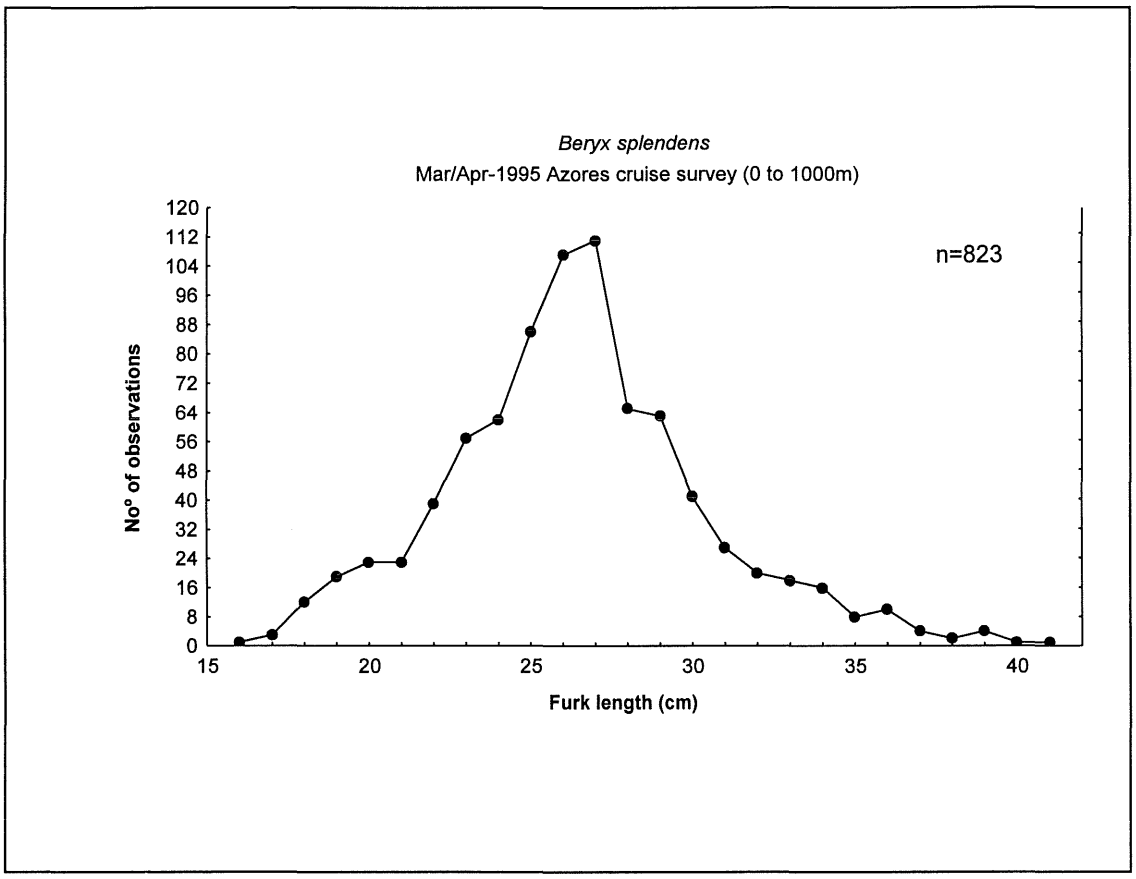


Figure 13.6 Mean length at depth (± SD) of *Beryx splendens* of ICES Area X (Azores) from the 1995 cruise surveys.

