COOPERATIVE RESEARCH REPORT

No. 86

THE BIOLOGY, DISTRIBUTION AND STATE OF EXPLOITATION OF FISH STOCKS IN THE ICES AREA

Part II

ISSN 2707-7144
ISBN 978-87-7482-509-8

International Council for the Exploration of the Sea
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Denmark

February 1979

https://doi.org/10.17895/ices.pub.5507

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I. THE ATLANTIC AREA

INTRODUCTION

At its meeting in November 1976 NEAFC asked ICES to submit, as soon as possible, information on the biology of and fisheries on stocks shared between zones of extended fisheries jurisdiction.

In view of the magnitude of the work involved, and the urgency with which some of the data was required, the Liaison Committee of ICES decided to submit initially a report on the major stocks in the North Sea. This was done (Coop.Res.Rep., No.74, 1978) in 1977, with an undertaking that a subsequent report dealing with the other stocks in the Convention area would be prepared, and submitted, as quickly as possible.

This report, which fulfills that undertaking, was prepared by the Advisory Committee on Fishery Management in collaboration with various ICES Assessment Working Groups, which were asked at their 1978 meetings to review the drafts they had previously prepared, in the light of any new information available. Because fisheries research by ICES member countries has, in general, been more intensive in the North Sea than in other areas the data available for the stocks dealt with in this report are less comprehensive in many cases, than for those in the preceding one. They are, however, the best relevant data available, and are presented here in the hope that they will be of some help to the Commission and the other bodies concerned with management and allocation problems in the areas concerned.

In the Introduction to the preceding report on this subject the Liaison Committee commented on the general principles and problems in the management of shared stocks under the new regime of extended zones of fisheries jurisdiction. ACFM would wish to endorse these comments and to recommend that they be read in relation to this report by anyone who has not already done so.

A. REGION 1 STOCKS

A.1 Cod in Sub-areas I and II

A.1.1 General biology

The North-East Arctic cod is the main stock in these Sub-areas. Smaller stocks inhabit Norwegian (coastal cod) and Soviet (Turijanka and White Sea cod) coastal waters. These small stocks are restricted to coastal waters and are not considered further in this report.

Spawning time and area

North-East Arctic cod gather to spawn along the Norwegian coast from late January to the middle of April (Figure 1); the spawning is most intensive in the last week of March and the first week of April. Spawning takes place close inshore, mainly in the Vestfjord but also occurs sporadically along the shelf from 62°N to about 70°N.

Larval and post-larval distribution

Developing planktonic eggs and larvae drift in a northerly direction over the Norwegian shelf (Figure 2) and arrive as early 0-group in August/September on the southern banks of the Barents Sea and on the Svalbard shelf, i.e. in the northern part of the Norwegian zone, in the Svalbard zone and in the USSR zone (Figure 3). At this time these 0-group cod are still pelagic; they do not settle on the bottom until late autumn and early winter. They are then about 10 cm long and spend their first winter where they settle.

A.1.2 Distribution and migration of juvenile and adult component of the stock

Juvenile fish of two and three years of age migrate to a limited degree in search of food, these feeding and wintering migrations become more extensive with age. As 3-4 year olds they gather in large shoals and as 4-5 year olds make rather long migrations. In summer they disperse and feed on the shallow banks in the southern Barents Sea and on the Svalbard shelf. At the end of the feeding season, they form shoals in deep water and migrate to their wintering grounds in the southern Barents Sea (off East Finmark and on the West Murman coast) and on the continental slopes south of Bear Island. In warm years the wintering grounds spread to Goose Bank in the southern Barents Sea, and to the southern West Spitsbergen Banks. In cool years the wintering and feeding grounds shift westwards.

In spring, shoals of cod enter the southern Barents Sea from the west and migrate eastwards where the water is warm. They feed intensely on the banks in summer. The timing and the routes of the seasonal migrations and the positions of the feeding areas change from year to year. Adult cod migrate to the west towards the spawning grounds with the onset of winter; immature cod stay in the Barents Sea in winter (Figure 1).

Tagging experiments indicate that there is no exchange between immature cod inhabiting the southern Barents Sea and the Svalbard shelf.

The young cod stay in the feeding areas until maturation which normally begins at an age of 6 years. Year classes are fully recruited to the spawning stock at an age of about 12 years. After spawning, mature fish return either to the Svalbard shelf or to the southern Barents Sea, depending on which ground they had lived on before spawning.

During April and May most of the spent fish migrate along the shelf between the Vestfjord and North Cape. They arrive in the Bear Island area in May and June. Some of these migrate further north and reach the West Spitsbergen area in July and August and others reach Hopen Island. However, most migrate in the North Cape current, in the northern part of the Norwegian zone, and in May to July reach the Soviet zone. Towards the end of the year, the mature fish gradually move westward again on their way back to the spawning area and reach the Norwegian zone at the end of the year. In January the spawning stock migrate southwards along the coast and reach the main spawning area in late February and the beginning of March.

A.1.3 Exploitation and management

Description of fisheries

The bottom trawl fisheries in the southern Barents Sea and the Svalbard area concentrate on immature cod; the proportion of mature fish in the catches varies from month to month but they are always of secondary importance.

Small quantities of cod are caught during summer and winter by long line off Bear Island. Off the East Finmark coast, fisheries with long line, gill net, Danish seine and handline take place throughout the year, based mostly on immature cod, although some mature cod are caught in late autumn and early winter.

The Norway coast fishery is worked by gill net, long line, hand line, Danish seine and trawl. Several nations have taken part in the trawl fishery, but the other gears have been used only by Norwegians. Cod is the target species for all gears in the area south of 71°N with by-catches of haddock, saithe and redfish. Gears other than trawl take the bulk of the nominal catches from this part of Division IIa. Trawl

catches are more important in the northern and eastern part of Division IIa. While mature cod form the basis for the fishery in the area south of 71°N, a higher proportion of the catches in the remainder of the area are immature.

Historic yields

In the period 1966-69 the nominal catch of cod in Sub-areas I and II increased from 483 000 to 1 197 000 tons (Tables 1-4). Thereafter the catch declined steadily to 565 000 tons in 1972. In 1973 the catch increased again and reached 1 028 000 tons in 1974. The quota scheme introduced in 1975 stabilised the total catch at about 850 000 tons in the following two years.

The fluctuations in landings are mainly caused by variation in year class strength. As soon as an abundant year class starts to recruit to the fishery in the feeding areas (Division IIb and Sub-area I) the yield increases. The peak of the catch in the spawning area (Division IIa) follows that in the feeding areas 3 years later.

Effort data for the feeding area fisheries are available from the Soviet and British fisheries. This effort is directed mainly at cod and to a lesser extent at haddock, but saithe and redfish are also caught. British fishing effort increased in 1969 and 1970 when stock abundance was high but this was not shown in the Soviet and Norwegian material. Nevertheless the catches per unit effort are probably reliable as indices of abundance.

The total fishing effort exerted on the stock remained roughly steady during the 1960s, but increased sharply in 1970 in Sub-area I and in 1971-73 in Sub-area II. Increased catches during this period were taken by the Faroe Islands, France, Federal Republic of Germany, Poland and 'Others'.

Stock fluctuations

Large fluctuations are observed in the numerical strength of year classes. Catch statistics indicate that strong year classes, at an age of 3 years, are 20 times more abundant than poor ones. In the period from 1921 to 1976 20 strong year classes (36%), 26 year classes of medium strength (46%) and 10 poor year classes (18%) have been recorded. The total stock was high in the early 1950s but decreased gradually up to 1965. It then increased in the following years reaching a peak in 1968. The lowest stock size in the 1970s was observed in 1971. Since then a new increasing trend has been observed, which probably reached its peak in 1975/76. The mature part of the stock has shown similar variations, but they occur three years later than those in the total stock.

Exploitation pattern

From the beginning the fishery on North-East Arctic cod was concentrated on the mature fish and to a lesser extent on adolescent fish. These fisheries were seasonal. The fishery for mature cod took place in January to April followed by the spring cod fishery up to the end of June. Long lines, gill nets and hand lines were the main gears used. A trawl fishery started towards the end of the 1920s both on migrating mature cod in Division IIa and on adolescent cod in Sub-area I and Division IIb.

The relative importance of the Sub-area I and Division IIb fisheries has increased with time, at the expense of the Division IIa fishery. When the fishery started in 1946, after an almost complete stop in the Sub-area I and Division IIb fishery from 1940-45, the landings from Division IIa were about 40% of the total. The landings from Division IIa showed a decreasing trend during the following years, with some temporary interruptions due to rich year classes.

Comparing the period 1968-77 with that of 1960-67 shows that catches have increased as a result of increasing effort. The exploitation pattern has remained roughly the same throughout the whole period 1960-77. Fishing mortalities on the adolescent fish (ages 3-6) averaged 0.23 during this period (that in the period 1970-77 is 0.21), but those on the older fish were somewhat higher (1960-77, 0.63; 1970-77, 0.62).

International and national management measures

Until the end of 1974 mesh size regulations were the most important management measures in the trawl fishery. The regulation minimum mesh size since 1967 has been 120 mm for trawls of polyamide, for all other materials 130 mm; for the Danish seine it has been 110 mm for all materials.

No vessel is allowed to use any device by which the mesh size in any part of a fishing net is obstructed. However, material may be attached to the underside of the cod end to prevent or reduce wear or tear provided it is fastened to the cod end along the forward and lateral edges only. A topside chafer (or a cover made of a piece of netting, consisting of the same material as the cod end) with a mesh twice the mesh size of the cod end in all parts is also legal. Norwegian regulations, in addition, require a mesh by mesh fastening of the topside chafer along the two diagonals.

The present minimum landing size of 34 cm for cod is based on the 50% retention length of the regulation mesh size. According to national regulations in USSR the fishery for cod is closed when the scientists observe too high an abundance of cod less than 35 cm in an area.

Fisheries with small mesh nets for Polar cod, capelin, herring and prawns are authorised in the area using mesh sizes between 16 and 50 mm. These are in some areas mixed fisheries, and catches of protected species are unavoidable. When fishing with a small mesh net, that part of the catch not intended for human consumption may consist of 10% by weight of undersized protected species.

Norwegian authorities have put a total ban on prawn trawling in coastal areas inside the 12 n. mile limit shallower than 100 m. Specially sensitive fjords have been protected by a complete ban on prawn trawling. A quota regulation was introduced for Arcto-Norwegian cod in 1975, and the same scheme was subsequently extended to 1976. A total quota of 810 000 tons was allocated between 10 states and five other states were allowed to take 500 tons each. In addition the Norwegian quota was increased by 40 000 tons representing the estimated average annual catch of coastal cod, which, for the purpose of the agreement is deemed to be a separate stock. The USSR quota was also increased by 40 000 tons represening the estimated average annual catch of coastal cod, including the White Sea cod.

If the cod quota is taken before the end of the year the coastal state concerned may nevertheless permit its vessels to continue fishing with gill nets, long lines or hand lines.

In order to keep the exploitation of the spawning cod in the main spawning area at a reasonable level the use of purse seines is forbidden by Norway in the main spawning area, from the end of January to the middle of April. To prevent additional fishing mortality on young cod and haddock Norway has totally prohibited midwater trawling within the Norwegian 12 n. mile limit.

A.2 Haddock in Sub-areas I and II

A.2.1 General biology

There is one stock of haddock in Sub-areas I and II.

Spawning and distribution of eggs and larvae

Spawning occurs in March-April in a diffuse area on the Norwegian continental shelf from 64°N to 72°N, over depths 350-600 m (Figure 4). Eggs and larvae drift in a north-easterly direction above the Norwegian continental shelf (Figure 5). They arrive during summer as pelagic 0-group in the southern Barents Sea, in the Norwegian and the Soviet zones. Only a small proportion of each year's production of 0-group reach the Svalbard zone (Figure 6). The 0-group adopt the bottom living habitat in late summer and autumn throughout the whole area of distribution.

A.2.2 Distribution and migrations of juvenile and adult stock components

Up to the age of 2 or 3 years young haddock live in the pelagic zone in summer and sink to the bottom zone in October-November. The 1-group inhabit mostly coastal and western areas, whereas two- and three-year olds stay in coastal and central areas. The eastern boundary of the stock depends on the temperature conditions. In cool years the eastern boundary is shifted westwards. Haddock start regular seasonal migrations at an age of 3 years. Juveniles are much more abundant in the southern Barents Sea than in the Svalbard area. Young haddock stay within the feeding areas until maturation which begins at an age of 4 years old and is not complete in all individuals of a year class until it is 8 years old.

After spawning the spent fish migrate northwards over the Norwegian continental shelf into the Soviet zone as far east as Kap Kanin Bank and the northern edge of Goose Bank (Figure 4). Late in the year they return to the spawning areas.

A.2.3 Exploitation and management

Description of the fishery

The main gear is trawl, but haddock is also caught by long line, hand line, and Danish seine off the Norwegian coast. Little directed fishing for haddock takes place; it is mainly caught as a by-catch in the cod fishery. There is no fishery on the spawning concentrations. The fishery for haddock in the southern Barents Sea is based mainly on 3-6 year olds,40-60 cm long, whereas the Division IIa fishery is based on 5-11 year olds, 50-80 cm long.

Historic yields

Nominal catches from Sub-areas I and II amounted to 182 000 tons in 1968 (Tables 5-8). They decreased steadily until 1971 when less than 80 000 tons were landed. An increase in catch was observed in the following two years and a peak of 320 000 tons was reached in 1973. Since then a decreasing trend in catches has been observed. Only a small part of the total catches has been taken in Division IIb; about 2/3 having been taken in Sub-area I, and about 1/4 in Division IIa.

The state of the stock

Fluctuations in the catches are partly caused by stock size fluctuation and partly by fluctuation in fishing effort. The larger catches in 1972-75 were due to a high stock size and to a diversion of effort

from the cod fishery as quotas were imposed on cod, to the haddock fishery in Sub-area I.

Year class size fluctuates by a factor of sixty. The total stock size, calculated as the fish of 3 years and older, fluctuated around 400 000 tons in the period 1950-68, except in the years 1953-56 when it attained about 700 000 tons due to the very abundant 1950 year class. The rich 1969 year class increased the stock to 600 000 tons in 1972-73. During the last three years the stock size has decreased to about 300 000 tons, 100 000 tons below the level in the early 1950s and 1960s.

A more pronounced fluctuation has been observed in the spawning stock biomass (fish of 6 years and older). As for cod, the peaks in the spawning stock are usually 2-3 years later than the peaks of the total stock. A low spawning stock biomass is expected in the immediate future (1979-80). However, an increase, in both the total stock and the spawning stock biomass, is expected when the 3 most recent year classes 1974-76, which are of high abundance, recruit to the stock of 3 years and older.

Exploitation pattern

Since the distribution of haddock is similar to that of cod these two species are exploited in conjunction. Being the smaller of the two resources, the haddock fishery has tended to follow the developments in the cod fishery. In absence of a well defined spawning area there is no intensive fishery for spawning haddock, as there is for cod.

International and national management measures

The trawl gear regulations described for North-East Arctic cod are also applied to the fishery for North-East Arctic haddock. The minimum mesh size for trawl is 120 mm for gear made of polyamide and 130 mm for all other materials. The present minimum landing size for haddock is 31 cm. No quota regulation has yet been introduced for haddock. However, the contracting states of NEAFC which have exhausted their cod quotas are not then permitted to continue a directed trawl fishery for haddock in Sub-areas I and II.

A.3 Polar Cod in Sub-area I and Division IIb

A.3.1 General biology

Polar cod has a circumpolar distribution (Figure 7). It is very abundant in the eastern Barents Sea, off Novaja Zemlja and near the Kolguev Island. It is less abundant in the northwestern Barents Sea and off Spitsbergen. In summer, schools of Polar cod occur near the ice edge, east of Franz Joseph land. The borders of the habitat are shifted to the east and north in warm years and to the west and south in cool years.

Spawning and distribution of larvae

The majority of Polar cod attain sexual maturity at an age of 3-4 years and at a length of 16-17 cm.

The major spawning grounds are in the southeast Barents Sea, White Sea and Kara Sea. Some individual spawners are caught on the Bear Island-Spitsbergen shelf. The peak of spawning is in December-January. Polar cod occurs in small schools, in midwater, on the spawning grounds.

The eggs are pelagic. Hatching of eggs extends from March-April to August-September with a peak in May-June. Eggs and larvae drift to the north and northeast with the currents.

A.3.2 Distribution and migrations of juvenile and adult stock components

0-group during summer live in the midwater layer west of Novaja Zemjla and along West Spitsbergen (Figure 8). They descend during October-November to the near bottom layer.

Polar cod make a pre-spawning and spawning migration to the south of the distribution range in autumn-winter, and a feeding migration to the north in spring-summer.

A.3.3 Exploitation and management

Description of the fishery and historic yields

Table 9 gives the catch figures from 1966 to 1975. A regular fishery was established in 1969 in open waters in the Barents Sea. The annual catches have fluctuated between 330 000 tons in 1971 and 50 000 tons in 1975. The fishery covers a vast area in the eastern part of the Barents Sea from 77° to 68°N and from 40° to 59°E. The main gears are bottom, off-bottom and midwater trawls, but purse seine has also been used. The catches consist mainly of 3-5 years old, 14-26 cm long Polar cod.

State of the stock and management measures

The state of the stock is not known. No management measures are in force for this species.

A.4 Saithe in Sub-areas I and II

A.4.1 General biology

Saithe in the North-East Arctic region spawn chiefly in February-March at 150-200 m depth. The most important spawning grounds are Svinöy area, the Halten Bank and the Lofoten area.

Eggs, larvae and juveniles are transported to the north and east, and by the end of August the juveniles are distributed in the shore region from Svinöy to the Murman coast.

A.4.2 Distribution and migrations

The young saithe gradually migrate away from shore towards deeper water. At 4-7 years of age they recruit to the spawning stock. A spawning migration to the southern spawning grounds starts in November-December. After spawning there is no clear migration pattern, but most of the individuals probably return to northern Norway during spring.