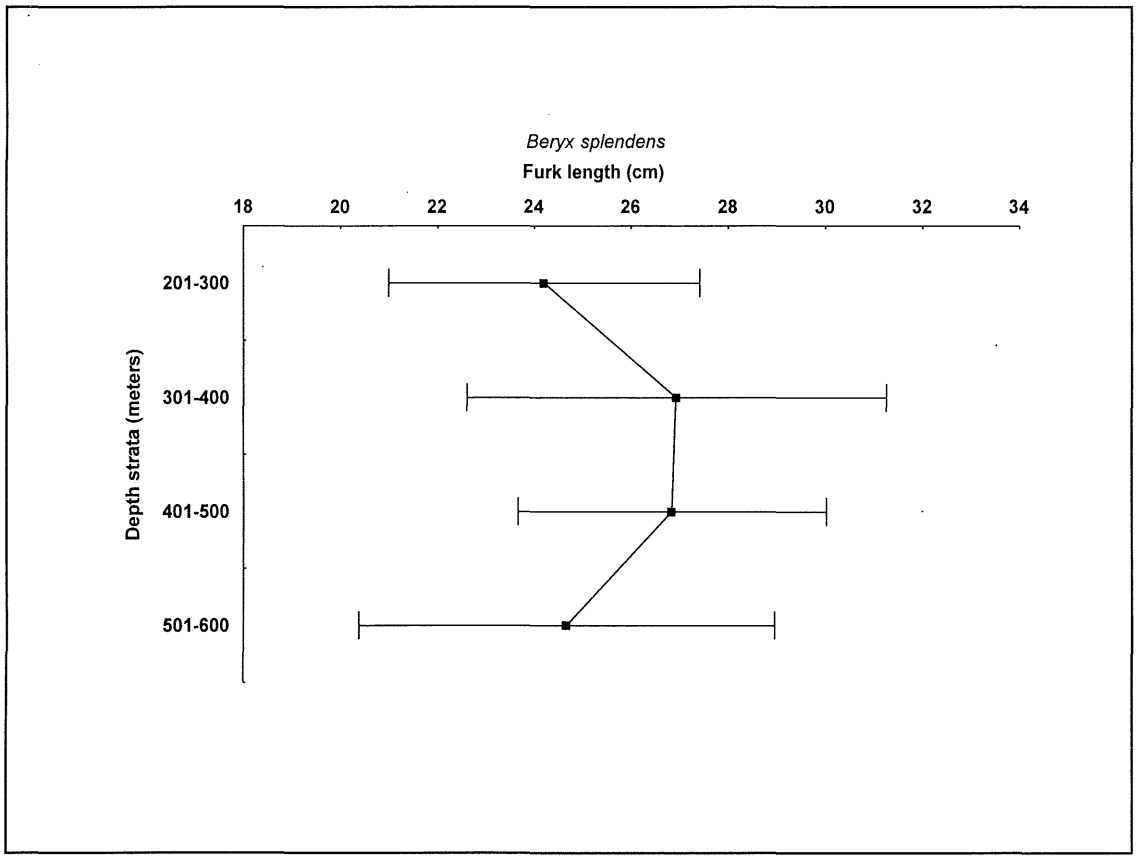
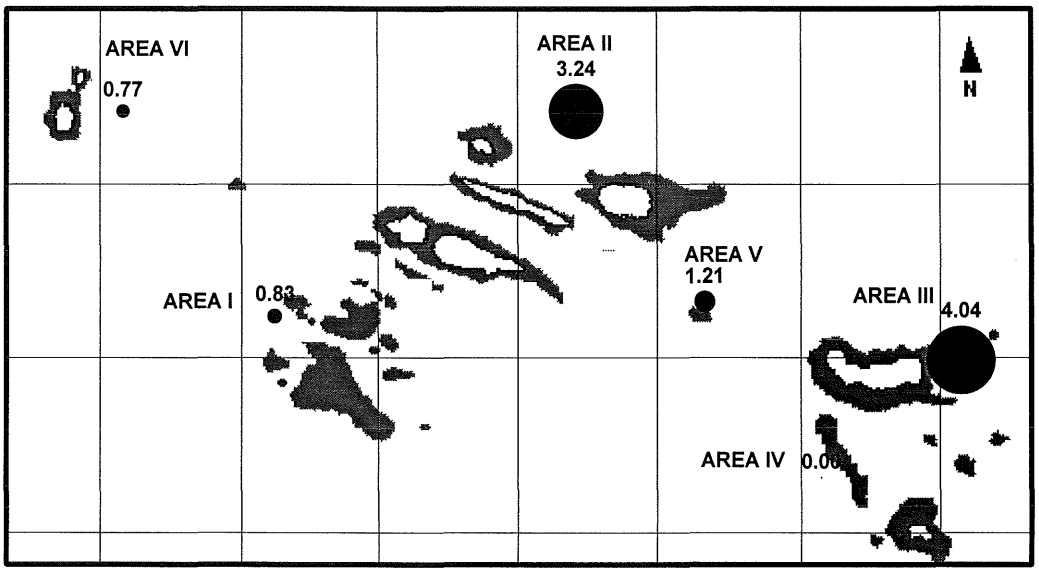
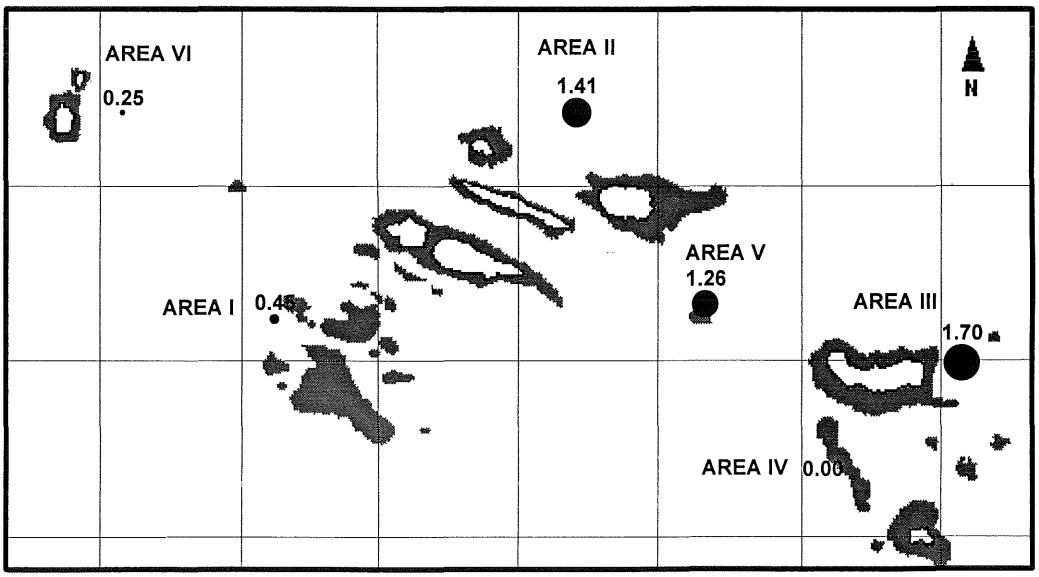


Figure 13.7 Relative abundance indices of golden eye perch (*Beryx splendens*) in number (A) and weight (B), for each sampling survey area.

A



B



600 meters depth

ÁREA I - Princesa Alice, Açores, Condor and S. Mateus Banks
AREA II - The coast of the Central islands
AREA III - The coast of the Eastern islands
ÁREA IV - Mar da Prata Bank
AREA V - D. João de Castro Bank, Formigas islets, Gigante and other seamounts
AREA VI - The coast of the Western islands

Figure 13.8 Relative abundance indices of golden eye perch (*Beryx splendens*) in number (A) and weight (B), for each depth strata sampled in the 1995 survey cruise.

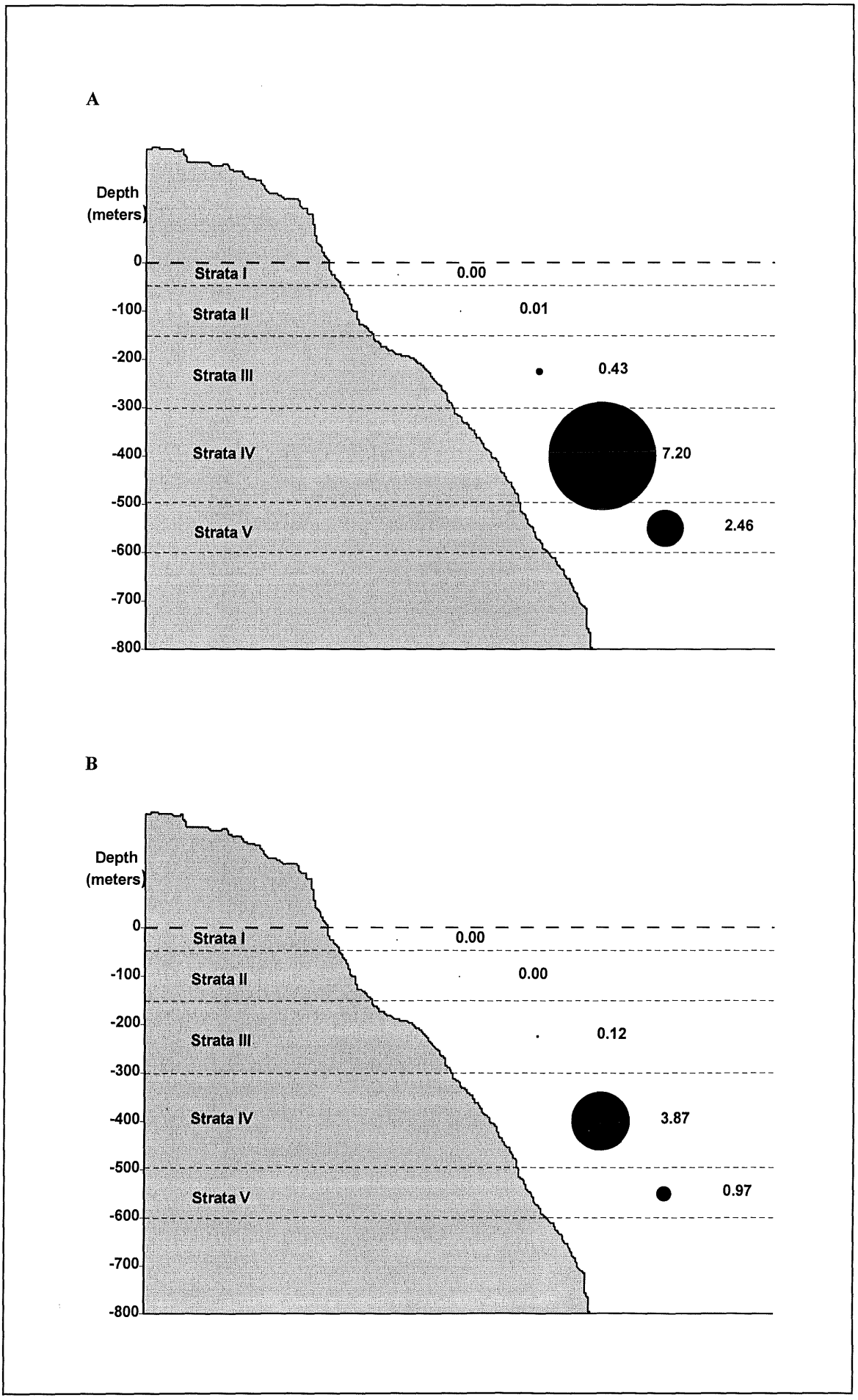


Figure 14.1.1 F and effort plotted against year.