The North-East Arctic stock of saithe is restricted chiefly within the Norwegian 200 mile fisheries zone. Its distribution extends slightly into the Soviet fisheries zone. Mature individuals migrate to some extent to the North Sea to spawn and in recent years there has been a considerable migration of young saithe from the Svinöy area to the North Sea. Migration of adult saithe to Icelandic waters appears to have been extensive in some years. At present, however, the rate of recaptures from Iceland is not very high.

A.4.3 Exploitation and management

Except for Norwegian catches, practically all saithe caught in the North-East Arctic are taken by trawl, partly as by-catch in fisheries for cod and haddock. On the spawning grounds, trawling is conducted

mainly by the German Democratic Republic, the Federal Republic of Germany and Norway. These countries also fish for young saithe in the Svinöy area during the rest of the year. The remaining trawl landings are mostly from northern Norway.

The total landings from the main fishing areas are given in Table 10 for the period 1967-77.

Purse seine, which chiefly exploits 2-4 year old fish, accounts for about 60% of the Norwegian catches. The rest is taken mainly by trawl, hand line, gill net and Danish seine.

In 1976 NEAFC introduced a minimum landing size for saithe of 35 cm in the whole North-East Arctic except in the area between 62°N and 64°N where the minimum landing size was set at 30 cm. The effects of this regulation have so far been small. Previously, there was no international regulation of the saithe fisheries.

In Norway it has, since 1965, been forbidden to land or catch saithe for other use than human consumption and bait.

A.5 Plaice in Sub-areas I and II

A.5.1 General biology, distribution and migrations

The plaice of the North-East Arctic are distributed mainly along the Murman coast between Rybachy Peninsula and Kolguev Island, although some are to be found in the vicinity of Bear Island, Novaja Zemlja, off the coast in the central Barents Sea, and along the Norwegian coast. In general the plaice on the Murman coast occur in shallow (30-80 m) depths but during the early part of the year the adult part of the stock migrates, to spawn in March-May, to deeper water.

A.5.2 Exploitation and management

The main catches of plaice in the post-war period used to be taken by English vessels. As national fishery limits were extended to 12 nautical miles catches were reduced due to the coastal fish becoming inaccessible to foreign vessels (Tables 11-14). In the years 1966-72 the average annual catch was about 3 000 tons. In 1973 and 1974 large quantities were landed from this stock, particularly from Sub-area I with the total catches reaching 16 100 and 18 007 tons respectively in these two years. In 1975 and 1976 the catches decreased to 3 376 and 6 531 tons respectively.

The minimum mesh size regulations for trawls and seines described in paragraph A.1.3 in relation to cod, are also applicable to plaice fishing using these gears. A minimum landing size of 29 cm for plaice was introduced by NEAFC for this area. Norway has a total ban on plaice fishing during the peak spawning period of 1 March to 1 July. This ban is extended to 1 September in a smaller area in the Vestfjord.

A.6 Common Dab (*Limanda limanda*) in Sub-areas I and II

A.6.1 General biology, distribution and migrations

The common dab is widespread in the waters along the European coast from the Barents Sea and the White Sea southwards to the Bay of Biscay and also off Iceland and in the Baltic. It inhabits the shelf area (20-200 m depth) in the North-East Arctic where the water temperature is above 0°C.

In summer, dab enter shallow inshore waters and migrate offshore in the beginning of the autumn. They reach sexual maturity at an age of 4-5 years, and a length of approximately 22-24 cm. Dab has no special spawning grounds. Spawning takes place in depths of 20-50 m, within a temperature of 2-10°C, in inlets, bays of the Murman coast in May-August, and in the White Sea in June and July.

A.6.2 Exploitation and management

Only small catches of common dab are recorded in official statistics (Tables 15-18). This species is regularly taken as a by-catch in the fishery for cod and haddock, but are either discarded or reported as unsorted, unidentified species. The catch of common dab actually taken therefore is considerably greater than reflected in the statistics. The minimum mesh size regulations for trawl and seine fisheries described in A.1.3 are also applicable to this species. In NEAFC Recommendation 4 the minimum landing size stipulated for dab in this area is 15 cm.

A.7 Long Rough Dab in Sub-areas I and II

A.7.1 General biology, distribution and migrations

Long rough dab occurs from the English Channel to the northernmost part of Spitsbergen, and over the entire Barents Sea. Females mature at an age of 9-11 years and males at 6 years. They spawn in the whole area of distribution, in the open sea and in coastal waters at a depth of 125-200 m with temperatures between 1 and 5°C. Spawning of the planktonic eggs extends from March to July. Discrete spawning schools are not observed. Larvae hatch at a length of 3-4 mm and live in the midwater layer until they are 3-4 cm. They then migrate to the bottom. Figure 9 shows the distribution of 0-group fish in August/September 1976.

A.7.2 Exploitation and management

There are no directed fisheries for long rough dab in the Barents Sea. The few nominal landings are given in Tables 19-22. The actual catch, however, must be much higher since long rough dab are very common as a by-catch in the fishery with bottom trawl for cod, haddock and redfish. The catch consists mostly of fish between 22-37 cm at an age of 5-9 years. There are no management regulations specific to long rough dab in this area.

A.8 Greenland Halibut in Sub-areas I and II

A.8.1 General biology

Spawning areas and times, larval drift

There are no direct observations on the spawning areas of this species. According to Hognestad (1969) the distribution of 0- and I-group fish, together with hydrographical conditions along the slope of the continental shelf between Norway and Spitsbergen, lead to the conclusion that the main spawning area of Greenland halibut must be along the slope between 70°N and 75°N at depths between 400 and 800 m. Nizovtsev (1969) found the greatest accumulation of spawners at 600-800 m between 71°30'N and 73°30'N in this area.

Milinsky (1944) found males to become mature at 9-10 years old and females at 11-12 years old. Lahn-Johannessen (1965) found most mature

males to be 8-9 years old, and most mature females to be 9-11 years old. Nizovtsev (1969, Figure 152) found about 50% of the 9 year old females and 50% of the 7 year old males to be mature. The corresponding lengths for these age groups were 40-45 cm for 7 year old males, and 55-60 cm for 9 year old females.

It is thought that spawning takes place from March or April to July (Milinsky, 1944 and Andriashev, 1954). However, Nizovtsev (1969) states that the main spawning period is from October to January. It might be concluded that spawning takes place over a long period.

Eggs drift in the plankton; the larvae move to the upper layers as they grow. Metamorphosis is complete at about 60 mm length, before the larvae seek the bottom (Hognestad, 1969). In the 0-group surveys, few Greenland halibut larvae longer than 80 mm have been found.

A.8.2 Distribution and migrations

Nursery areas

Figure 10 shows the distribution of 0-group Greenland halibut in August/September 1976, which corresponds to the findings of previous 0-group surveys. Hognestad (1969) reports finding 0- and I-group only from the Spitsbergen area, and he concludes that the nursery grounds seem to be confined to the inshore Spitsbergen waters, with a southward migration taking place later.

Figure 11, based on the work of Sorokin (1967) and Schultz (pers.comm.) shows that the juveniles (≤ 30 cm) occur mostly in the more shallow regions of the Barents Sea in waters with negative temperatures, i.e. in the northern and eastern parts of the stocks' range. With increasing size, the fish are found in deeper waters and in the more western part of the range.

Distribution and migration of adults

In the eastern Norwegian Sea, the mature stock is distributed from the Norwegian coast along the slope of the continental shelf northwards to the west of Bear Island and Spitsbergen. Lower abundances are found off the coast of southern Norway, in the southern part of the Barents Sea, eastwards to the Kanin Peninsula, the southwest coasts of Novaja Zemlja, and also off the southern coast of Spitsbergen (Hognestad, 1969) (Figure 12).

Adults are confined to depths of 100 to 900 metres.

Judging from the seasonal distribution of the fishery, it seems that mature Greenland halibut migrate slowly from the area off northern Norway to the waters west of Bear Island and Spitsbergen, from February to July. From the same area, some migration also takes place eastward to the southern Barents Sea during the same period (Sorokin, 1967), but this is probably mainly the immature part of the stock (Hognestad, 1969).

A.8.3 Exploitation and management

Catches of Greenland halibut in Sub-areas I and II are given in Table 23. Greenland halibut have been caught with long line by Russian and Norwegian fishermen for many decades, mainly in deeper coastal waters off Northern Norway. Some were also caught as a by-catch in the trawl fisheries for cod and redfish.

The Norwegian long line fishery increased around 1960 when concentrations of Greenland halibut were discovered along the continental shelf from Norway towards Bear Island. The following decade was the main period for the Norwegian long line fishery, when, on average, about 15 000 tons were caught annually. The fishing was also extended to the Spitsbergen area (Lahn-Johannessen, 1972). In recent years, this fishery has decreased due to a smaller stock and competition with trawlers on the best fishing grounds.

In 1964 Soviet trawlers obtained good catches of Greenland halibut west of Bear Island. This initiated a directed trawl fishery for this species. This trawl fishery increased greatly after 1968, mainly by USSR trawlers, but also because of increased participation by trawlers from the German Democratic Republic and to some extent from Norway and Poland. The peak of the total fishery was in 1970, when nearly 90 000 tons were caught. In the period 1973 to 1976, the yearly catches have been fairly constant, at an average of 35 000 tons. The catches of the Norwegian long line fishery have decreased from 13% to about 5% in the same period. The Norwegian long line fishery is a seasonal one which usually starts in April/May and ends in August/September (Lahn-Johannessen, 1972). The directed trawl fishery is conducted mainly in the autumn. Since 1969 the fishery on Greenland halibut has been mainly concentrated in Division IIb. In the period 1969 to 1977, on average 68% of the total catches in Sub-areas I and II were taken in Division IIb. The largest concentrations are found on the slope of the continental shelf in the western Barents Sea at depths of 350 to 700 m.

The age groups become partially recruited to the fishery at age 4-5, and fully recruited with the onset of maturity.

A.9 Catfish in Sub-areas I and II

A.9.1 General biology, distributions and migrations

Three species of catfish: Anarhichas lupus (Linné), A. minor (Olafsen) and A. latifrons (Steenstrup) inhabit Sub-areas I and II. They do not spawn every year. Their large eggs are pelagic.

A. lupus inhabits the area with depths of 150-200 m in winter and moves to more shallow waters during summer. It spawns in July-September. Sexual maturity is attained at an age of 5 years or older, at a length of 36-41 cm. Specimens 40-70 cm long, weighing 0.5-4 kg, are abundant in the catches.

Concentrations of A. minor have been recorded off Spitsbergen, on the slopes around Bear Island, and in the central southern part of the Barents Sea. This species occurs most frequently at depths of 100-200 m. Spawning takes place in June-July. Spawning migrations are unlikely to be extensive. Females attain sexual maturity at a length of 80-105 cm. Specimens 90-110 cm long, weighing 7-17 kg, dominate in the catches. The largest catches are taken in March-April in the Barents Sea.

A. latifrons occurs mostly at 150-400 m depth and at greater depths in winter than in summer. The spawning takes place from April to October along the continental slope. Females attain sexual maturity at a length not less than 80-100 cm. Specimens 70-120 cm long, weighing 10-20 kg, dominate in the catches.

A.9.2 Exploitation and management

There is no regular directed fishery for catfish, although a directed Norwegian long line fishery occurs sporadically. Substantial by-catches of catfish are sometimes taken during February-July in the USSR cod fishery in the southern Barents Sea, on the slopes of Bear Island and on the Central Elevation. About 80% of the USSR landings of catfish consist of A. minor.

Tables 24-27 give the nominal landings of the three species combined. The total annual landings in Sub-areas I and II were fairly constant in the period 1966-72, with an average of 14 400 tons. In 1973 the catch almost doubled, and reached a peak of 33 000 tons in 1974. The high catches in 1973 and 1974 were caused by increased USSR catches in Sub-area I and Division IIb, mostly of A. minor.

There are no specific management measures in force for catfish in this area.

A.10 Redfish in Sub-areas I and II

A.10.1 General biology

Two species of redfish, Sebastes marinus and Sebastes mentella, are of commercial interest in the North-East Atlantic. These species are widely distributed and subject to exploitation.

Redfish are ovoviviparous, that is hatching takes place within the female gonads and the brood is released as larvae. The release of fry is here referred to as spawning. Mating takes place during August-November, mainly in September, and fertilisation of eggs inside the ovaries in February-March. The spawning time is April-June, mainly in May. Both species of redfish grow slowly; 5 year old fish are about 15 cm long, 10 year old fish about 26-30 cm and at an age of 20 years they have reached about 40 cm. The age of first maturity is not less than 13 years. In the following account, other aspects of the biology and distribution of the two species are treated separately.

Sebastes marinus

Spawning area

The main spawning area of S. marinus is along the continental slope west of Vesterålen (Lofoten), but there is also some spawning in the fjords of northern Norway (Figure 13).

Larval and juvenile fish distribution

It is very difficult to distinguish between larvae of S. mentella and S. marinus. The larvae of both species drift with the Atlantic Current northwards along West-Spitsbergen and eastwards into the Barents Sea. In August-September the 0-group redfish are mainly distributed as shown in Figure 14. Immature redfish are recorded as far east as the Goose Bank.

Migration of young fish

In the first years young redfish make only minor migrations to deeper waters in winter, and back to shallow waters in spring. The migrations are extended as the fish grows older.

Sebastes mentella

Spawning area

The main spawning area of S. mentella is in the region southwest of the Kopytov area between 70°N - 71°N and 11°E - 16°E.

A.10.2 Distribution and migrations

Distribution of the adult stock

S. marinus is distributed along the continental slope to about 79°N and in the southern parts of the Barents Sea. Few adult specimens are caught east of 35°E. They are most abundant between 100 m and 350 m depth.

Migrations of adult fish (Figure 13)

Females of S. marinus migrate northwards and eastwards from the spawning grounds. They meet the males at Tromsøflaket or Bear Island and then migrate together to the borders of the distribution area for feeding and copulation. When winter cooling begins, the female fish start their migration towards the spawning grounds, but the males stay in the area of Bear Island - Tromsøflaket for over-wintering.

Distribution of the adult stock

S. mentella prefer deeper water than S. marinus, ranging from 200 m to 500 m. Adults are mainly distributed along the continental slope of Bear Island, West Spitsbergen and in the Bear Island Channel.

Migration of adult fish (Figure 15)

Mature specimens start migrating to the feeding areas in July-August. Here copulation takes place in August-November. In January-February the females start their migration towards the spawning area while the males mainly migrate towards the Kopytov area in late March. After spawning the females mix with the males and then move towards the feeding grounds.

A.10.3 Exploitation and management

The two species are not separated in the fisheries statistics. It is therefore necessary to deal with these species together in the following paragraphs.

Description of the fishery

Redfish are exploited by vessels of USSR, United Kingdom, German Democratic Republic, Federal Republic of Germany, Norway and Poland. Except for the fishery of S. mentella in the Kopytov area by USSR and German Democratic Republic trawlers, all catches of redfish are mainly a by-catch from the cod fishery. The main part of the catches is taken by bottom trawl and mid-water trawl, only small quantities are taken by line.

History of yields

In Tables 28-31 the nominal catches of redfish are given for the period 1965-76. Total catches have shown an increasing trend since 1971, but the catches in 1975 and 1976 were remarkably high. In 1976 the total catch reached about 313 000 tons, which is 7 times the long-term average over the years 1965-74. This increase in

total catches in 1975 and 1976 was mainly due to increased USSR catches of S. mentella in the Kopytov area.

Stock fluctuations

Very few data exist on stock fluctuations. The decrease in the landings in the period 1960-68 is, to some extent, due to reduced effort by USSR trawlers, but it can be attributed mainly to a reduction in stock size. USSR data on catch per unit effort show a decrease from 10 tons per hour trawling in 1956 to 2.5 tons per hour in 1967. The greater landings in recent years are partly due to an increase in stock size. The year classes 1964, 1965 and 1966 seem to be strong, while the year classes 1967 and 1968 may be poor. Since 1969 the year class strengths in the 0-group stage have not been below average and in the last 4 years 0-group redfish have been very abundant in the Barents Sea and adjacent waters.

Exploitation pattern

In the fishery for S. mentella up to 1972 exploitation started at an age of about 9 years, with a maximum around age 15. Since 1973, however, the exploitation has shifted towards younger ages. At present the exploitation starts at age 6.7, and the maximum lies at age 9-13. In the fishery for S. marinus data from the Federal Republic of Germany indicate a relatively stable exploitation pattern beginning at age 12 with a maximum at age 16 or even older. However high catches in numbers have been reported from the USSR fishery in 1976 and 1977 starting at age 3 and having a maximum at ages 12 to 13.

A.11 Norwegian Spring Spawning Herring

A.11.1 General biology

Spawning times and areas

From the beginning of this century and up to about 1955 the main spawning took place off the coast of western Norway, between Egersund and Stadt. From 1955 onwards the main spawning gradually shifted northwards off Møre and Trøndelag. However, spawning also took place off Helgeland and, especially in recent years as far north as off Lofoten. Since 1955 the spawning time changed from January or February to March. In the 1960s some spawning also occurred on the Sandø-bank, east of Faroes. The changes in spawning grounds during the period 1950-68 are shown in Figures 16-18.

Larval, post-larval and juvenile fish distribution

The larvae from the Norwegian spawning grounds are transported northward with the coastal currents. The larval stage lasts for about 2 months, and during that time some larvae drift into fjords and bays on the Norwegian coast, but others remain in the outer coastal areas until metamorphosis.

The 0-group in the coastal areas migrate into the fjords in autumn, but in years of high 0-group abundance their distribution is very widespread and ranges from the fjords of western and northern Norway to the open ocean of the Norwegian Sea and the Barents Sea. In the last 10 years, oceanic 0-group herring have only been found in significant numbers in 1973 and 1976, and the main nursery area of the young herring has been in Norwegian coastal waters.