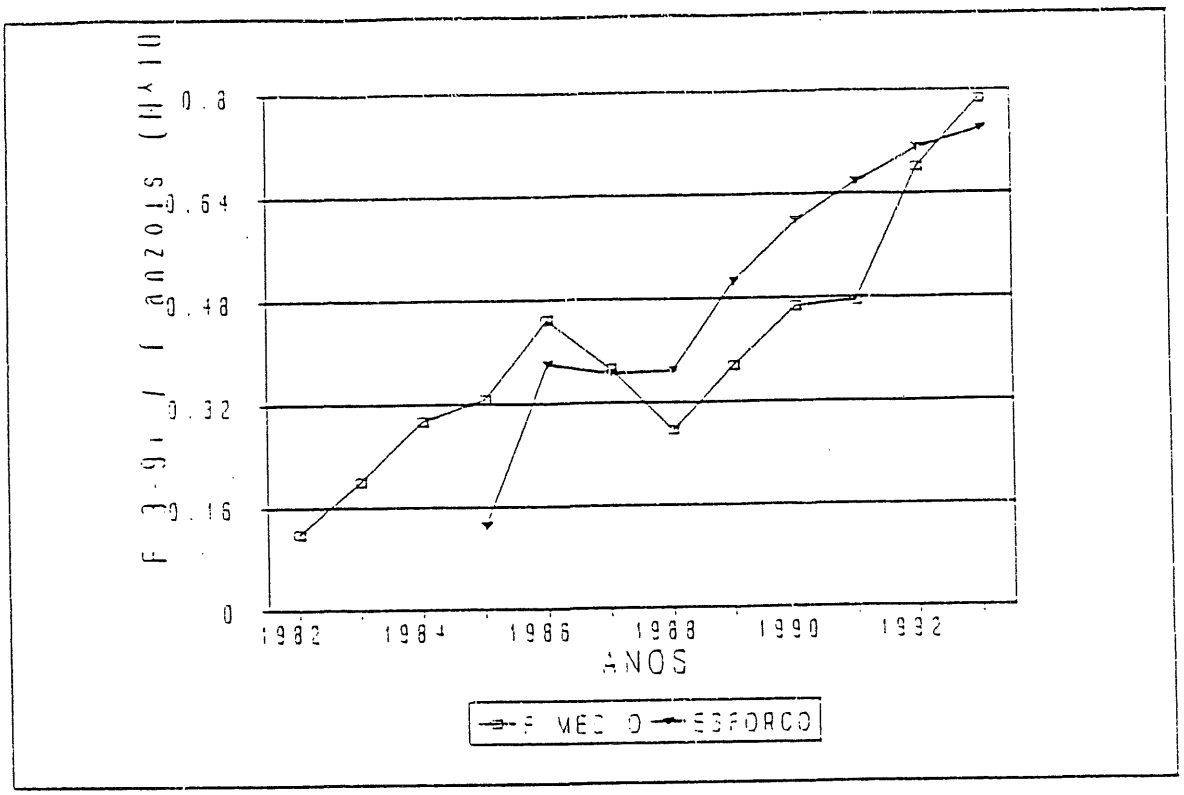


Figure 14.1.2 SSB-R plot.

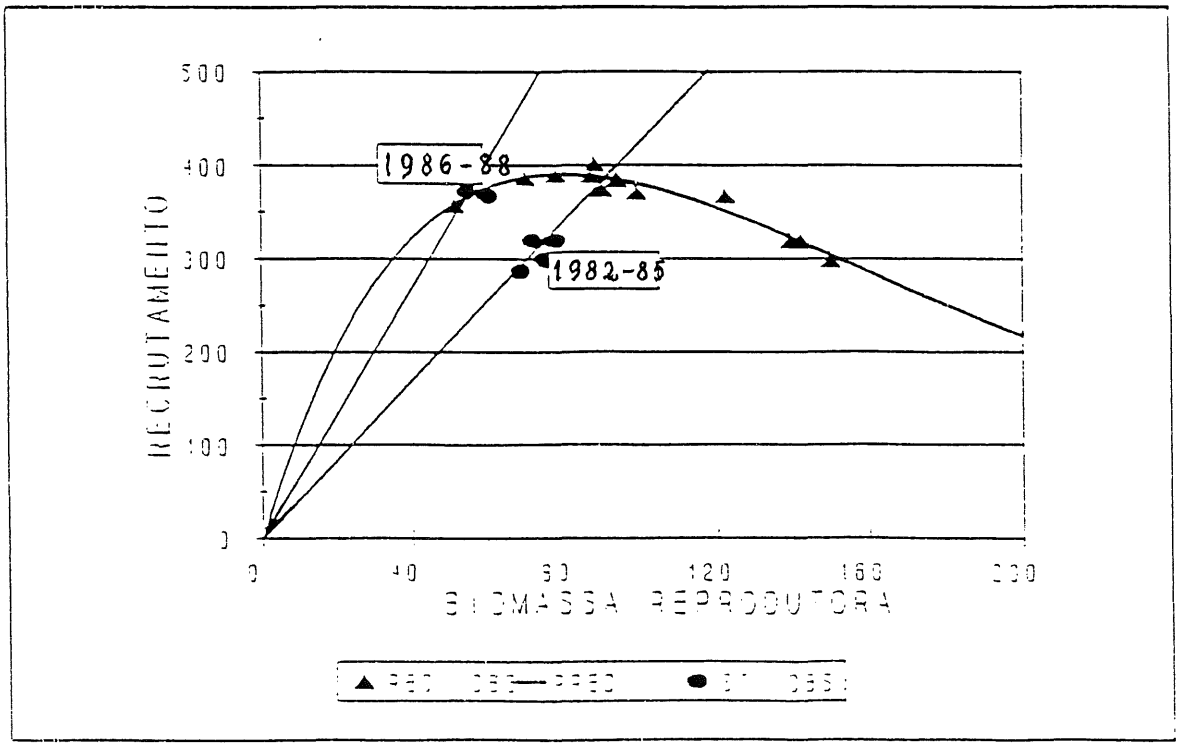


Figure 14.1.3 Yield per recruit plot.