A.11.2 Distribution and migration of young and adult stock components

As 1 and 2-group, herring feed in Norwegian coastal areas and in the SW Barents Sea. During periods of exceptionally high abundance these age groups had a much wider distribution. Young herring from the southern coastal areas usually accumulate as 1 and 2 years old fish in the area Helgeland-Troms. Young herring in Finnmark usually spend one more year in the coastal areas before they begin their migration to the Norwegian Sea to join the adult stock.

The traditional adult herring migration was from the spawning grounds on the Norwegian coast to the summer feeding grounds in the Iceland-Jan Mayen area. In the late 1960s the main feeding grounds moved further north and east to the Jan Mayen-Bear Island area. During autumn the adult herring concentrate in an area east of Iceland, where they remain until January when the migrations to the spawning areas at the Norwegian coast begin. The changes in migration pattern of the adult herring during the period 1950-68 are shown in Figures 16-18. In the 1970s, the migration pattern has changed drastically. Both the juvenile and adult herring have remained in Norwegian coastal waters throughout the year.

A.11.3 Exploitation and management

The fisheries

Traditionally the main fishery on the adult stock has taken place along the Norwegian coast prior to and during the spawning season and on the feeding grounds off North and East Iceland as well as in the oceanic areas between Iceland and Jan Mayen. The catches in each of these fisheries are given by countries in Tables 32-34. In addition to the fishery on adults there has been a fishery on young and adolescent herring mainly in the northern Norwegian fjords and coastal areas. Total catches in different fisheries during the period 1950-76 are shown in Table 35.

Rate of exploitation and changes in stock size

The total catch of adult herring has fluctuated widely in relation to the recruitment of strong or weak year classes. Thus, the very strong 1950 year class caused high catches in the adult herring fisheries in the mid-1950s, and the strong year classes of 1959 and 1960 resulted in high catch levels in the years 1964-67. The high catches in the latter period were associated with a sharp increase in the fishing mortalities mainly due to increased effort in the summer and autumn fisheries. Prior to 1963 the fishing mortalities were at a rather low constant level (Figure 19).

During the whole of the period 1950-70 the exploitation rate on young herring was high. The purse seine fishery in Norwegian coastal waters generated much higher fishing mortalities on weak or moderate year classes than on strong ones, and the former survived to an age of 4 years only in very small quantities. The 1961 year class was the last one which recruited to the spawning stock in any quantity. Some fish of the 1963 and 1964 year classes survived to an age of 4 years, but these were practically fished out in the 1968 fat herring fishery. Thus, there was practically no recruitment to the adult stock after 1966 which inevitably resulted in a decline in adult stock size (Figure 20). This decline was further accelerated by the increased exploitation of the adult component.

Management

The collapse of the stock was almost complete before management action was taken. In 1972-74 the fishery was regulated by an agreement between Iceland, Norway and USSR. There were no catches of adult herring apart from some small quantities taken for scientific purposes, and the catches of small and fat herring were limited by catch quotas. In 1975 and 1976 the fishery was regulated by a NEAFC agreement. In 1975 a TAC of 3 500 tons was set and in 1976 no commercial fishing was permitted.

Long-term sustainable yield

No firm estimate of the long-term sustainable yield has ever been made. The mean annual catch in the period 1950-59 was 1 264 thousand tons, and the stock was still in a healthy state at the beginning of the 1960s. The long-term yield, however, is very dependent on the pattern of exploitation. With a lower exploitation rate on young herring, the stock could have sustained a higher catch than that mentioned above. With a rational exploitation pattern the long-term sustainable yield would be at least of the order of 1 500 000 tons if the stock can be rebuilt.

A.11.4 Distribution of catches in relation to Zones of Extended Fisheries Jurisdiction

Nearly all the catch in the winter herring and small and fat herring fisheries (Table 33) has been taken within the Norwegian zone. These catches have been plotted as a percentage of the total catch in the same year during the period 1950-70 in Figure 21. The catches from the summer and autumn herring fisheries have been partly taken within the Icelandic zone and partly in the Jan Mayen-Bear Island area. The proportion taken within the Icelandic zone has varied between periods. During the period 1950-62 a large part of the summer and autumn herring fishery took place within the Icelandic zone, while in 1963-66 this fishery also took place in the Jan Mayen-Bear Island area, as a result of the shift in the location of the feeding areas described in Section A.11.1. This shift was particularly pronounced in 1967-69. During the spawning migration some catches were also taken in the Faroe zone. Since 1970 all catches of Norwegian spring spawning herring have been taken within the Norwegian zone.

A.12 Capelin in Sub-areas I and II

A.12.1 General biology

Spawning time and areas

The majority of the Barents Sea capelin spawn when they are 3-5 years old; normally 4 years old fish dominate in the spawning stock. Most of the capelin spawn only once. The most important spawning months at the Norwegian coast are March and April, but spawning may occur to a lesser extent during other months in the period February-July. Spawning takes place on gravel and sand bottoms mainly within depths from 10-100 m. Potential spawning areas are found along the Norwegian and the USSR coast from Vesterålen in the west to the entrance to the White Sea in the east (Figure 22). Capelin usually spawn only in parts of this area, most often between North Cape and the Rybachi Peninsula. Incubation time varies from 1 to 2 months, depending on the temperature.

A.12.2 Distribution and migrations

Most of the Barents Sea can be considered as the feeding area for capelin (Figure 22). After hatching the larvae drift with the current towards the north and east, and 0-group capelin may in some years be found as far north as 77°N.

The distribution of 1 and 2 years old capelin is usually farther north than that of the 0-group. Older capelin can be found north to the ice border at approximately 80°N during the autumn. During summer capelin mostly occur as scattering layers, although schools suitable for purse seining are also found. In autumn capelin migrate southwards in front of the advancing ice border. The immature capelin do not enter the warm water along the coast, and remain in far offshore waters throughout the winter. The maturing capelin tend to aggregate in certain areas before they continue their migration towards the coast. One relatively well defined such area is between the Skolpen Bank and the Goose Bank, but frequently they also aggregate in the Tiddly Bank - Thor Iversens Bank area, and north of the North Cape Bank. From these areas the capelin them move towards the coast, as shown in Figure 22. In the aggregation areas, and during the migration from these to the coast, capelin are often found in schools suitable for purse seining.

A.12.3 Exploitation and management

The fisheries

Barents Sea capelin are exploited almost exclusively by Norway and the USSR. Since the middle of the 1960s the Norwegian fishery has developed rapidly, the catch increasing from 20 thousand tons in 1964 to 1.5 million tons in 1972. Up to 1974 Norway took more than 96% of the total catch, but subsequently the USSR fishery increased and in 1975 they took 31% of the total catch (Table 36).

Traditionally the Norwegian fishery for capelin has been based upon the spawning stock approaching the coast during late winter and early spring. In recent years the fishery has been extended into the open sea with large purse seiners operating far from the coast (Figure 23). In 1968 Norwegian purse seine vessels started fishing for capelin during the summer/autumn. This fishery starts in late July and may extend until early November. The catch consists of two to four years old capelin. Initially, the main part of this fishery took place northeast of Hopen Island, along the eastern coast of Edge Island and north to King Karl's Land. Since 1975 it has also extended into the northeastern part of the Barents Sea (Figure 24).

The sharp increase in Norwegian capelin catches since 1964 has resulted from a major increase in effort, resulting from the introduction of large purse seiners which are able to operate in rough weather. As a result, the seasons have been much extended and fishing far offshore has been possible.

The Norwegian capelin fishery has been subjected to various forms of national regulation. In recent years opening dates have been set for both the winter and the summer fisheries. During the summer fishery certain areas have been closed to avoid exploitation of I-group capelin. During the spawning period the most important spawning grounds have been closed to fishing. The catch has also been restricted in periods of heavy fishing due to limitation of the processing capacity. No information was available regarding the management of the USSR fishery.

The present state of the stock

The abundance of the Barents Sea capelin stock is subject to large variations (Table 37). In the most recent years the stock of I-group and older capelin increased from 3.8×10^6 tons in September 1973 to 6.5×10^6 tons in 1975 and then declined to 5.2×10^6 tons in September 1976. These are acoustic estimates of stock biomass.

In Table 37 estimates are also given of the spawning stock as the quantity of capelin 14.5 cm or longer recorded during these September acoustic surveys. These must be underestimates as large capelin are some times found too close to the bottom to be effectively recorded.

A.13 Cod in Division Vb

A.13.1 General biology

Spawning times and areas

Spawning takes place in the spring reaching a peak in March. The adults aggregate on the spawning grounds in a depth of about 100 m. The main spawning ground on the Faroe Plateau is to the north of the islands (Figure 25). There is also spawning on Faroe Bank. On Faroe Plateau the eggs and young larvae are dispersed around the islands. 0-group fish surveys in the summer months have been conducted since 1972, and Figure 26 shows a typical distribution of the juveniles at this stage.

A.13.2 Distribution and migrations

Cod in the ICES statistical Division Vb are distributed over the whole of the continental shelf around the Faroe Islands, on Faroe Bank, and to a lesser extent on the banks to the southwest of Faroe Bank (Bill Bailey Bank and Lousy Bank). The most extensive studies have been undertaken on Faroe Plateau and Faroe Bank and comparatively little is known of the cod on the other banks.

Tagging and immunogenetic data (Jones, 1966; Jamieson and Jones, 1967) have shown that cod on Faroe Bank and on the Faroe Plateau constitute two separate self-contained stocks with virtually no interchange of fish between the two areas or with areas outside the Faroe Division. Faroe Bank cod have a faster growth rate than those on the Plateau. Generally the highest densities of 0-group fish are observed close to the islands and, like saithe but unlike haddock, the young cod move into the inshore and littoral areas as they end the pelagic phase of their lives. Cod under two years old have a predominantly inshore distribution but from the age of one to two years old the fish move out on to the banks and become available to the trawl fisheries. Cod at Faroes reach sexual maturity at the age of about 4 years.

A.13.3 Exploitation and management

Most of the fishery is concentrated on Faroe Plateau and Faroe Bank, and the bulk of the cod catch is taken by Faroese trawlers and long-liners and by British trawlers. Nominal catches from ICES Division Vb for recent years are given in Table 38.

In the post-war period there was a gradual increase in fishing effort which reached a maximum in the early 1960s by which time it

had reached such a level that cod catch rates were severely depressed. Subsequently, a reduction in fishing effort allowed the stock, and consequently the catch rates, to recover. In addition increases in minimum trawl cod end mesh sizes have resulted in a reduced rate of fishing mortality on the younger age groups. In recent years fishing effort has again increased and by 1976-77 the rate of fishing mortality on the fully exploited age groups of cod on the Faroe Plateau was estimated to be 0.65. This is above F_{max} which is about 0.4 for the current exploitation pattern. With the average level of recruitment and the present exploitation pattern, the conditional sustainable yield of cod would be 29 000 tons from Faroe Plateau with an additional 2 000 tons from Faroe Bank.

A.13.4 Distribution of catches in relation to Zones of Extended Fisheries Jurisdiction

All cod caught in the statistical Division Vb are taken within the Faroese 200 mile zone.

A.14 Haddock in Division Vb

A.14.1 General biology

Spawning time and areas

Spawning takes place in spring with a peak in the beginning of April. The eggs of haddock are found practically everywhere around the Faroes. The distribution is not uniform, however, and several centres of high egg density have been noted (Figure 27). Principal centres of density are to the north of the islands, north of latitude 62°30'N and between longitude 6°30'W and 7°30'W and also in the Nolsøy-Fugløy Bank region. Rather smaller concentrations have been noted on grounds to the west of Mykenes and in the extreme south of the islands. Eggs are also found on Faroe Bank. Larvae are distributed all round the islands and are also found on Faroe Bank (Figure 28).

A.14.2 Distribution and migrations

0-group haddock have been found all around the Faroes, both on the Plateau and also on Faroe Bank, principally in depths less than 200 m (Figure 29).

Adult haddock are found all round the Faroe Islands on the Plateau and on Faroe Bank, and primarily in water of less than about 200 m. Tagging experiments suggest little, if any, interchange of fish either between the Plateau and Faroe Bank or between these areas and other parts of the North Atlantic.

A.14.3 Exploitation and management

Fishing for haddock occurs all round the Faroe Islands on the Plateau and at Faroe Bank, in depths mainly less than 200 m.

Total international landings of haddock from Faroes have increased in the long term, from about 13 000 tons before the war to reach a peak of 28 000 tons in 1963. Since then landings have declined to fluctuate about a level of 20 000 tons (Table 39).

Spawning stock biomass decreased to a minimum in the middle of the 1960s and then increased to reach a peak in 1969.

Estimates of fishing mortality rates (F) of haddock in Division Vb suggest that this is about 0.5 on the fully exploited age groups. This is slightly below F_{max} (0.55) for the exploitation pattern consistent with a 135 mm mesh size.

A.14.4 Distribution of catches in relation to Zones of Extended Fisheries Jurisdiction

All haddock caught in statistical Division Vb come from within waters now under Faroese jurisdiction.

A.15 Whiting in Division Vb

A.15.1 General biology

The whiting at Faroe spawn in spring at 25-100 m depth all around the islands, except for the southwestern banks. Eggs and larvae are distributed around the islands.

A.15.2 Distribution and migrations

The whiting prefer soft bottom and all age groups are, therefore, most numerous in the coastal area and relatively rare on the banks. Maximum size is probably around 70 cm.

A.15.3 Exploitation and management

Whiting are caught chiefly as a by-catch in trawl fisheries. The landings have been increasing from about 500 tons in 1971 to 3 500 tons in 1975. No special regulation measures are in force except mesh size in use and a minimum landing size.

A.16 Lemon Sole (*Microstomus kitt*) in Division Vb

A.16.1 General biology

Spawning times and areas

According to Rae (1965), spawning takes place on all coastal banks at Faroe and on Faroe Bank and is most intense at points within these areas where lemon sole are most numerous. Spawning occurs between May and August, attaining its greatest intensity in June and July. Nothing is known about the drift of larval lemon soles at Faroe but they would be expected to be predominantly retained within the eddy current system which surrounds the islands.

A.16.2 Distribution and migrations

The existence of nursery areas for lemon sole has never been demonstrated. Young lemon sole are thought to adopt a demersal life at a length of about 2-3 cm and to inhabit the same areas as the adults. The main concentrations of adults are on the banks east of the islands.

There seems to be a migration into areas inside the 12 mile limit in May-June and out again in September-October. Lemon sole also occur on Faroe Bank in relatively low abundance.

Taggings in the Faroe area have shown that lemon sole do not as a rule make extensive migrations. The migration seems always to be against the main direction of the current system around Faroes.

A.16.3 Exploitation and management

Quantities of lemon sole landed from Faroese waters since 1960 are given in Table 40. Lemon sole are principally taken as a by-catch in the cod and haddock fisheries by trawlers. Up to 1970, exploitation was almost exlcusively carried out by the United Kingdom trawlers fleet. Since 1971, when a licensed trawl fishery inside the 12 mile limit was permitted, Faroese trawlers have also landed considerable quantities of lemon sole. The average age of the fish in Faroese landings is less than that in the United Kingdom landings.

The only attempt to assess the status of the Faroese lemon sole stock was carried out by an ICES Assessment Working Group (Anon., 1975). The exploitation rate on the stock is low and there is no evidence of overfishing. However, little long-term increase in yield per recruit would be achieved by increasing fishing effort.

No TAC or other regulatory measures have been recommended for Faroese lemon sole other than the minimum landing size of 25 cm and minimum mesh sizes adopted in the interests of other demersal species.

A.16.4 Distribution of catches in relation to Zones of Extended Fisheries Jurisdiction

All lemon sole caught on the Faroese grounds originate from within the Faroese 200 mile zone and there is no evidence of any appreciable transport of reproductive products to other areas.

A.17 Saithe in Division Va

A.17.1 General biology, distribution and migrations

The distribution of saithe is retricted to the shelf all around the coast of Iceland. Spawning takes place in the warmer waters off the SW-coast in early spring, starting in February and with a peak in March. Spawning is over by the beginning of April.

Eggs and larvae drift with the current system clockwise around the island. In May and June the 0-group of 4-6 cm length seek the inshore areas and are often found in shoals in very shallow waters close to the shore. For the next 2-3 years saithe stay in these waters more or less pelagically. At the age of 3-4 years they move to deeper waters but are still pelagic in their behaviour. Saithe become mature at the age of 5-6. Saithe which have grown up in the cold water area off the north and east coasts of the island migrate to the spawning places off the SW-coast in late autumn and early winter. After spawning the adults migrate mainly along the west coast to the feeding grounds off the NW-coast of Iceland. During summer the mature part of the stocks feeds there. A part of the mature stock also feeds off the SE-coast. The immature part of the stock has feeding grounds off the NW-, N-, SE- and SW-coasts of the island.

Tagging experiments at Norway have shown that saithe migrate from Norway to Iceland, sometimes on a large scale. Emigration from Iceland to other areas is known, but according to tagging

experiments at Iceland only 1% of the recaptures came from other areas. Comparison of age composition data from Iceland and the Faroes suggests that emigration from Iceland to Faroe may take place at least among the oldest age groups. No detailed information on the rate of these migrations to or from Iceland is yet available.

A.17.2 Exploitation and management

In Iceland saithe is caught with different gears, but most of the catches come from the trawl fishery, which takes place all the year round off the southeastern, southern, western and northwestern coasts. During autumn and early winter a gill-net fishery takes place off the south coast. During summer a minor fishery with hand-lines is carried out off the southwest coast.

During the period 1960-71 catches increased from 50 000 to 137 000 tons, but have since declined to 80 000 tons in 1976, due to low recruitment in recent years. The fishing intensity on the younger age groups is, in comparison with other stocks of saithe, relatively low.

The fishery by purse seine in Icelandic waters is heavily restricted and there are closure of a nursery area off the southwest coast of the island, and a minimum landing size of 50 cm.

Since 1 February 1977, there has been a minimum mesh size of 155 mm inside the Icelandic 200-mile fishery jurisdiction zone.

A.18 Saithe in Division Vb

A.18.1 General biology, distribution and migrations

The Faroese saithe is the largest stock of commercially important species in the area, and is found on the plateau, on the offshore banks and also feeding pelagically over deep water.

Spawning starts in February especially at depths between 100 and 200 m, reaches its maximum in late March and ends in April/May. The main spawning areas are the banks to the east of Faroe, especially Sandøy Bank.

The pelagic eggs and larvae are distributed all around the islands by the dominant anti-clockwise current system. During May the larvae start a migration towards inshore areas and by July all the 0-group saithe are concentrated in the littoral zone. Here they remain during the first year, but later migrate out of the fjords and in their 3rd and 4th years migrate to more offshore areas. As they mature (5-7 years), they enter the spawning stock. The spawning migration is not very well defined but there seems, from the fishery, to be a migration starting in January from deeper water to the north-east of the islands to the spawning grounds east of the islands.

Tagging of 2 year old saithe in the early 1960s showed some migration from the Faroe area to Iceland, and saithe tagged in Norway, and north of Britain have also been recaptured in the Faroe area. These tagging experiments do not allow for a quantification of the migration to and from Faroese waters.

A.18.2 Exploitation and management

The main saithe fisheries have in recent years been the French trawl fishery, the United Kingdom trawl fishery and the trawl fishery of the Federal Republic of Germany. Norway has a small gill-net fishery. In Faroes the main gear has been hand-line.

The French and German fishery takes place mainly in deeper waters, while the others are closer to the shore. The main season is from November to June.

The inshore distribution of the younger age groups has a great conservational value providing some protection from growth overfishing. The stock seems to have been fully exploited only in more recent years (1972-74), and in 1975 and 1976 catches have gone down again, due to reduced effort.

The "Arrangement relating to Fisheries in the Waters around the Faroes" was designed to limit the expansion of fishing for saithe in the Faroe area.

A.19 Redfish in Sub-areas V and XIV

A.19.1 General biology

Spawning areas

Redfish spawn over the great ocean depths and to some extent along the continental slope. Concentrated spawning takes place in the southeastern Irminger Sea, particularly in the Reykjanes Ridge area. That spawning area lies partly within the 200 miles fishery zone of Iceland extending beyond it into international waters. Another less important spawning area lies off East Greenland within its 200 miles zone.

Larval and juvenile fish distribution

The drift of larvae takes place from the oceanic areas to the continental shelves off Iceland, East Greenland and West Greenland. There are extensive nursery grounds for redfish both around Iceland, particularly west of Iceland, and on the East Greenland shelf, where dense accumulations of young redfish (both S. marinus and S. mentella) have been observed. Thus, the East Greenland shelf area seems to be the most important nursery area for the Sub-area V and Sub-area XIV stocks of redfish. The juveniles usually inhabit shallower waters and are found closer to the shore than the adult fish.

When approaching sexual maturity, they migrate to the offshore banks and to the continental slopes.

A.19.2 Distribution and migrations

Redfish have a wide distribution in Sub-areas V and XIV, extending along the coasts from the Faroe Islands, around Iceland and along East Greenland. The depth range in which they are found is relatively wide, from 100 to 800 metres, but they are most abundant in 200 m to 500 meters' depth. S. mentella inhabit greater depths in general than S. marinus. Thus S. marinus is mostly caught in depths from 200 m to 400 m, while S. mentella is mostly caught in 300 m to 500 m.

The migration of adult redfish is conditioned by spawning and feeding. Thus, in the Iceland-East Greenland area, the females migrate in late winter and spring from Iceland and East Greenland to the Irminger Sea for spawning. After spawning, they return to the feeding grounds. Summer- and autumn feeding migrations along the offshore banks and slopes off Iceland and East Greenland are common for both sexes. There is also some migration of redfish from West Greenland to East Greenland.

A.19.3 Exploitation and management

The fisheries

The main areas of exploitation are on the offshore banks on the continental slopes off West Greenland from Cape Farewell to Dohrn Bank, off the W-, SW- and SE-coasts of Iceland, on the Iceland-Faroe Ridge and off the Faroe Islands.

Tables 41-43 give the total catch of redfish in ICES Divisions Vb and Va, and in Sub-area XIV by year and country.

The Federal Republic of Germany has taken by far the largest catch of redfish in areas Va, Vb and XIV, except in 1976, when both Iceland and particularly the USSR, exceeded its catches. The catch in Division Va has decreased from 114 000 tons in 1965 to about 70 000 tons in 1975 but remained relatively stable around 70 000 tons since then, except in 1977, when it dropped to about 62 000 tons. In Sub-area XIV, the catch has fluctuated and declined greatly from 36 500 tons in 1965 to 7 900 tons in 1973. The sudden increase in the catch in Sub-area XIV in 1975 and 1976 was due to a large increase in effort by USSR vessels.

In Division Vb, the catches have fluctuated from 1 300 - 9 700 tons during the period 1967-77. In the last five years, however, the catch has never been below 5 000 tons.

The redfish fishery was formerly carried out almost exclusively with bottom trawls. During the last few years, however, midwater trawls have also been used.

Management measures

Iceland has unilaterally imposed regulations of fishing within its fishery zone which have also affected the redfish fishery. Thus, factory vessels, including freezers, are not allowed to fish and the minimum mesh size has been 135 mm since May 1976. Since the introduction of 155 mm mesh size in 1977, a special redfish fishery is allowed with 135 mm meshes within a limited area only. The minimum weight of individual redfish allowed to be landed is 500 grams, which corresponds to a minimum length of about 33 cm.

For further protection of small redfish, a certain nursery area has been closed to all trawling.

A.19.4 Distribution of catches in relation to Zones of Extended Fisheries Jurisdiction

The dividing line between the Icelandic and Greenlandic fisheries zones does not correspond to the ICES statistical areas, Division Va and Sub-area XIV. Thus, a part of the catches reported for Sub-area XIV has been taken in the Icelandic zone.

The dividing line crosses the Dohrn Bank and the usual fishing pattern on this bank is that most of the redfish catch is taken on the Greenland side of the line. However, catches of redfish reported from Sub-area XIV by the German Democratic Republic, Poland and USSR up to 1974 are thought to have been taken in connection with the Greenland halibut fishery, which takes place on the Icelandic side of the line.

The text table on page 25 is based on this assumption and indicates the quantity of redfish reported from Sub-area XIV but taken on the Icelandic side of the dividing line.

Estimated catch of redfish on the Icelandic side of the midline between Iceland and East Greenland in Sub-area XIV

Year	Tons	Year	Tons
1965	110	1971	994
1966	99	1972	1 188
1967	28	1973	1 186
1968	-	1974	1 399
1969	172	1975	4 822
1970	845	1976	-

According to the estimates, these catches did not exceed 1 000 tons until 1972 and reached a maximum in 1975 of almost 5 000 tons. The above-mentioned countries ceased fishing in the area in question in 1976.

In connection with this estimation, it should be born in mind that the trawlers of the Federal Republic of Germany have also, to some extent, fished for Greenland halibut in the area, but how much redfish was then caught as by-catch in that fishery it is not possible to estimate because of their special redfish fishery in Sub-area XIV. Also catches taken on the continental slope of Iceland west of latitude 27°W are reported as catch for Sub-area XIV. The figures in the text table are, therefore likely to be under-estimates.

A.20 Greenland Halibut in Sub-areas V and XIV

A.20.1 General biology

There is apparently only one stock of Greenland halibut in these two areas.

Spawning areas and times, larval drift

Greenland halibut spawn on the continental slope west of Iceland between Reykjanes Ridge and Dohrn Bank, especially south of 65°N (Figure 30). Some spawning, probably of minor importance, takes place on the south slope of the Faroe-Iceland ridge. The spawning time appears to be in January. The eggs are large 3.7 - 4.9 mm in diameter and therefore the fecundity is low. Some scattered eggs and larvae have been found in the ocean between Iceland and Greenland (Smidt, 1969; and the ICES 0-Group Survey in recent years). From the larval stages to 3 year old fish, there is a gap in the knowledge of the life history of the species in these areas.

The youngest mature males are about 7 years old, and the youngest females about 8 years, but the majority of both sexes become mature at an older age. Growth is slow, and the growth of males is retarded earlier than that of females. The males are also younger than the females when they disappear from the catch.

A.20.2 Distribution and migrations

Nursery grounds for the immature fish, and feeding grounds for the mature part of the stock, are in deep waters off the northwest, north and east coasts of Iceland.

The main migration is between the feeding grounds at Iceland and the spawning grounds between Iceland and Greenland. Fish probably partly pass through the fishery limits between Iceland and Greenland. Occasional migrations are known from the Icelandic area to the Faroe Islands, Barents Sea and East Greenland.

A.20.3 Exploitation and management and distribution of catches in relation to Zones of Extended Fisheries Jurisdiction

Catches of Greenland halibut in Sub-areas V and XIV are given in Table 44. The Icelandic and Norwegian catches in Division Va are mostly from longline fisheries. Other countries' catches from that Division are mainly taken by trawl.

All catches from Sub-area XIV are from the trawl fisheries, except the Greenlandic catch. The fishing grounds in Division Va are off the northwest, north and east coasts of Iceland, whereas those in Sub-area XIV are mainly rather close to Division Va and are, therefore now inside the Icelandic fishery limits.

The Icelandic longline fishery for Greenland halibut started in 1969, being initially very profitable, with a catch of 718 kg per 1 000 hooks. In 1972 the catch per 1 000 hooks had declined to 390 kg. This decline was not due to competition with the trawlers, the extent of which was insignificant. Since then, the long-liners have fished for Greenland halibut more occasionally than directly.

The total catch of Greenland halibut in Division Va and Sub-area XIV was rather small until the 1960s. In 1969 the nominal catch was 23 000 metric tons, of which about 17 000 tons were taken by trawl, mostly in Icelandic waters. In the following years, the trawl fishery in Sub-area XIV increased rapidly,while the trawl catches in Icelandic waters decreased. The catch of Greenland halibut in Sub-area XIV was mainly taken in late April, May and early June when the fish migrate from the spawning grounds to the feeding grounds. What has been said above would infer that the catches have been predominantly taken in the Icelandic zone.

A.21 Capelin in Sub-area V

A.21.1 General biology

Spawning time and areas

Icelandic capelin spawn mainly during the second half of March and the first half of April. Further spawning also takes place later in April, May and June. The first spawners arrive at the southeast coast of Iceland in late January or during the first three weeks of February and migrate westwards along the south coast. The spawning begins, usually off the western south coast, some three or four weeks later. Subsequent runs of capelin may spawn elsewhere off the south and southeast coast. The main spawning area extends from southeast Iceland along the south coast to Snaefellsnes peninsula or Latrabjarg in the west. The main spawning lasts for about three to six weeks. The south and west coast spawning is

usually finished sometime during the first half of April. Spawning also takes place off the eastern north coast of Iceland, and on occasion off the western north coast. This is a later spawning which may last throughout May into early June. In 1977 some spawning took place on the outer banks off the northwest peninsula where it had not been observed before. The spawning grounds are shown in Figure 31.

Larval, post-larval and juvenile fish distribution

After hatching, the larvae and post-larvae drift with the current to the west and north of Iceland. In some years at least a considerable proportion also drifts towards East Greenland. The larvae hatched at southeast Iceland probably drift northwards along the east coast. The feeding area of the capelin during its first summer and autumn is therefore very wide and in some cases even oceanic (Figure 32).

In early winter, 0-group capelin migrate towards the shore and during the first winter are distributed in coastal waters. Dense concentrations of 1-group capelin are generally found off the north coast of Iceland.

A.21.2 Distribution and migrations of young and adult stock components

The 2- and 3-group are usually mixed on the feeding grounds in the deep waters to the north and northwest of Iceland. In recent years there has been a shift of the main feeding area of the capelin to the west, and the 1976 late summer and autumn fishery mainly took place to the north and northwest of the northwestern peninsula. The feeding area is shown in Figure 33.

In late November and December this mixture of juveniles and maturing fish migrates eastwards in deep waters off north and northwest Iceland. In early January, they are usually found near the edge of the continental shelf off northeast Iceland. The migration continues southwards as mature and immature fish segregate. The juveniles remain in the cold waters off east Iceland, while the spawners continue to the warm waters at southeast Iceland. The most important spawning and feeding migrations, as well as overwintering grounds, are shown in Figures 34 and 35.

A.21.3 Exploitation and management

The fishery

The annual Icelandic capelin catch is given in Table 45 for the years 1964-76. Prior to this period, capelin was caught only for bait and the catch was only a few hundred tons per year. The increased catches in the 1970s are to a large extent due to extension of the fishing season as indicated in Table 45. Summer fishing of capelin started in 1975, but was not successful until 1976, when 125 000 tons were taken. Although capelin have on occasion been fished successfully with pelagic trawl, the catch taken in this way has, on the whole, been negligible. The gear used almost exclusively is purse seine both during the winter and the summer fisheries.

Stock fluctuations

It has not yet been possible to evaluate the absolute size of the Icelandic stock of capelin. Research aimed at obtaining such data makes it clear,however, that it must be counted in millions

of tons. Almost throughout the period 1966-77 the spawning runs have been of a large size and this, together with other information, suggest a relatively stable stock which has remained at a high level of abundance. The only exception was in 1970 when the spawning migration was unusually small and the spawning grounds much restricted in size.

Long-term yields

In the absence of quantitative data on the actual size of the Icelandic capelin stock it is difficult to assess its long-term yield. Considering the information at hand, as well as the apparent stability of the stock in the past years and the possible exploitation pattern in the future, it is suggested that the long-term yield may lie somewhere around one million metric tons per year.

Exploitation pattern

The exploitation pattern of the Icelandic capelin has been relatively simple. Until the summer of 1976, this fishery was based exclusively on spawning and pre-spawning capelin. With the introduction of the summer fishery, the catch includes young adults as well as pre-spawners, but to date there has been no fishery of any importance on juveniles.

Management

Regulatory measures have mainly been precautionary in nature. Since 1973 there has been a closed season from 14 May lasting for 2-3 months. In addition, the juvenile overwintering areas have been closed to all fishing. In 1975 a minimum landing size of 12 cm was introduced.

A.21.4 Distribution of catches in relation to Zones of Extended Fisheries Jurisdiction

The fishery for bait at north, south and west Iceland prior to 1964 was exclusively coastal, being conducted with purse seines or drag nets at or just off the shore. The amounts caught were negligible.

After the migrating spawners enter coastal waters at southeast Iceland in winter they have been fished extensively since 1965. This fishery lasts for 4-8 weeks, depending upon environmental and biological factors. The yield has been between 170 and 430 thousand tons annually for the last nine years. Most of this catch is taken in immediate coastal waters and almost never farther offshore than 25 n.m.

In 1973 a new phase of the winter capelin fishery started, on migrating spawners, conducted further offshore (usually 45-80 n.m.) off east, northeast and north Iceland in January and February. Annual fluctuations in the yield are considerable, the catch having varied between 28 000 and 245 000 tons.

The summer and autumn fishery is a new one, having existed for only one season. The total catch in 1976 amounted to 111 000 tons, taken off north and northwest Iceland. Only negligible amounts were taken on the Greenland side of the median line between Iceland and Greenland, and in 1976 there seemed to be no great opportunities in that area.

The location of the feeding ground is, however, subject to considerable annual variations. Earlier surveys have, however, shown that during summer the heaviest feeding most frequently takes place in deep waters directly off the north coast of Iceland. The total yield of the Icelandic capelin fishery for the years 1964-77 is shown in Table 45.

A.22 Icelandic Spring Spawning Herring

A.22.1 General biology

Spawning time and area

Icelandic spring spawners spawn mainly during the second half of March and the first half of April. During the period of normal abundance the spawning localities were distributed at various places along the south and southwest coast of Iceland as shown in Figure 36. During the recent period of depletion spawning concentrations have occasionally been located but only on the spawning grounds near Vestmann Islands.

Larval, post-larval and juvenile fish distribution

The larvae and post-larvae from the spawning grounds near the Vestmann Islands, and from further west, drift along the southwest coast and north along the west coast. The juvenile fish spend their first two winters in the fjords along the west and north coast of Iceland. The larvae from spawning grounds near the southeast corner of Iceland probably drift to the east coast and then spend their first winter in the southern east coast fjords of Iceland.

In their third year the herring recruit to the adult stock although they do not generally reach maturity until the age of four.

A.22.2 Distribution and migrations of young and adult stock components

The adult herring are found at the south coast of Iceland in January and February before segregating to the various spawning grounds. After spawning the herring migrate to the feeding grounds off the north coast where they are mixed with Norwegian spring spawners. As autumn approaches the stocks segregate. While the Norwegian component assembles in the cold east Icelandic current, the Icelandic spring spawners return to the warmer waters off the western and southeastern coast of Iceland.

A.22.3 Exploitation and management

The fisheries

Icelandic spring spawning herring have traditionally been caught in the north and south coast purse seine and drift net fisheries. During the period 1950 to 1955 the total catch was between 20 000 and 25 000 tons. The catch reached a maximum of 274 000 tons in 1962. After 1962 the total catch decreased sharply until 1970, the last year when any appreciable catch was taken.

Rate of exploitation and changes in stock size

In the period up to 1958 the exploitation rate was low. After 1958 it rose sharply and remained at a high level until the stock collapsed in the late 1960s. During the 1950s the biomass of the adult stock was about 800 000 - 1 000 000 tons but declined sharply during the

1960s. The long-term yield is estimated at about 50 000 tons.

Regulatory measures are identical to those applied to the Icelandic summer spawners which are described in Section A.23.3 on the Icelandic summer spawners.