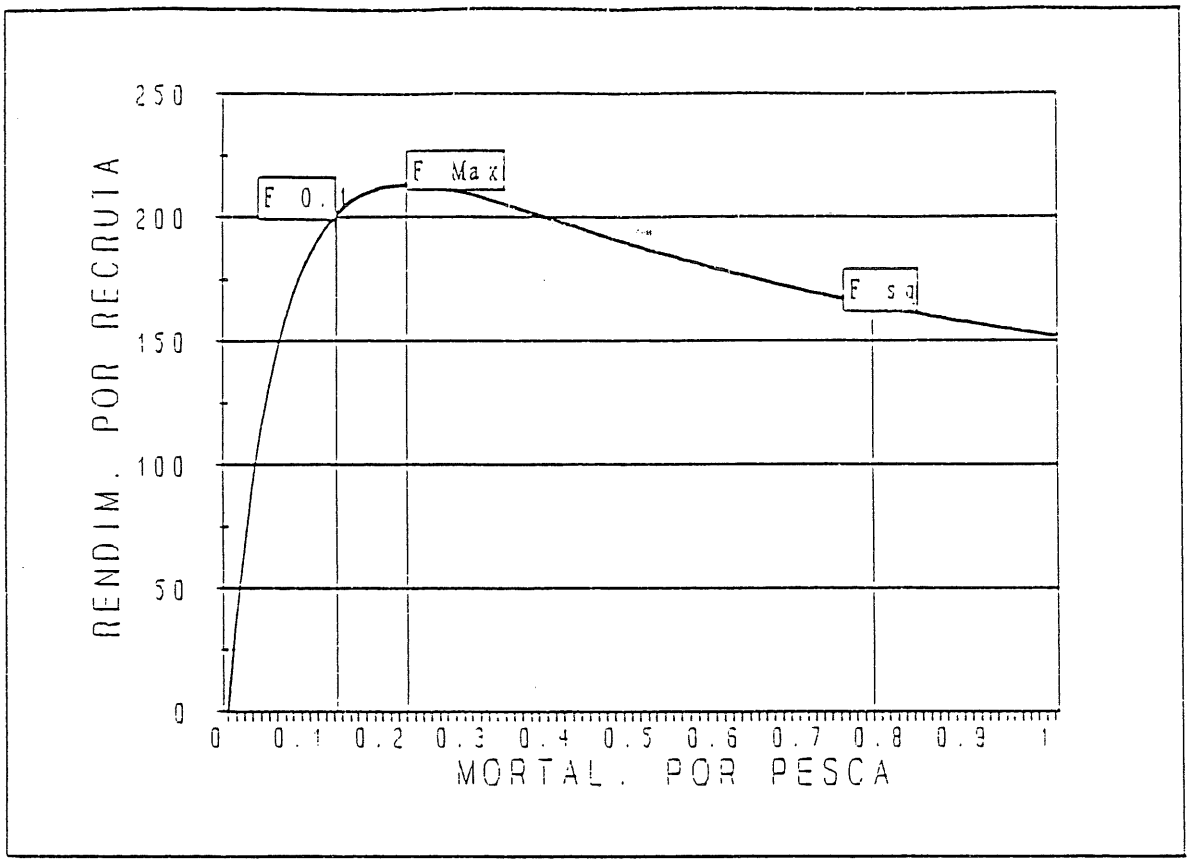


Figure 14.1.4 Length frequencies of *Pagellus bogaraveo* for ICES area X (Azores) from 1995 cruise surveys.