A.22.4 Distribution of catches in relation to Zones of Extended Fisheries Jurisdiction

The nominal catch of the Icelandic spring spawners is given in Table 46. This catch is divided between the south and the north coast fishery. Both are within the Icelandic fisheries zone.

A.23 Icelandic Summer Spawners

A.23.1 General biology

Spawning times and areas

Icelandic summer spawners spawn mainly during July although some spawning may occur in June and as late as September. The spawning areas are shown in Figure 36.

Larval, post-larval and juvenile fish distribution

The larval drift of the summer spawning herring follows a similar pattern to that of the spring spawners. During the first winter the summer spawners remain in the post-larval stage very close inshore at the west and north coast. The distribution of the juvenile fish is also similar to that of the spring spawners in that they spend their first two years of life in inshore waters along the northwest, north and east coast. But they recruit earlier to the adult stock as one and two ringers when they migrate to the south coast of Iceland. They remain in these waters until they reach maturity as three ringed fish, i.e. as four year old.

A.23.2 Distribution and migrations of young and adult stock components

After spawning the adult fish migrate to the feeding grounds off western and eastern Iceland. In the autumn they concentrate at southwest Iceland and used to mix with the spring spawning component throughout the last three months of the year. In recent years, however, the summer spawners have migrated eastwards along the south coast of Iceland at the end of September and the beginning of October and assembled off the eastern south coast in late October. They then concentrate in inshore waters in November-December and January. In the early spring they again scatter along the various parts of the south coast especially off the western south coast, before assembling on the spawning grounds in July.

A.23.3 Exploitation and management

The fisheries

The summer spawners were mainly exploited by the south coast drift net fishery. Up to 1955 they made up about 50% of the catches. During the late 1950s the total catch of summer spawners was about 30 000 tons. When purse seining started at the south coast in 1960 the total catch of summer spawners increased sharply and reached a maximum of 130 000 tons in 1963 (Table 47). The catch remained high

until 1965 but fell drastically thereafter until the fishery was stopped by regulation at the end of 1971. Catches in recent years have been taken according to catch quotas.

Rate of exploitation and changes in stock size

The rate of exploitation increased sharply during the sixties. In addition the fishing pattern changed as a result of the introduction of purse seining resulting in high exploitation of pre-recruits in the 1960s. The biomass of the spawning stock during the period 1960 to 1977 is shown in Figure 37. The long-term yield of the summer spawners is estimated at about 50 000 tons.

Management

In 1966 a minimum landing size of 23 cm was introduced for all herring fished in Icelandic waters. In 1968 it was increased to 25 cm and in 1975 it was further increased to 27 cm. In 1968 there was a closed season from 1 March - 15 August. In 1969-71 the closed season covered the period 1 February - 1 September each year.

In 1968-70 a TAC of 50 000 tons was set. In 1971 this was reduced to 25 000 tons. On the 1 February 1972 herring fishing was forbidden with all gear other than drift nets. This ban was in force until 1975 when a TAC for purse seining was set at 7 500 tons and allocated to about 50 boats which in fact took 9 200 tons. The fishing season in that year was restricted to 15 September to 1 December. In 1976 a TAC of 10 000 tons was set for the purse seine fishery allocated to about 50 purse seiners, which in fact took 10 034 tons. The fishing season was restricted to the period 25 September - 25 November. In 1976 the value of any excess catches would have been confiscated by the state and excess catches in 1975 were subtracted from individual allocations in 1976.

A.23.4 Distribution of catches in relation to Extended Zones of Fisheries Jurisdiction

The catches of summer spawning herring are shown in Table 47. These catches are allocated to the north and south coast fishery and it can be seen that the major part of each year's total was taken at the south coast. Since the south coast fishery usually takes place less than twelve miles from the coast, especially in later years, there has been practically no participation by non-Icelandic vessels in the exploitation of this stock during the period in question and all these catches have been taken within the Icelandic zone.

A.24 Greenland Cod (Sub-area XIV)

A.24.1 General biology

The spawning grounds of the East Greenland cod are situated along the east coast of Greenland between Walloe Bank (60°N) and Dohrn Bank (65°30'N). After spawning the cod migrate back to the feeding areas off the southeast and southwest coasts of Greenland.

The fry also drifts into the feeding areas and here the fish stay until the first maturation begins at an age of about 8 years. The spawning migration starts in late autumn and spawning takes place in spring.

A.24.2 Distribution and migrations

From tagging experiments at Iceland no migration of cod from Iceland to Greenland has been observed during the last decade, but in some years eggs, and particularly fry, have drifted westwards with the current to East Greenland waters.

On the other hand, migration of adult cod from West Greenland to East Greenland and to Iceland is a well known fact. This migration fluctuates between years and year classes and is also affected by changes in the environment at East Greenland; but generally it takes place from an age of 7-8 years onwards. Various estimates of the strength of this migration have shown that on average 25% of the mature cod at East Greenland migrate to Iceland and mix with the Icelandic spawning population there.

A.24.3 Exploitation and management

The cod fishery off East Greenland is almost entirely a trawl fishery in the feeding areas as well as on the spawning grounds. In the period 1962-72 the total nominal catch in Sub-area XIV has fluctuated without trend between 13 000 tons and 36 000 tons. A drastic decline in catches occurred after 1972 mainly due to a decline in stock size (Table 48).

A.24.4 Distribution of catches in relation to Zones of Extended Fisheries Jurisdiction

Since the catches in Sub-area XIV are not reported in smaller area units it is not possible at present, to split the total catches into a Greenlandic and an Icelandic component. Analysis of the cod fishery of the Federal Republic of Germany for the years 1975 and 1976 indicates that about 9% (140 tons) in 1975 and about 1% (70 tons) in 1976 were taken in the Icelandic part of Sub-area XIV.

B. REGION 2 STOCKS

B.1 Sole in Sub-area IV

B.1.1 General biology

Sole stocks are generally restricted to wide coastal areas and seldom occur at distances of over 200 miles from the coasts.

The main component of the North-East Atlantic sole population is distributed in the North Sea south of 57°N. The North Sea sole stock consists of a number of separate spawning populations which spawn close to the coasts of Denmark, Federal Republic of Germany, the Netherlands and Belgium. Spawning takes place in spring, when the fish migrate to the spawning grounds from the overwintering areas in the central part of the North Sea.

Nursery areas

Spawning takes place in the vicinity of the nursery areas in shallow water (Figure 38). Young sole spend one or two years in these nurseries, which they leave annually in winter for deeper water to avoid cold winter temperatures. Re-entering the nurseries in the following spring is achieved by selective tidal vertical migration, the same mechanism which maturing sole use when passively being

transported from the winter quarters to the spawning grounds (de Veen 1967, 1969). The main nurseries are situated along the coasts of England, Belgium, the Netherlands, Federal Republic of Germany and Denmark, and in the Wadden Sea areas of the last three countries. Recruitment to the adult stock takes place when the fish are about 2 years old. In contrast to plaice, where the recruiting fish are found mainly in shallow water, recruiting sole occupy the same wide area as the adults irrespective of depth.

Growth

Since 1962/63, sole have shown an increase in growth rate as well as in fecundity and a change in length at first maturity. This phenomenon does not reflect density-dependent growth, but probably is related to beam trawler effort which has resulted in increased availability of food through the effects of tickler chains.

B.1.2 Distribution and migrations

The various sub-stocks in the North Sea show real migration in contrast to all other stocks in the North-East Atlantic area and the Mediterranean, where the sole form local concentrations with random movements throughout the year. Figures 39-43 demonstrate the migration patterns of the various sub-stocks as derived from the international tagging experiments carried out from 1959-61. The main distribution of the sole stock is confined to the southern and central North Sea, the northern boundary roughly coinciding with a line drawn between Shields (United Kingdom) and Thyborøn (Denmark).

B.1.3 Exploitation and management

The fisheries

From 1960 to 1977, the catches were as follows (nominal weight in 10^3 tons):

1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
19	24	27	26	11	17	32	34	33	28	20	24

1972	1973	1974	1975	1976	1977*
21	19	18	18	14	14

* Provisional official figures

The North Sea fishery is carried out by beam trawl (Belgium and the Netherlands), otter trawl (Belgium, Denmark, England, the Netherlands, the Federal Republic of Germany) and by gill nets (Denmark). Figure 44 gives the average age (1972-75) distribution of the Dutch annual sole catches per statistical rectangle, showing the areas where 80% of the total North Sea sole landings have been fished. The Belgian catches responsible for an additional 9-10% of the total catch are shown in Figures 45-48. The stock size has fluctuated considerably, due to large variations in the strength of the recruiting year classes. The increase in yield since the mid-sixties is due to the recruitment of the very strong 1963 year class and to a

rapid increase in the size and efficiency of the Dutch beam-trawler fleet. In recent years, Dutch catches have formed nearly 80% of the total compared with 58% in 1960/62. In the early seventies, catches were declining in spite of the effort still increasing.

State of exploitation

The assessments carried out in 1971 showed that if recruitment remains constant at the level existing prior to 1971, then the catch and the stock size for the next years were going to decrease, unless fishing effort was reduced immediately to a level of 40% of the then present level.

In that case, the stock size could be kept constant, while the catches would drop to about half the 1971 level. In 1973, the Council recommended to NEAFC that a total allowable catch for 1974 should be implemented as soon as possible in order to prevent a further rapid decline of the stock. It was only in 1975 that a TAC became effective. The NEAFC TAC of 12 500 tons kept constant for 1976 and 1977 was considerably overshot. The sole stock continued to decline and the average recruitment level over the last eight years appeared to be lower than the average recruitment in the forties, fifties and sixties. However, the 1975 year class following the poorest year class on record (1974), turned out to be very good indeed, and recently the 1976 year class proved to be above the average level. Thus, at the moment the fear of reduced recruitment in the North Sea sole stock is not supported by the present good year classes. However, the present age composition of the adult stock is such that the incoming year class will have a very pronounced short-term effect on TAC advice. The objective of TAC advice at present (doubling stock biomass in order to avoid the dangers of reduced recruitment due to a depleted spawning stock) still holds. This will also reduce the strong influence of variable recruitment on the adult stock and on the resulting TAC.

B.2 Bristol Channel (Division VIIf) Sole

B.2.1 General biology

This stock is distributed throughout the Bristol Channel. Its life history is similar to that of the other stocks, except that it spawns earlier in February and March, off Minehead, Devon (Figure 38). The growth rate of this stock is faster than that of either the North Sea or Irish Sea, and the maximum size recorded is slightly larger than for these two stocks. It is probable that this stock also extends into Division VIIg.

B.2.2 Exploitation and management

The fisheries

From 1962 to 1976 the catches were as follows (in 000's tons):

1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
0.6	0.3	0.6	0.6	0.5	0.7	0.6	0.7	0.8	0.8	0.5	0.8	0.7	0.6	0.5

The fishery is carried on mainly by Belgian beam trawlers and Belgian and United Kingdom otter trawlers. Landings increased almost uninterruptedly from 342 tons in 1959 to 790 tons in 1970, mainly as a result of increased fishing intensity by Belgian vessels. Originally these were otter trawlers but are now almost entirely beam trawlers. In 1970 Belgian landings formed 68% of the total international catch from this stock. After 1970 the catch fluctuated, but over the last three years has declined due to a drop in effort, despite a TAC set at too high a level. The distribution of these catches is shown in Figures 44-48.

State of exploitation

The total mortality rate on this stock lies between 0.27 and 0.34 (24-29%), which means that the stock is almost fully exploited. The maximum sustainable yield is approximately 670 tons a year, but because of the variation in year class size which appears to be rather small the total allowable catch is likely to vary to some extent from year to year. However, if the TAC is kept at too high a level fishing effort will increase to take it, resulting in overfishing.

B.3 English Channel (Divisions VIId,e) Sole

B.3.1 General biology

The stock structure appears to be complex involving a series of more or less isolated coastal sub-populations along the entire length of the English and French coasts. There is a small interchange of adults (perhaps 5%) with the North Sea but generally sole tagged in the Channel are recaptured within 20 km of their release positions.

The growth rate in Division VIId is similar to that in the North Sea but in Division VIIe the K value is lower and the W_∞ higher.

The spawning period is from February to early April. Unusually for this species, the main spawning in Division VIIe has been found to occur in water deeper than 50 m between the Eddystone and the area south of Start Point (Figure 38). The nurseries in Division VIIe are located in areas with muddy sediments such as certain estuaries on the English coast (e.g. that of the River Tamar) or, on the French side, in St. Malo Bay. The spawning grounds in Division VIId are unknown from egg surveys and the nursery areas have been poorly described. However, 0-group sole are found in a few places along the open ocean off Kent and Sussex (e.g. off Newhaven). On the French side, places such as the Baie of Somme and the muddy areas of the Baie de la Seine are thought to be sole nurseries.

B.3.2 Exploitation and management

The fishery

From 1962 to 1977, the catches were as follows (nominal weight in 10^3 tons):

1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
0.9	1.0	0.7	1.0	0.2[1)]	1.1	0.8	0.9	1.2	1.4	1.4

1973	1974	1975	1976	1977*
1.5	1.4	1.3	1.7	1.8

1) French catch not included.

* Provisional figures.

The fishery is carried out by France, United Kingdom and Belgium. The total catch has increased rapidly since 1968, due to increase in the United Kingdom catch following a change from otter to beam trawling in Division VIIe and the development of trammel netting in Division VIId, as well as to an expansion of twin-beam trawling by Belgian vessels in Division VIId since 1970. In both Divisions, the catch approximately doubled between 1968 and 1972 and has since remained fairly steady. The distribution of Dutch and Belgian catches is shown in Figures 44-48.

State of exploitation

In both Divisions, sole is almost fully exploited at the present level of fishing mortality and the stock is producing its maximum yield.

B.4 Sole in Division VIIa

B.4.1 General biology, distribution and migrations

The Irish Sea sole population is mainly concentrated in the area between 53°30' and 54°30'N and from the west coast of England to 05°00'W. During the winter the fish are widely dispersed, mainly over the western part of this area. In April-May there is an inshore spawning movement. Dispersal starts about mid-summer. The life history of the young fish is similar to that in the North Sea except that the estuaries of the rivers on the English west coast provide the nursery grounds. This is the slowest growing population of soles and the maximum size reached is also slightly less than that by soles of other stocks.

B.4.2 Exploitation and management

From 1962 to 1976 the catches were as follows (in 000's tons):

1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
0.6	0.5	1.6	1.6	1.1	1.0	0.9	1.4	1.8	1.9	1.5	1.5

1974	1975	1976
1.3	1.4	1.4

The Irish sole fishery is carried out by beam trawlers (Belgium and the Netherlands and to a small extent England and Ireland) and by otter trawlers (Belgium, England and the Netherlands). Between 1951 and 1963 annual landings varied between 451 tons and 922 tons, caught mainly by British trawlers. Belgian trawlers started to fish intensively in the Irish Sea in 1964 and total landings rose. Although they fell again in 1966 they rose subsequently to their maximum recorded level in 1971. The increase in landings resulted mainly from a change to beam trawling by the Belgian fleet and the start of the Dutch fishery in 1970. In 1971 these two countries caught 81% of the sole landings from the Irish Sea. After 1971 catches dropped to the present level of 1 400 tons. In 1976 the Belgian and Dutch caught 69% of the total catch. The distribution of the catches by these fleets is shown in Figures 44-48.

The estimated fishing mortality rate on the fully exploited age groups is about 0.4, at which level the stock is almost fully exploited. The maximum sustainable yield from the stock is about 1 300 tons a year. As year class size does not vary as much as in the North Sea, the total allowable catch for any year is likely to approximate to the maximum sustainable yield.

B.5 Lemon Sole (*Microstomus kitt* Walbaum) in Sub-area IV

B.5.1 General biology

Spawning times and areas

The data tabulated below are from Rae (1965).

Region	Spawning time		
	Start	Maximum	End
Shetland	End of April	May/June	Start of September
Moray Firth	End of April	June/July	End of September
F. of Forth	Mid-May	Mid-June/August	Start of October
W.Central N.Sea	Mid-May	July/August	Start of November

Drift of eggs, larvae and pelagic juveniles

According to Rae (1965), at least some of the eggs spawned around the Hebrides in May, may drift into the North Sea. Eggs spawned within the North Sea are not thought to drift far from the areas in which they are spawned.

Distribution of young demersal stages

Lemon sole begin demersal life at a length of about 2.5 cm. Almost nothing is known about the distribution of lemon sole during their first two years of demersal life, since very few have been caught at these ages. Scottish research vessel data indicate that young lemon sole live at depths between 13 and 150 metres on rough ground.

B.5.2 Distribution and migrations of adults

The main concentrations of adult lemon sole in the North Sea occur between the Moray Firth and the Firth of Forth, off the east coast of Scotland. Very few lemon sole occur in the Norwegian zone of the North Sea.

Within the main area of concentration, the young and adolescent fish do not migrate and only about 20% of the adult fish marked in various experiments travelled distances greater than 30 miles. Even these movements did not usually take fish outside the main centre of density of the stock.

B.5.3 Exploitation and management

Landings of lemon sole from the North Sea by Scotland, England, Denmark, Belgium and the Federal Republic of Germany for the period 1922 to 1975 are shown in Figure 49. Since 1950, total landings have shown no marked trend, fluctuating fairly widely about a mean value of 4½ thousand tons.

The age at which lemon sole caught around Shetland are first landed is 5-6 years, while the corresponding value for landings from the Scottish east coast is 3-4 years. These differences are due to differences in the growth rates in the two areas.

Apart from the adoption, under NEAFC Recommendation 4, of a minimum landing size of 25 cm, no specific measures have been taken to conserve lemon sole. Landings-per-unit-effort by Aberdeen trawlers were relatively stable over the period 1920-1939. Between 1945 and 1955, landings-per-unit-effort rose to about double the pre-war value and have since fallen to a level slightly below that in the 1920s and 1930s.

Preliminary estimates of the total instantaneous fishing mortality rate for lemon sole off the east coast of Scotland, and in the vicinity of Shetland, are 0.75 and 0.5 respectively. Assuming a value of M = 0.1, and arguing on a yield-per-recruit basis, lemon sole in the northern North Sea are slightly overfished.

Scottish landings over the period 1967-76 indicate that 95% originated from EEC waters and 5% from Norwegian waters.

B.6 Cod in Sub-areas VI and VII

B.6.1 General biology

In Sub-area VI the cod at Rockall (Division VIb) may be independent of those in Division VIa, but there is no firm evidence on this topic. There may also be more than one cod stock within Division VIa but again the evidence is inconclusive. In this Sub-area spawning takes place in spring, the major spawning area being to the north and west of the Outer Hebrides. The eggs and larvae are probably carried in a clockwise direction around the Scottish northwest coast but it is uncertain how far they are transported and whether they reach the North Sea.

In the Irish Sea and Bristol Channel (Divisions VIIa and VIIf) spawning takes place in late February to early April on three main spawning grounds: off Carlingford Lough, southwest off St. Bee's Head and west of Hartland Point. 0-group cod probably occur in most rocky coastal areas in the Irish Sea; 1-group cod start to appear in the commercial fishery during late summer, when they occur in concentrations, particularly along the Irish coast.

B.6.2 Distribution and migrations

In Division VIa cod are to be found on the shelf to the west of Scotland in depths up to about 300 m.

In Sub-area VII tagging experiments on the three main spawning grounds show that there is virtually no movement of mature fish between them. After spawning fish from St Bee's Head remain in the area between the Solway Firth, the Isle of Man and the Cumberland coast although a few have been recaptured in the Clyde and the southern Irish Sea. Fish tagged off Carlingford Lough show a marked migration to the south with many recaptures from southeast Ireland during the summer. In the Bristol Channel most recaptures have been from within 90 miles of the release point.

B.6.3 Exploitation and management

In Sub-area VI annual landings fluctuated between 10 000 and 25 000 tons from 1966 to 1976 with the peak landings in 1967 and 1968. From 1970 to 1975 landings fluctuated around 14 000 tons without any apparent trend. The fishing mortality rate on fully recruited age groups is currently about 0.7.

In Divisions VIIa and VIIf annual landings have been about 10 000 tons since 1967 compared to an average of about 4 000 tons in the period 1960-66. This increase was, at least in part, due to a series of good year classes. The cod fisheries in this area follow a regular seasonal pattern with peak catches during the spawning season when there are intensive directed fisheries in each of the three spawning areas. In summer the catch rates fall and there are no directed cod fisheries, but in September, when catch rates start to increase, directed fisheries start again mainly along the Irish coast and in Belfast Lough, and chiefly on 1-group cod. In these Divisions the fishing mortality rate since 1968 has averaged 0.8 - 0.9 in the fully exploited age groups; compared with an F value of 0.3 for the maximum yield per recruit with the present exploitation pattern.

B.7 Whiting in Sub-areas VI and VII

B.7.1 General biology

Little is known about the stock structure of whiting in Sub-area VI; it is possible that the exploited population consists of more than one stock. The population as a whole, is characterised by very fast growth, attaining a length of 42 cm at 5 years old.

In Division VIIa spawning takes place from February to June with a peak in April. The progeny, when 4-5 months old, appear in shallow water at a length of 7-8 cm. After spending almost 1 year in these shallow water nurseries they migrate into deeper water. The majority attain sexual maturity at the end of their second growth season and migrate northwards to the spawning area.

In the English Channel (Divisions VIId and e) spawning takes place from February to July. The main spawning area is off Plymouth where larvae are most abundant in May.

B.7.2 Exploitation and management

In Sub-area VI catches increased from an annual level of 6 000 to 8 000 tons in the early 1960s to 19 000 tons in 1965 and have since remained at this high level. A 40% reduction in fishing mortality would result in an increase in the long-term yield.

In Division VIIa the fish aggregate at certain times of the year and give rise to intensive seasonal fisheries. One example of this is the fishery off County Dublin and County Down, which starts in October and declines in the first quarter of the year, and is based chiefly on I- and II-group fish. Large quantities of undersized whiting are taken in this Division as a by-catch of the Nephrops and industrial fisheries. During the last 30 years catches have fluctuated between 6 000 and 20 000 tons without any trend. The total mortalities are high but the major gain would arise from an improvement in the exploitation pattern.

In Divisions VIId and e catches have fluctuated between 1 300 tons and 11 000 tons since 1945. No assessments have been done of the state of the stock.

B.8 Saithe in Sub-areas VI and VII

B.8.1 General biology

In Sub-area VI saithe spawn extensively off the north coast of Scotland and to the northwest of the Hebrides. The Clyde estuary forms a small separate spawning area. As in other areas the juvenile fish have an inshore distribution.

In Sub-area VII spawning probably takes place on banks to the west of Ireland. 0-group saithe have been observed on the west coast of Ireland.

B.8.2 Distribution and migrations

In Sub-area VI the stock is distributed over the whole of the continental shelf area to the north and west of Scotland with small components on the offshore banks. After spawning the adult fish disperse widely over the area with the adults occurring in the deeper water towards the edge of the shelf west of the Hebrides.

B.8.3 Exploitation and management

The stock in Sub-area VI currently yields annual catches of about 30 000 tons; in Sub-area VII annual catches in the period 1966-75 have fluctuated between 5 000 and 12 000 tons, in 1973-75 catches have been somewhat lower, in the range 5 - 6 000 tons (Table 49).

C. REGION 3 STOCKS

C.1 Sole in Sub-areas VIII and IX

C.1.1 General biology

Little is known about the biology of soles in these Sub-areas. Taking the catch levels into consideration the abundance in Sub-area VIII may be about twice to three times that in the Irish Sea and the abundance in Sub-area IX comparable with that in Sub-area VIII.

C.1.2 Distribution and migrations

In Sub-area VIII the fishery is concentrated on a few areas where fishing with otter trawls is possible. In Sub-area IX sole form coastal stocks.

C.1.3 Exploitation and management

In Sub-area VIII sole catches (in 000's tons) in the period 1962 to 1975 were as given in the text table below:

1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
2.5	1.5	1.9	1.0	1.6	2.0	1.9	2.1	2.4	3.7	4.5	2.6	3.0	2.9

The annual catches increased somewhat in the early 1970s and have since shown some decline. Nothing is currently known of the state of exploitation of the stock.

In Sub-area IX over the same time period annual catches were as follows (in '000 ton units):

1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
1.4	1.4	1.6	1.8	2.1	2.0	2.0	2.3	2.8	2.5	1.5	2.6	2.0	2.3

The catches have been fairly constant throughout this period which might suggest the stock is not overexploited.

C.2 Cod in Sub-area VIII

The landings of cod reported from Sub-area VIII are very small with a maximum of about 550 tons in 1967. These cod are all caught in the northern part of the Sub-area and can be considered as being entirely located within the EEC fishing zone.

C.3 Whiting in Sub-area VIII

C.3.1 General biology

Spawning takes place from late January to late June. No clearly demarcated spawning areas have been reported. 0-group are first found on the bottom in May in rather shallow depths. They attain a length of about 10 cm by their first winter.

C.3.2 Exploitation and management

Annual catches over the period 1967-76 have fluctuated without any obvious trend in the range of 1 050 to 2 900 tons. There are no further data on which to assess the state of exploitation of the stock.

D. STOCKS WHOSE DISTRIBUTION EXTENDS ACROSS MORE THAN ONE REGION

D.1 Blue Whiting (*Micromesistius poutassou*)

D.1.1 General biology

The blue whiting is a deep-water gadoid ranging in its distribution in the eastern Atlantic from approximately 35° - 80°N. Within this

range there is as yet no clear evidence of differentiation into separate stocks, but the largest component undoubtedly occurs to the north of 50°N.

Spawning areas and larval drift

The major spawning areas as defined by the occurrence of eggs and small larvae in the plankton are shown in Figure 50. Spawning appears to begin in the south in March and progress northwards. In the main spawning area, west of the British Isles, spawning lasts from March - late April with a peak in early April. Spawning probably occurs north and east of the Faroe Shetland Channel on a small scale because larvae have been found off the Norwegian coast north to about 72°N. Most of the known spawning areas are situated within the EEC zone, but spawning also takes place within the Faroese, Icelandic and Spanish zones, and some may occur on a small scale in international waters. Some spawning also takes place in an area to the southwest of Iceland, as shown in Figure 50.

Nursery areas

Knowledge of current patterns would suggest that most larvae from the major spawning area probably drift northeastwards. The nursery areas for fish less than one year of age are not well-documented, but the juveniles from about one year of age make a considerable contribution to the industrial fisheries off the southwest coast of Norway and off southwest Iceland. Other sources suggest that the immatures are widely distributed around the oceanic banks, along the edge of the European continental shelf and off southern and west Iceland (Figure 50), that is in a number of national zones. The distribution of immatures south of 50°N is not adequately recorded.

D.1.2 Distribution and migrations

From an age of about 2-3 years onwards, the blue whiting recruit to the spawning population which undertakes an annual migration from the spawning areas west of the British Isles to feeding areas in the Norwegian Sea (Figure 51). Although a small proportion of the population remains in the south, the majority migrate north after spawning, reaching Faroe in May, the edge of the east Icelandic current in June, and subsequently dispersing widely to the east of Iceland and in the Norwegian Sea during the summer to feed. In addition concentrations of adult and immature blue whiting have recently been located from March - November in the area between Iceland and Greenland. The northern and eastern limits of distribution vary according to sea temperature and in some years reach 80°N west of Spitsbergen and 35°E in the Barents Sea. In addition, part of the population finds its way into the Norwegian Deeps, but no spawning has yet been recorded there. By November the fish are again concentrated off eastern Iceland and north of the Faroes. The spawning migration takes place in January and February. The seaward distribution west of the British Isles and south of Iceland is poorly defined, but echo-traces characteristic of blue whiting are recorded to at least 20°W in the area south of 60°N. There are also records of small populations in the northwest Atlantic. Migrations south of 50°N are not recorded and it is not clear what relationship the population

in that area bears to the more northerly one. During the course of their life history, the main northerly population of blue whiting thus disperses from the EEC zone into Norwegian, Faroese and Icelandic zones, and possibly the international zone. As adults, they migrate annually from the Norwegian and Icelandic zones and the open area in the Norwegian Sea, through the Faroese zone to the EEC zone to spawn.

D.1.3 Exploitation and management

Blue whiting catch statistics are not yet recorded with sufficient consistency to tabulate landings with any accuracy. From data available to the ICES Statistician and additional data supplied by a number of scientists, blue whiting catches have been tabulated for the period 1966-76 in Table 50. Total recent landings, including landings from mixed industrial fisheries, as reported are as follows (in tons):

1970	1971	1972	1973	1974	1975	1976	1977
32 900	64 800	34 400	38 000	35 600	95 600	152 900	154 100

The provisional total for 1977 is not significantly higher than the revised total for 1976, but some important statistics from Spain, USSR and the German Democratic Republic are not yet available.

In 1977 there was a change in the proportion of the total catches from each area: 60% of the total came from Division Vb (Faroe) compared with only 23% in 1976. A corresponding drop occurred in Division VIa.

Without detailed reporting, it is not possible to define the fishing areas with any precision. Nevertheless, an attempt has been made to do so for 1975, 1976 and 1977 in Figure 52, excluding any exploitation south of 50°N, for which no details are available.

Fishing in 1975-77 in the main spawning area was largely experimental and it cannot be assumed that a developed fishery will follow the same pattern. The main fishing occurred from March to May along the edge of the continental shelf west of Scotland and in May-June south and west of Faroe. There have for some years been important mixed industrial fisheries for Norway pout and blue whiting off the southwest coast of Norway, in Division IVa, and to the south of Iceland. For a number of years, Spanish vessels have also fished to the northwest of Spain. From 1969-71, the USSR made substantial catches to the east of Iceland. New developments in 1977 were a fishery west of Iceland mainly in September-November, and a fishery near Bear Island in the period July-October.

To date blue whiting have not been subject to any management action. From the details of its life history, it is clear that successful management of blue whiting stock or stocks will ultimately depend on a high degree of international cooperation. In particular, the fact that immature fish are distributed in different zones from the adults, which themselves migrate between zones, is likely to have considerable bearing on the management of the exploitation pattern. It is clear, however, that present exploitation takes a relatively small fraction of the maximum sustainable yield.

D.1.4 Distribution of catches in relation to Zones of Extended Fisheries Jurisdiction

Despite the lack of official statistics an attempt has been made in Table 51 to allocate the reported catches in 1975, 1976 and 1977 to national zones. The main fisheries divided in this way are:

a) the Norwegian mixed industrial fishery in the Norwegian zone (19 000 tons of blue whiting in 1977);

b) the small Icelandic mixed industrial fishery to the southwest of Iceland (5 900 tons of blue whiting in 1977);

c) the multinational fishery for spawning blue whiting west of Scotland in the EEC zone (14 600 tons in 1977);

d) the multinational post-spawning fishery south and west of Faroe in the Faroese zone (93 000 tons of blue whiting in 1977);

e) the summer fishery for adult blue whiting east of Iceland (4 600 tons in 1977).

In addition, in 1977 two new fisheries developed:

f) a fishery west of Iceland in the Icelandic zone (900 tons of blue whiting in 1977);

g) a fishery for adult blue whiting in the areas around Bear Island and Spitsbergen in July-October (7 500 tons in 1977).

D.2 Ling

D.2.1 General biology

Ling spawn in March-July at approximately 60-400 m depth with maximum at 100-200 m on the continental shelf or slope from the northern part of the Bay of Biscay along the western coasts of the British Isles to the Faroe Islands and the southwest coast of Iceland. Spawning also occurs in the northern North Sea, in Skagerrak and along the Norwegian coast up to about 67°N. The most intensive spawning seems to take place west of Scotland, at Rockall, west of Shetland, at Faroe, at Iceland and along the Norwegian coast.

The deeper northern part of the North Sea plateau is a nursery area for young ling. Samples from Norwegian industrial trawl catches in 1976 indicate that the young ling are most numerous on the north-eastern part of the plateau. However, the importance of the North Sea plateau as a nursery area for ling in relation to different spawning grounds is not known.

The larvae are found chiefly in waters of 30-100 m depth. Details of the drift of eggs, larvae and juveniles from the spawning grounds are not known.

D.2.2 Distribution and migrations

The distribution of the species coincides well with the spawning areas and this could mean that the spawning products are not generally carried very far away from the spawning grounds. Young

ling are usually found in shallower waters than the older individuals. The longline fisheries generally give the best yields in spring, which indicates that some sort of spawning migration takes place. Apart from this, there is no evidence of migration.

D.2.3 Exploitation and management

Faroe Islands and Norway have specialised longline fisheries for ling, which are responsible for most of the catches of these countries. The rest is taken chiefly as by-catch in trawls and this is also the case for most of the catches from other countries.

In the catch statistics of most countries (Tables 52-60), blue ling are included in the ling catches, and it is therefore in some cases difficult to assess whether trends in the ling catches are caused by ling or blue ling. Generally, the ling catches are variable, but with no clear trend. The large French reported ling catches in Division VIa in recent years are predominantly blue ling.

The Norwegian longline catches are according to preliminary data composed of ling from about 8 to over 20 years. The age groups 10-15 years, basically covering the length range 70-100 cm, dominate the catches which contain mostly mature individuals. No conservation measures on this species are in force.

D.2.4 Distribution of catches in relation to Zones of Extended Fisheries Jurisdiction

It is not clear to what extent the ling in the North-East Atlantic Ocean is comprised of different stocks. Channels deeper than 300-400 m separate the spawning grounds and may represent boundaries between stock units. If so, there would be separate stocks at Faroe, Iceland, Rockall and Norway coast, all clearly restricted within the respective 200-mile fisheries zone. Along the shelf from the Bay of Biscay to the northern North Sea there are apparently no topographic boundaries between spawning grounds which seem to be more or less continuous, although there are large variations in the spawning intensity. The whole of this area is inside the EEC fisheries zone, except the northeastern part of the North Sea, which belongs to the Norwegian zone.

D.3 Blue Ling

D.3.1 General biology

Statements about the upper depth limit for spawning of blue ling vary from 200 m to 600 m, and the lower limit probably extends beyond 1 000 m. Spawning takes place in March-May from northwest of Ireland, seemingly continuously northwards along the continental slope to southwest of Iceland. In addition, spawning also takes place in some of the deep fjords on the Norwegian west coast.

The distribution of blue ling coincides with the spawning areas, except that the species also occurs along the continental slope off western Norway where no eggs or larvae have been found so far. However, investigations have not been extensive enough to exclude the possibility of spawning off Norway. If spawning does not take place there, this occurrence is most probably the result of drift of eggs and larvae either from the fjords or from the western area. The latter theory is supported by the fact that

relatively small blue ling occasionally are caught on the North Sea plateau. A less likely possibility is that the occurrence off Norway is a result of migration of older blue ling.

D.3.2 Distribution and migrations

Nothing definite is known about the drift of eggs, larvae and juveniles, or about migration of blue ling. The longline fisheries give the best yields in autumn, but blue ling may also be caught in considerable quantities by trawl in much deeper waters in spring in the same areas. This indicates that a seasonal vertical migration, which is probably connected with the spawning, takes place.

There is no evidence that the blue ling along the continental slope from Ireland to Iceland comprises more than one stock, in which case it is distributed inside the EEC, Faroese and Icelandic fisheries zones. The distribution of the stock biomass between the zones is not known.

The blue ling in the Norwegian fjords represent in all probability a local population. The relation between the blue ling off western Norway and the other stocks is not clear.

D.3.3 Exploitation and management

Blue ling are caught with longline by Faroe Islands, Iceland and Norway. In recent years France has developed a trawl fishery for blue ling at around 800-900 m depth west of the British Isles and at the Faroe Islands. Because of its generally deep occurrence, blue ling are uncommon in ordinary trawl catches.