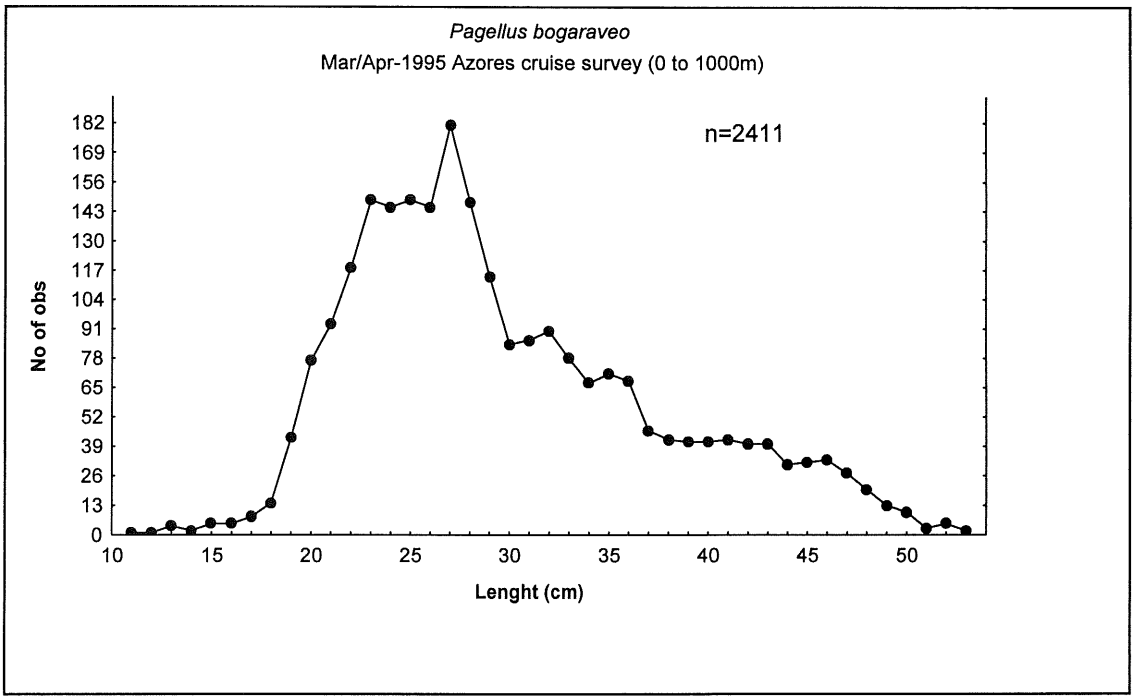


Figure 14.1.5 Relative abundance indices of red (blackspot) seabream (*Pagellus bogaraveo*) in number (A) and weight (B), for each sampling survey area.

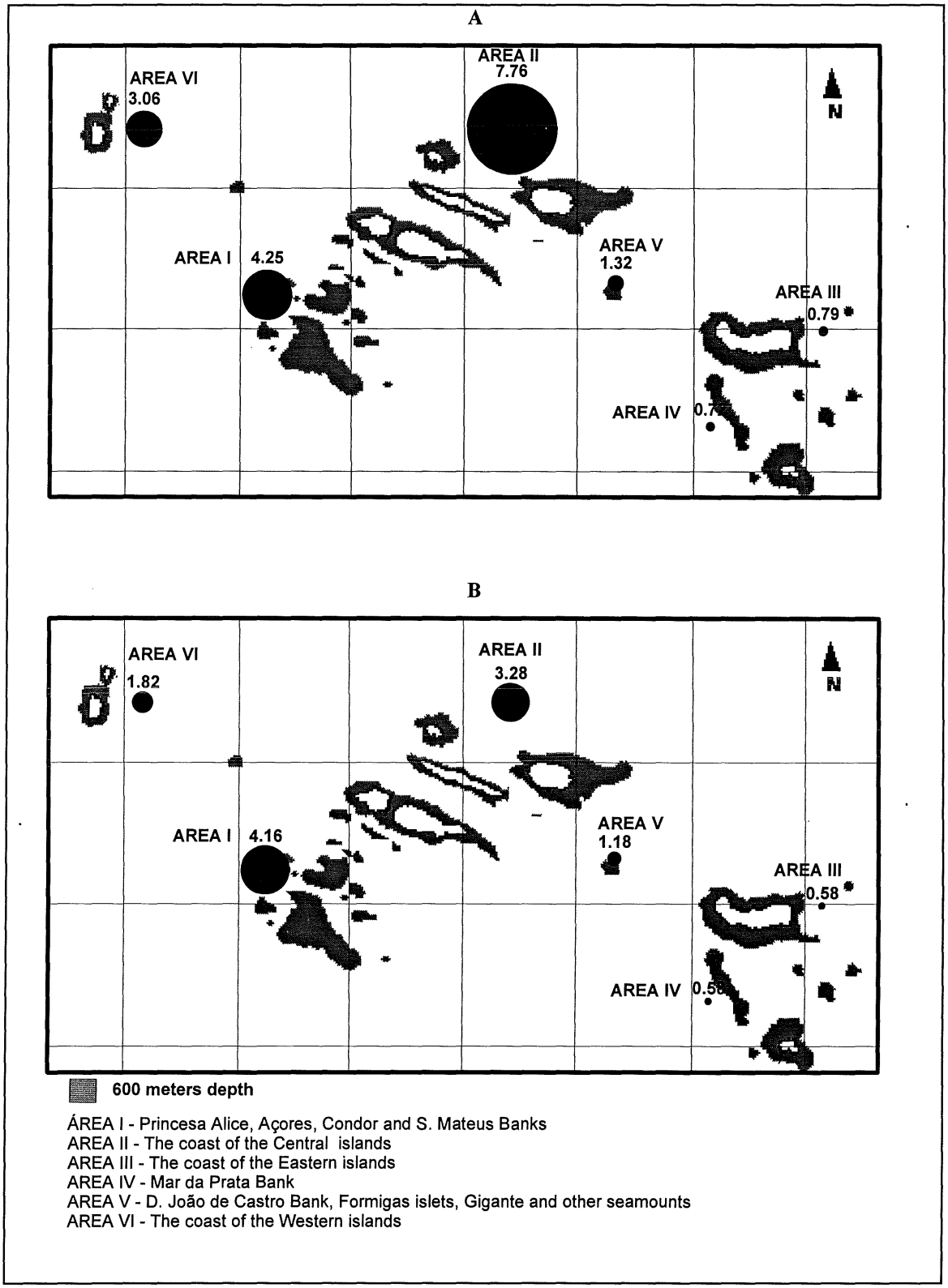


Figure 14.1.6 Relative abundance indices of red (blackspot) seabream (*Pagellus bogaraveo*) in number (A) and weight (B), for each depth strata sampled in the 1995 survey cruise down to 600 m.

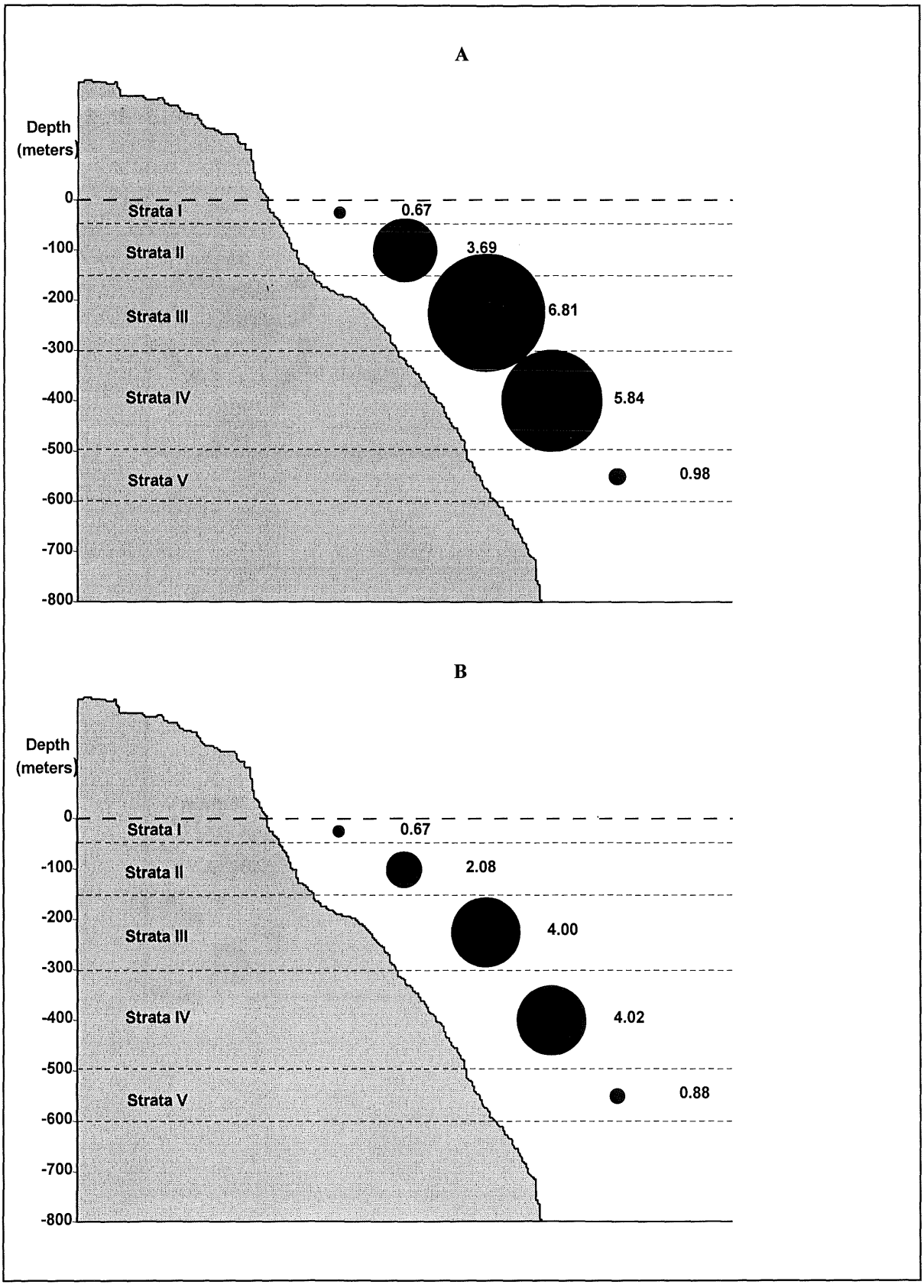


Figure 14.1.7 Mean length at depth (± SD) of *Pagellus bogaraveo* of ICES area X (Azores) from 1995 cruise surveys.