The catches of blue ling are apparently relatively small (Tables 61-66) in most areas compared with ling; but because blue ling is often included in the reported ling landings, trends in the catches are difficult to assess. However, according to French sources, the ling catches by France in Sub-area VI are predominantly blue ling. Although previous catch statistics are incomplete, there has probably been a large increase in the catches of blue ling, from this area in recent years.

Preliminary Norwegian data indicate that the blue ling caught by longline are mostly 15-30 years old and practically all of the fish are mature. Most of the fish are between 90 and 120 cm. In the French research vessel trawl catches the same length groups dominated, but the length range, 50-150 cm, was larger, especially towards the smaller fish. The growth rate appears to be about 2 cm per year for mature individuals.

D.4 Tusk

D.4.1 General biology

Tusk spawn in April-July on the continental slope or shelf from the west coast of Ireland northwards along the west coast of Scotland and around Rockall to Faroe and the southwest coast of Iceland. Spawning also takes place in the northern North Sea and along the Norwegian coast from Skagerrak up to about 70°N. The spawning appears to be most intensive west of Scotland, at Rockall, Faroe, Iceland and on the Norwegian coast. Spawning occurs at depths from 50 to probably 500-600 m with a maximum at around 200 m.

The distribution of eggs, larvae and juveniles indicates that the spawning areas may not be separated to the same extent as for ling.

D.4.2 Distribution and migrations

Little is known about migration of tusk. However, the longline fisheries give approximately the same yields throughout the year and this may mean that adult tusk are fairly stationary.

The distribution in general coincides with the spawning areas, except that it extends, although in decreasing quantities, further to the north and east along the Norwegian coast and the Soviet coast as far as the Kola Peninsula and northwards to Bear Island.

There is no clear evidence that the tusk in the North-East Atlantic Ocean is comprised of several stocks. However, deep channels may represent boundaries between stocks. Accordingly, there may exist stock units of tusk at Rockall, Faroe, Iceland and on the Norwegian coast, all restricted to one fisheries zone, except the latter, which extends slightly into the Soviet zone.

Along the shelf from west of Ireland to the northern North Sea there are apparently no topographic boundaries. This area of distribution is basically within the EEC fisheries zone, but extends into the Norwegian zone in the northern North Sea. Norwegian industrial trawl catches from the North Sea indicate that young tusk are most numerous in the northeastern part. However, it is considerably less numerous than young ling, and the North Sea plateau is probably not very important as a nursery area for the species.

D.4.3 Exploitation and management

Tusk are caught with longline by Faroese and Norwegian fishermen. It is also a by-catch in trawl fisheries, but usually to a lesser extent than ling. Catches in all areas fluctuate without clear trends (Tables 67-73). Catches of tusk in Sub-areas VII-VIII have been negligible and are not tabulated. However, in 1975 Norway reported a catch of 197 tons.

According to preliminary data, the Norwegian longline catches are basically comprised of 10-30 years old tusk of 45-85 cm length. Most of them are mature fish which apparently have a growth rate of only about 2 cm per year.

D.5 Halibut

D.5.1 General biology

Halibut spawn in deep water from about 300 - 1 500 m in depth along the Norwegian coast and in the fjords, mainly in northern Norway, off the west and southwest coasts of the Faroe Islands and off the south and west coasts of Iceland at temperatures of 5°-7°C. Spawning takes place along the Norwegian coast in the period December-April, with a peak in January. At the Faroe Islands, spawning begins in late winter until June. At Iceland, the main spawning activity takes place in March to May.

The eggs are bathypelagic and have been recorded at 200-700 m in depth. The 0-group occur generally closer to the surface in depths of 10-50 m near the coasts.

Halibut seek the bottom in shallow waters at the age of 1-2 years. The most important nursery areas are fjords, bays and coastal banks.

D.5.2 Distribution and migrations

Halibut is found along the coast of West Greenland north to Disko, from Nova Scotia to Virginia, Spitsbergen and Bear Island to the Barents Sea, and across to Iceland, Faroes and the North Sea southwards to Biscay. At the age of 3-5 years, halibut migrate to deeper waters. Even though older fish usually stay at greater depths, the adults migrate to some extent to feeding areas in shallow waters during summer.

Halibut reach maturity at the age of 8-12 years. The mature individuals usually stay in deeper waters. Tagging experiments show migration between Iceland and the Faroes, and vice versa. Some recaptures from tagging experiments carried out at the Faroes have been made in the North Sea, but the Norwegian halibut seems to be a unit stock. There is also no indication of any migration between Iceland and Greenland, but pelagic larvae from Icelandic waters might be transported to Greenland.

D.5.3 Exploitation and management

Most of the halibut catches taken from the Norwegian stock are from Division IIa. Nearly the whole of the total catch there is caught by Norway. The only directed fishery for halibut of the Norwegian stock is the Norwegian gillnet fishery. This fishery takes place in the northern part of Division IIa in the winter during the migration to the spawning grounds. Norway has put a total ban on the gillnet fishery during the spawning season from 20 January to 1 March. A minimum mesh size for gillnet has been introduced and a minimum landing size of 60 cm is recommended.

In Division IIIa, and Sub-areas IV and VI the annual catch throughout the period 1960-69 fluctuated between 800 and 1 300 tons, but from 1970 onwards the annual catch fell to around 600 tons. This fishery exploits principally the immature age groups. In Iceland and the Faroes, halibut have mostly been caught as by-catch in the trawl and Danish seine fisheries, but some directed longline fishery for halibut takes place in Faroese waters. Catches have decreased considerably in the Faroes area during the last 15 years. In the whole ICES statistical area, the decline in the total halibut catch has been even more pronounced (Table 74). Although no effort data are available, nor estimates of mortalities, the declining yield from the fishery as a whole is most likely to be the result of excessive fishing mortality, particularly on the younger age groups.

There are no conservation measures that apply directly to halibut in the Faroe-Iceland area, apart from the general restrictions on the mesh size of trawls, and the regulations of the trawl fisheries, especially the prohibition of fishing inside the 12 n.m. limit, which gives some protection to the younger age groups. The introduction of a minimum landing size for this species should be given serious consideration, since halibut do not reach maturity until 8-12 years of age at approximately 100 cm length, conservation presents some serious problems. But any increase in fishing effort must be viewed with great concern.

D.6 Hake

D.6.1 General biology

European hake are widely distributed from the coasts of Norway in Division IIa, and from south of Iceland, to Cape Blanc in Mauritania at 21°N latitude. Little is known about the existence of distinct stocks within this distributional range.

Spawning

In the Bay of Biscay and in the Celtic Sea females first attain sexual maturity at a length of 50-60 cm. Hickling (1930) has suggested that to the west of Ireland female hake do not spawn below a length of 60-70 cm. The spawning period is extended, with the mode of the seasonal spawning being progressively later as one moves northwards: February in Galicia, February-May in the Bay of Biscay, April-July west of Ireland and May-August west of Scotland. In all of this range spawning concentrations first appear at the edge of the continental shelf and then spread over it as the season advances. Eggs and larvae have, however, never been caught anywhere in large quantities.

Recruitment and nursery areas

For a long time it has been accepted that hake have a prolonged juvenile pelagic stage; Hickling (1930) claimed that they did not adopt a demersal mode of life until a length of about 10 cm and an age of about 15 months. Recent observations in the Bay of Biscay have shown first recruitment to demersal life at 4-11 cm in late April-early June and these are considered to be 0-group. Subsequent following of this age group has suggested they reach a length of 16-17 cm by the first winter.

From northwest of Ireland to the coast of Cantabria the most important nursery area is in the Bay of Biscay, on the continental shelf off the French coast. Another important one is to be found off the coast of Galicia. In the Bay of Biscay 0-group hake are to be found abundantly over the whole of the muddy substrate area, in depths of 75-120 metres, from the south of Brittany to the Charente coast. Their distribution in November when recruitment to the bottom mode of life is complete is shown in Figure 53. As I-group, although there may be some movement of small amplitude, they continue to inhabit the muddy zone. In Celtic Sea the available data would suggest that young hake are less abundant and do not seek out muddy bottoms to the same extent. Northwest and west of Ireland young hake are virtually absent both from commercial and research vessel catches.

D.6.2 Distribution and migrations

As stated above hake are widely distributed from the north of Norway to Mauritania. Judging from the distribution of commercial catches the largest concentrations within the NEAFC area are in Sub-areas VII, VIII and IX. In the latter two Sub-areas, however, it should be noted that under the current exploitation pattern the catches are predominantly of young hake. Migrations have been demonstrated between the coast and the open sea which would explain the strong relation between length and depth of capture. Nothing is known of larger scale migrations, largely because of the difficulties of tagging this species.

D.6.3 Exploitation and management

Catches of hake have increased in the ICES area in the period 1973-76 to a mean value of about 100 000 tons (Tables 75-77). Practically all of this come from Divisions IVa, VIa, VIIa-k, VIIIa-c, and IXa;* the principal catching countries being France, Spain and Portugal. The catches in the various Sub-areas in recent years are given in the text table below (in thousand ton units):

Sub-areas	1973	1974	1975	1976
IV + VI	10.7	10.8	12.9	11.5
VII	31.2	29.0	29.1	27.4
VIII	38.3	35.3	33.3	29.1
IX	35.7	23.3	30.2	27.2
Total	115.9	98.4	105.5	95.2

The catches in Sub-areas IV and VI after declining from 17 thousand tons to 7 thousand tons in the period 1962-67, increased again to 13 thousand tons in 1975. French and United Kingdom trawl catches showed a continuous decline in catch per unit effort over the period 1961-77. The increase in catches from 1971-77 is likely therefore to have reflected the increased fishing effort from the development of the Spanish fishery in these Sub-areas rather than from an increase in stock. In Sub-areas VII and VIII the total catch decreased from 86 000 to 51 000 tons from 1961 to 1969 and thereafter fluctuated about a level of 60 000 tons. Catches per unit effort declined very sharply until about 1968 and then stabilised at the lower level. In Division IXa the total catch increased from 1961 to 1970 from 39 000 to 51 000 tons and has since fluctuated about a value of 26 000 tons. The catch statistics from this Division need to be interpreted with some caution however due to the fact that until 1970 Spanish statistics include unknown quantities from African and British waters. Catch per unit effort in this Division decreased sharply until 1969 and subsequently stabilised.

The maximum mesh sizes recommended in NEAFC Recommendation 1 (75 mm double synthetic in Region 2 and 65 mm in Region 3) are applicable to hake in these areas. These mesh regulations are not, however, in all cases effectively enforced. Some categories of vessels using mesh sizes in the range 35-50 mm landed large catches of small hake. As a result the proportion of the total landed catch below the minimum regulation landing size of 30 cm in the fisheries in IVa, VIa, VII, VIIIa,b was 71% and in VIIIc and IXa as high as 88%.

French and Spanish national regulations forbid fishing in part of the Bay of Biscay nursery area and Spanish regulations to the same effect operate in two areas off the coast of Cantabria. In 1976 NEAFC set a TAC of 63 000 tons for Sub-areas VI, VII, and VIII in 1977 for hake.

* See also Appendix, p. 202, with Chart of statistical areas.

D.7 Megrim (Lepidorhombus whiffjagonis (Walbaum)

D.7.1 General biology

Data on the biology and fishery for megrim exist only for Sub-areas IV and VI and these are limited. For all other areas, the only available data are those on landings, as published in "Bulletin Statistique".

It should be pointed out that while the megrim landed from the North Sea and from Sub-area VI are almost all L. whiffjagonis, it is likely that megrim landings from further south contain increasing quantities of L. boscii. Since, however, no breakdown of landing statistics by species exists, it is impossible to comment further on this point. All landings have been treated as 'megrims'.

The only available data are from Russell (1976) who states that megrim spawn 'off the Scottish coast in May' and 'off the Irish coast from March to May'.

No relevant information exists on larval distributions or on nursery grounds.

D.7.2 Distribution and migrations

Megrim do not appear in the commercial landings of Scottish vessels until they are at least four years old. A few megrim of 3 or 4 years old have been caught by Scottish research vessels, but data are insufficient to accurately describe the distribution of these younger age groups. The adult stock component is distributed in deep water close to the edge of the continental shelf. The stock extends across the boundary between the Norwegian and the EEC zones. Nothing is known about megrim migrations.

D.7.3 Exploitation and management

The landings of megrim from ICES Divisions and Sub-areas are given in Table 78. Scottish landings over the period 1972-76 from Sub-areas IV and VI indicate that 97% originates from EEC waters and 3% from Norwegian waters.

Apart from the adoption of a minimum landing size of 25 cm, no attempts have been made to manage the megrim fishery.

Scottish data suggest that the total instantaneous fishing mortality rate (Z) is about 0.5 in the northern North Sea and 0.6 in Sub-area VI. Assuming M = 0.1, from yield-per-recruit considerations the stock is probably slightly overfished.

In Sub-areas VII, VIII and IX the only data available are the landings statistics given in Table 78.

D.8 Pilchard (Sardina pilchardus)

D.8.1 General biology, distribution and migrations

In the ICES region pilchard are widely distributed all over the area between the North Sea and Azores (Figure 54). The main fisheries take place in Divisions VIId-e, Sub-area VIII and coastal parts of Sub-area IX.

From meristic and morphometric characters, two races have been described:

- the Iberian race or southern European Atlantic race, with a distribution from Gibraltar to the Cantabrian coast.
- the northern European Atlantic, distributed between northern Spain and the North Sea.

The pilchard is a serial spawner. The spawning areas and periods are shown in Figure 55.

The youngest individuals have seldom been caught and only in shallow water along beaches or in ports.

The '0-group' appears in commercial catches in the second half of July between 46° and 47°N at a length of about 8 cm. In August, this age group is fished at the mouth of the Loire and in September and October off south Finistère.

In winter the majority of these young fish migrate southwards to the Landes coast where they are fished in February and March; the length is then 15 to 16 cm and they have a winter ring on the scales. In no other areas have 0-group fish been detected in commercial quantities despite research vessel fishing. In spring and summer fisheries occur along the coast of Brittany on fish with a modal size of 18-19 cm. These fish are believed to migrate to the spawning areas in the Celtic Sea, the English Channel and along the edge of the French continental shelf. Figure 56 shows the distribution of the juveniles, 0- and I-group, in the southern area.

After spawning, one component of the adults (Figure 57) migrates towards the area north of the Loire. For the northern component of the population, little is known about the migration pattern. However, it is known that the fish withdraw westwards from the North Sea at the onset of winter.

D.8.2 Exploitation and management

The size of the spawning stock in the English Channel was estimated from egg surveys to be 10^{10} fish in 1950 (i.e. 800 000 tons). More recent data on fecundity rate would reduce this figure by one half. In Sub-area VIII relevant data concerning stock size are not available.

The size of the Western Channel stock has been estimated from a cohort analysis as 100 - 200 thousand tons in 1975 depending on the parameters used. This estimate would require to be increased by 31% to take account of revised catch statistics for that year.

Table 79 gives catches from 1965 to 1975. In Sub-area IX following a period of high catches in 1965-67 of about 170 000 tons, the level declined to about 100 000 tons in 1973-75. No detailed breakdown of the distribution of Spanish and Portuguese catches within the Sub-area is available.

Catches in Sub-area VIII have fluctuated around 38 000 tons annually. Spain took 90% of the total catch from this Sub-area in this period, probably mostly from its own waters.

In Sub-areas VIII and IX the only gear used up to the early 1970s was the purse-seine. In later years in France, pelagic trawling has been developed using boats below 21 m. In Sub-area VII, after the decline of the British drift net fishery pelagic trawling by single or pair trawlers was the main gear used. No detailed data are available on fishing effort.

NEAFC Recommendation 2 specifies a minimum mesh size for pilchard in Region 3 of 20 mm but not within that part of the region limited in the northeast by a line bearing 310° from Cape Higuer and in the south by the 36°N parallel.

D.9 Horse Mackerel (Trachurus trachurus (L.))

D.9.1 General biology

The horse mackerel (Trachurus trachurus (L.)) has an extensive distribution. In the ICES area, the range extends from off Portugal and Spain as far west as ICES Sub-area X, north around the British Isles and into the North Sea extending eastwards into the Kattegat and western Baltic (Figure 58).

Only two major spawning areas are known. In the southern area off Spain and Portugal, spawning occurs from February to May, while in the northern area (English Channel-North Sea) spawning occurs from May to August. During these periods temperatures in the surface waters range from 11°C to 16°C. Horse mackerel spawn for the first time at age 3 or 4. The eggs are pelagic.

The distribution of larvae and juveniles are not well documented. Juveniles have been found off Portugal and Spain, in Biscay, English Channel, the southern North Sea and in fjords of western Norway. The growth pattern of horse mackerel is similar to that of mackerel with a rapid rate during the first 3 years of life, then dropping off sharply after maturity is reached.

D.9.2 Distribution and migrations

No data are available to show the migration patterns or permit any stock discrimination. Some general ideas regarding distribution can be proposed based on catch distribution, limited sampling and general observation. The known horse mackerel overwintering areas are in the western English Channel, and to the south and west of that area. During the spring and summer there is some movement northwards along the west coast of the British Isles and into the North Sea. It is not known if the population in Sub-areas VIII and IX take part in this migration.

D.9.3 Exploitation and management

Horse mackerel fisheries occur throughout the year within the ICES area, but vary seasonally from sub-area to sub-area. A wide variety of gears is used. These include trawls, purse seines, gill nets, hooks and lines. The horse mackerel is used for human consumption and for fish meal and oil. No regulation has been applied to these fisheries.

Because of the limited biological data in Sub-area VII, and the possibility that the recent high catches there may have resulted only from an increase of fishing effort on a declining stock biomass, the Mackerel Working Group in 1977 recommended that the

total annual catch should not be allowed to exceed 120 000 tons until better data become available. Similarly in Sub-area IX the Group recommended that the annual catches should not exceed 40 000 tons. A Portuguese assessment of the fishery conducted in Division IXa confirmed the analysis by the Working Group indicating that the stock was being heavily exploited and that the effort in recent years was about 25% above the level at which the maximum potential yield is obtained (Borges et al., 1977).