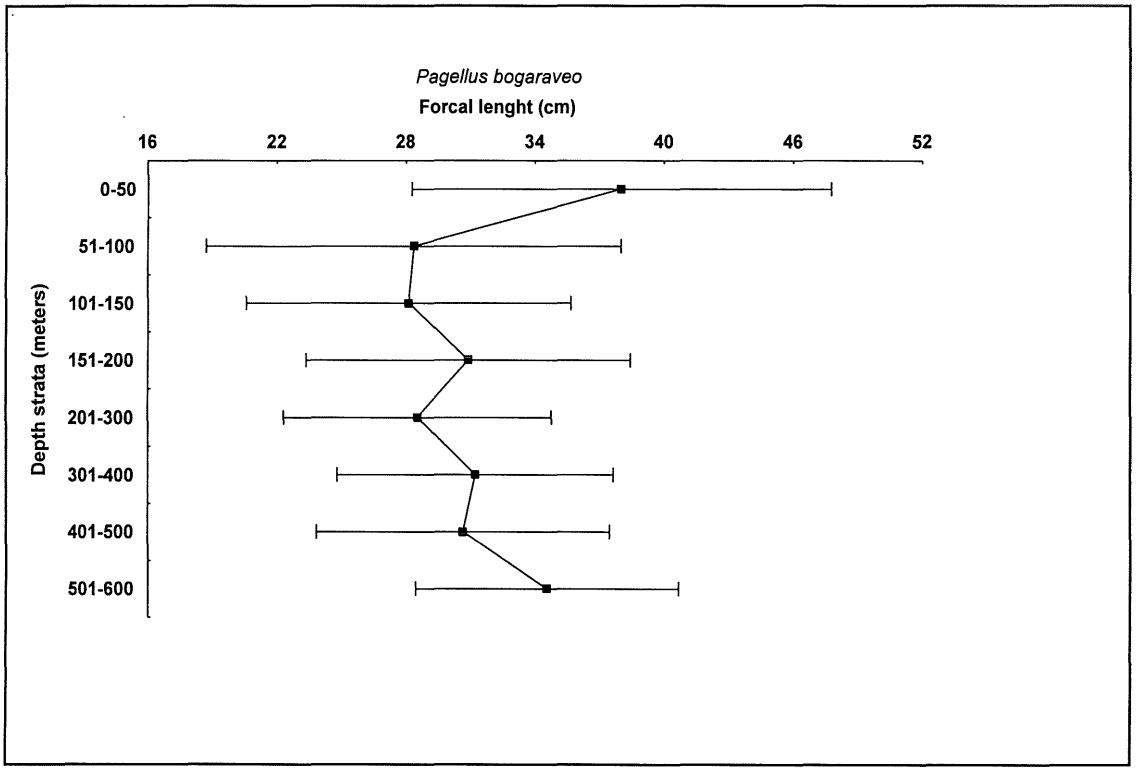


Figure 14.2.1. Evolution of the red seabream (Pagellus bogaraveo) landings, in kg, in the fishing ports of the Basque Country, during the period 1900-1995. From 1900 to 1909 data correspond to only two important ports; from 1910 to 1927 data were available from only one port; since 1963 on data from all ports are included. Source of the data: Register books of the "Cofradias de Pescadores/ Arrantzalearen Kofradiak" (Fishermen Associations) of the Basque Country. (Lucio, 1996).

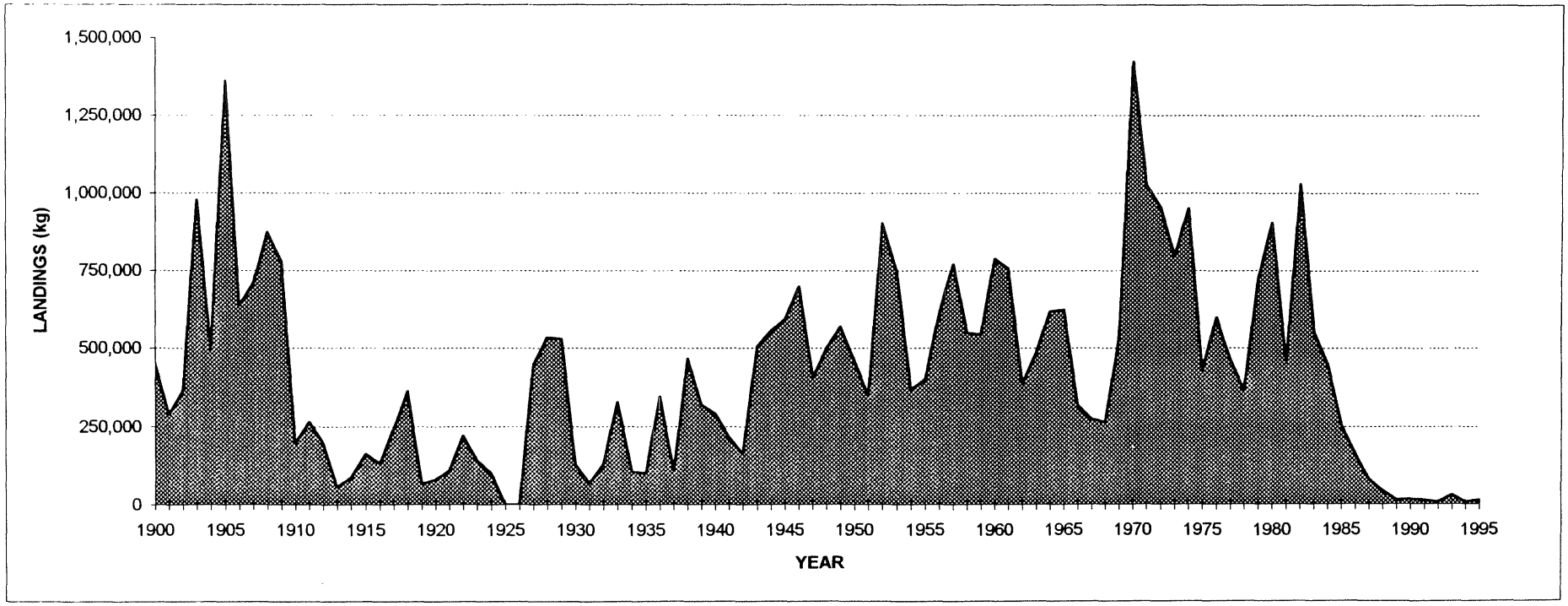


Figure 14.2.2 Mean monthly landings by decades of red seabream (Pagellus bogaraveo) in the fishing ports of the Basque Country, during the period 1930-1995. From 1963 on data from all ports are included. Source of the data: Register books of the "Cofradias de Pescadores/Arrantzalearen Kofradiak" (Fishermen Associations) of the Basque Country. (Lucio,1996).