Catch statistics for the differant ICES areas for the period 1967-76 are given in Table 80. The 1976 catch (370 000 tons) is the highest recorded and has increased by over 100 000 tons on the 1975 figure. This was mainly due to increases in the Spanish and USSR catches.

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Table 1. Nominal catch (metric tons, whole weight) of Cod in Sub-area I.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Belgium	-	-	-	-	-	-	-	-	171	-	-
Faroe Island	-	-	-	-	-	-	-	-	3 582	5 010	4 931
France	2 222	-	-	-	44 245	34 755	8 915	17 128	10 674	19 482	19 040
German Dem.Rep.	2	17	3	1 429	3 662	437	474	98	2 446	2 121	262
Germany, F.R.	7	823	-	-	3 257	2 452	2 166	12 847	43 581	12 106	16 031
Netherlands	-	-	-	-	-	-	-	-	-	-	-
Norway	100 618	118 315	119 223	120 787	199 286	131 282	78 175	88 548	146 841	158 971	142 046
Poland	-	-	-	7 856	42	12	668	764	2 917	2 860	1 029
Potugal	-	-	-	-	-	-	-	-	25 995	10 554	4 000
Spain	-	-	-	-	-	-	-	33	8 302	4 630	4 509
UK	50 764	48 218	94 689	130 377	119 115	46 101	33 437	55 066	73 452	85 644	58 652
USSR	138 640	155 425	428 537	418 929	229 315	97 466	73 180	318 332	405 528	260 323	288 624
Total	292 253	322 798	642 452	679 373	595 260	312 505	197 015	492 816	723 489	561 701	539 124

Table 2. Nominal catch (metric tons, whole weight) of Cod in Division IIb.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Belgium	-	-	-	-	-	-	-	-	-	614	-
Faroe Island	-	-	-	5 026	-	-	543	-	635	4 705	4 706
France	-	-	-	-	-	-	-	-	29 150	5 672	5 600
German Dem.Rep.	85	10	252	3 926	8 634	275	63	1 220	1 381	6 280	4 271
Germany, Fed.Rep.	-	-	-	3 607	2 828	2 958	87	2 286	32 995	15 616	5 416
Norway	6 822	3 534	4 462	24 333	6 931	4 631	6 324	4 096	36 408	17 951	4 650
Poland	-	-	-	-	2 895	526	67	65	6 771	4 097	5 207
Portugal	-	-	-	-	-	-	-	-	-	-	2 000
Spain	-	-	-	-	-	-	-	-	407	2 340	2 335
UK	19 086	10 601	16 225	32 076	25 452	3 948	4 754	11 785	9 449	6 868	17 663
USSR	30 660	106 915	248 221	193 286	47 317	44 580	21 144	68 512	135 272	83 257	51 802
Total	56 653	121 060	269 160	262 254	94 057	56 920	32 982	88 207	254 730	147 400	103 650

Table 3. Nominal catch (metric tons, whole weight) of Cod in Division IIa.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Belgium	-	-	-	-	-	-	-	-	-	-	7
Faroe Island	-	-	-	24 348	26 265	5 877	850	1 916	1 500	1 594	1 569
France	745	664	-	--	-	17	-	-	6 204	3 580	3 360
German Dem.Rep.	141	18	112	552	3 662	4 286	693	3 366	1 033	1 580	4 413
Germany,Fed.Rep.	4 284	2 809	1 073	1 827	3 366	4 316	1 189	1 618	1 931	2 315	3 333
Netherlands	121	6	133	-	--	-	-	-	-	-	218
Norway	96 352	97 061	131 926	160 126	171 389	271 131	309 682	192 540	104 027	100 177	187 132
Poland	-	-	-	-	2 216	974	157	14	210	478	750
Portugal	-	-	-	-	-	-	-	-	-	-	1 000
Spain	-	-	-	-	-	213	166	243	1 101	1 230	1 207
UK	33 162	28 189	29 473	68 613	36 914	30 053	20 191	11 957	7 993	9 322	11 712
USSR	-	-	-	-	-	2 756	2 329	351	1	-	1 678
Total	134 805	128 747	162 584	255 599	243 812	319 623	335 257	211 762	124 215	120 276	216 379

Table 4. Nominal catch (metric tons, whole weight) of Cod in Sub-areas I and II.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Belgium			-						171	614	7
Faroe Island	-	-	-	29 374	26 265	5 877	1 393	1 916	5 717	11 309	11 206
France	2 967	664	-	-	44 245	34 772	8 915	17 028	46 028	28 734	28 000
German Dem.Rep.	228	45	255	5 907	12 413	4 998	1 300	4 684	4 860	9 981	8 946
Germany,F.R.	4 284	3 632	1 073	5 343	9 151	9 726	3 405	16 751	78 507	30 037	24 780
Netherlands	121	6		133						-	218
Norway	203 792	218 910	255 611	305 241	377 606	407 044	394 181	285 184	287 276	277 099	333 828
Poland	-	-	-	7 856	5 153	1 512	892	843	9 898	7 435	6 986
Portugal									25 995	10 554	7 000
Spain						215	166	276	9 810	8 200	8 051
UK	103 012	87 008	140 387	231 066	181 481	80 102	58 382	78 808	90 894	101 834	88 027
USSR	169 300	262 340	676 758	612 215	276 632	144 802	96 653	387 196	540 801	343 580	342 104
Total	483 704	572 605	1 074 084	1 197 226	933 246	689 048	565 287	792 686	1 102 434	829 377	859 153

Table 5. Nominal catch (metric tons, whole weight) of Haddock in Sub-area I.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Belgium									20	-	
Faroe Island	-	-	-	-	-	-	-	1 015	626	38	40
France	-	-	-	-	-	-	-	3 214	1 166	2 697	325
German Dem.Rep.	-	11	-	-	-	-	785	-	62	3	43
Germany,Fed.Rep.	-	144	-	-	-	17	436	8 116	11 150	7 480	13 041
Netherlands										-	
Norway	64 190	40 461	51 661	53 988	26 040	35 183	35 152	67 889	42 121	31 818	27 984
Poland	-	-	-	-	-	-	1 397	304	2 787	669	183
Portugal										-	450
Spain									6 209	1 538	1 499
UK	11 215	10 115	13 655	11 537	6 595	6 969	10 523	23 349	18 353	14 981	6 940
USSR	48 710	57 346	75 654	24 211	26 802	14 822	173 675	179 841	76 543	62 462	49 062
Total	124 115	108 077	140 970	89 736	59 437	56 991	221 968	283 728	159 037	121 686	99 567

Table 6. Nominal catch (metric tons, whole weight) of Haddock in Division IIb.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Belgium										47	
Faroe Island	-	-	-	-	-	-	-	117	78	4	3
France									1 242	1 713	206
German Dem.Rep.	-	-	-	-	159	-	41	1	16	24	37
Germany,Fed.Rep.	-	-	-	-	-	-	44	597	6 953	2 765	841
Netherlands										-	
Norway	967	169	57	113	56	10	385	1 519	2 297	1 011	250
Poland	-	-	-	-	-	6	4	2	258	263	710
Portugal										-	100
Spain									307	902	887
UK	647	271	668	452	497	477	1 722	4 060	1 269	444	662
USSR	-	-	-	-	-	-	-	6 693	1 928	2 553	7 277
Total	1 614	440	725	565	712	463	2 196	12 989	15 068	9 726	10 973

Table 7. Nominal catch (metric tons, whole weight) of Haddock in Division IIa

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Belgium											5
Faroe Island				2	541	81	137	80	221	257	261
France	1 072	1 208							1 193	781	94
German,Dem.Rep.	11	3	204	309	497	16	3	21	376	410	268
Germany,Fed.Rep.	2 098	1 561	1 867	1 490	2 119	879	953	870	5 306	5 685	2 446
Netherlands	74	23		25		3	2 223				246
Norway	16 933	11 324	12 358	13 448	10 620	10 522	11 163	17 359	21 746	23 137	19 228
Poland						43	32	19		148	93
Portugal											450
Spain									809	676	673
UK	15 861	13 772	25 806	25 245	13 331	8 957	4 921	4 999	16 671	13 236	9 065
USSR						956	22 550		77		215
Total	36 049	27 891	40 235	40 519	27 108	21 457	41 982	23 348	47 033	44 330	33 044

Table 8. Nominal catch (metric tons., whole weight) of Haddock in Sub-areas I and II.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Belgium									20	47	5
Faroe Island				2	541	81	137	1 212	925	299	304
France	1 072	1 208						3 214	3 601	5 191	625
German Dem.Rep.	1	14	204	309	656	16	829	22	454	437	348
Germany,Fed.Rep.	2 098	1 705	1 867	1 490	2 119	896	1 433	9 583	23 409	15 930	16 328
Netherlands	74	23		25		3	2 223				246
Norway	82 090	51 954	64 076	67 549	36 716	45 715	46 700	86 767	66 164	55 966	47 462
Poland						49	1 433	325	3 045	1 080	986
Portugal											1 000
Spain									7 325	3 116	3 059
UK	27 723	24 158	40 129	37 234	20 423	16 373	17 166	32 408	36 293	28 661	16 667
USSR	48 710	57 346	75 654	24 211	26 802	15 778	196 225	186 534	78 548	65 015	56 554
Total	161 778	136 408	181 930	130 820	87 257	78 911	266 146	320 065	221 138	175 742	143 584

Table 9. Nominal catch (metric tons, whole weight) of Polar Cod in Sub-area I.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Norway	-	-	-	17 761	8 947	16 484	388	2 831	77	38
USSR	838	3 484	2 195	116 547	234 409	331 576	166 377	79 403	123 611	63 124
Total	838	3 484	2 195	134 308	243 356	348 060	166 765	82 234	123 688	63 162

Table 10. Saithe. Summary of total landings of saithe from Sub-areas I and II, V, and VI (in metric tons, whole weight). These figures differ to some extent from the official Bulletin Statistique data.

Year	Fishing area			
	NE Arctic	Va	Vb	VI
1967	191 191	75 712	21 319	16 034
1968	107 181	77 549	20 387	12 787
1969	140 379	115 853	27 437	17 214
1970	260 404	116 601	29 110	14 538
1971	244 732	136 764	32 706	19 246
1972	214 386	111 301	42 186	29 225
1973	214 153	110 888	57 574	35 812
1974	261 223	97 568	47 188	36 298
1975	233 453	87 954	41 578	30 949
1976	242 486	82 003	33 067	41 432
1977*	182 052	61 957	33 968	30 083

* Preliminary.

Table 11. Nominal catch (metric tons, whole weight) of Plaice in Sub-area I.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Germany, Fed.Rep.									112	26	512
Norway	150	71	110	183	198	117	120	131	31	67	..[a]
U.K. (Eng. & Wal.)	1 692	274	1 226	2 070	2 650	4 307	2 539	985	304	2 809	
U.K. (Scotland)										29	
USSR								10 074	11 869		4 352
Total	1 842	345	1 336	2 253	2 848	4 424	2 659	11 190	12 316	2 931	

* Preliminary.

a) I included with IIa..

Table 12. Nominal catch (metric tons, whole weight) of Plaice in Division IIb.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976*
German, Dem.Rep.	-	-	-	-	-	-	-	12	-	22	-
Germany, Fed.Rep.	-	-	-	-	-	-	-	-	10	2	-
Norway	-	-	-	-	-	-	-	21	-	-	... a)
U.K. (Eng. & Wal.)	-	5	22	19	5	-	13	24	1	42	-
U.K. (Scotland)	-	-	-	-	20	1	11	1	-	-	-
USSR	-	-	-	-	-	-	-	4 256	5 187	-	829
Total	-	5	22	19	25	1	24	4 314	5 198	66	

*Preliminary.

a) IIb included with IIa.

Table 13. Nominal catch (metric tons, whole weight) of Plaice in Division IIa.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976*
France	19	31	-	-	-	-	-	-	-	-	-
German, Dem. Rep.	-	-	-	-	-	-	-	2	-	-	4
Germany, Fed. Rep.	-	-	-	-	-	-	2	+	12	1	10
Netherlands	-	1	-	--	-	-	-	-	-	-	-
Norway	1 087	755	563	643	603	395	440	555	461	371	700[b]
Sweden	-	-	-	-	-	-	-	-	-	+[a]	-
U.K. (Eng. & Wal.)	33	62	18	99	44	108	26	11	11	7	-
U.K. (Scotland)	-	-	-	-	+	1	+	-	-	-	-
USSR	-	-	-	-	-	-	-	28	9	-	124
Total	1 139	849	581	742	647	504	468	596	493	379	

* Preliminary.

a) IIa includes smaller quantities taken in other areas (IV and IIIa,b,c).

b) IIa includes I and IIb.

Table 14. Nominal catch (metric tons, whole weight) of Plaice in Sub-areas I and II.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
France	19	31									
German Dem.Rep.								14		22	4
Germany,Fed.Rep.							2	+	134	29	522
Netherlands		1									
Norway	1 237	826	673	826	801	512	560	707	492	438	700
Sweden										+	
U.K. (Eng& Wal.)	1 725	341	1 244	2 188	2 699	4 415	2 578	1 020	316	2 858	
U.K. (Scotland)					20	2	11	1		29	
USSR								14 358	17 065		5 305
Total	2 981	1 199	1 939	3 014	3 520	4 929	3 151	16 100	18 007	3 376	

Table 15. Nominal catch (metric tons, whole weight) of Common Dab in Sub-area I.

Country	1966	1967	1968	1969	19701	1971	1972	1973	1974	1975	1976[x]
Germany, Fed.Rep.	-	-	-	-	-	-	-	39	63	120	
UK (England & Wales)	45	14	17	7	19	21	15	14	36	39	
UK (Scotland)	-	-	-	-	-	-	-	-	-	7	
Total	45	14	17	7	19	21	15	53	99	166	

[x]Preliminary

Table 16. Nominal catch (metric tons, whole weight) of Common Dab in Division IIb.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
German Dem.Rep.	-	-	-	-	-	-	-	-	-	67	
Germany,Fed.Rep.	-	-	-	-	-	-	-	18	72	121	
UK (England & Wales)	-	1	-	1	-	-	2	5	1	-	
UK (Scotland)	-	-	-	-	9	17	23	25	9	-	
Total	-	1	-	1	9	17	25	48	82	188	

Table 17. Nominal catch (metric tons, whole weight) of Common Dab in Division IIa.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
France	..a)	-	-	-	-	-	-	-	-	-	
Germany, Fed.Rep.	-	-	-	-	-	-	-	4	9	16	
Sweden	-	-	-	-	-	-	-	-	-	+b)	
UK (Engl.& Wales)	-	-	1	1	1	2	+	4	4	3	
UK (Scotland)	-	-	-	-	+	+	4	1	+	-	
Total	...	-	1	1	1	2	4	9	13	19	

a) Included with Lemon sole.

b) IIa includes smaller quantities taken in other areas (IV, IIIa,b,c,d).

Table 18. Nominal catch (metric tons, whole weight) of Common Dab in Sub-areas I and II.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
German Dem.Rep.										67	
Germany,Fed.Rep.								61	144	257	
Sweden										+	
U.K. (Eng.& Wal.)	45	15	18	9	20	23	17	23	41	42	
U.K. (Scotland)					9	17	27	26	9	7	
TOTAL	45	15	18	9	29	40	44	110	194	373	

Table 19. Nominal catch (metric tons, whole weight) of Long Rough Dab in Sub-area I.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976*
Poland							1				10
U.K. (England& Wales)	1	2			1	1		10	7		
TOTAL	1	2			1	1	1	10	7		

*Preliminary

Table 20. Nominal catch (metric tons, whole weight) of Long Rough Dab in Division IIb.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976*
German Dem. Rep.	-	-	-	-	-	-	-	119	-	377	
Poland	-	-	-	-	-	-	-	-	-	-	186
U.K. (England&Wales)	-	-	-	-	1	-	-	4	-	-	
TOTAL	-	-	-	-	1	-	-	123	-	377	

Table 21. Nominal catch (metric tons, whole weight) of Long Rough Dab in Division IIa.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976*
German Dem. Rep.	-	-	-	-	-	-	-	10	-	-	
Poland	-	-	-	-	-	-	-	-	-	-	14
U.K. (Engl. &Wal.)	-	-	-	-	-	-	-	1	1	-	
TOTAL	-	-	-	-	-	-	-	11	1	-	

* Preliminary

Table 22. Nominal catch (metric tons, whole weight) of Long Rough Dab in Sub-areas I and II.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976[x]
German Dem.Rep.								129		377	
Poland							1				210
UK (Eng.& Wales)	1	2			2	1		15	8		
Total	1	2			2	1	1	144	8	377	

[x]Preliminary

Table 23. Nominal catch (metric tons) of Greenland Halibut in Sub-areas I and II, 1967-76. (Data for 1967-76 from Bulletin Statistique.)

Country	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Faroe Islands	-	-	-	44	-	-	-	-	-	2
German Dem.Rep.	964[1]	257[1]	3 788[1]	18 729[1]	2 949[1]	1 633[1]	3 954	5 914	8 472	8 955
Germany, Fed.Rep.of	38	-	71	-	3	3	59	88	94	31
Norway Trawl catch	-	-	-	1 638	2 309	9 656	10 217	4 656	1 686	6 005
Norway Long-line catch	17 528	22 514	14 856	14 233	7 157	6 327	3 772	4 135	3 172	
Poland	-	-	5 314	19 262	12 277	7 981	2 140	5 146	3 645	3 566
UK (Eng. & Wales)	-	-	-	-	-	1 262	1 235	866	731	935
USSR	5 737[1]	3 397[1]	19 760	35 578	54 339	16 193	8 561	16 958	20 372	16 580
Total	24 267	26 168	43 789	89 484	79 034	43 055	29 938	37 763	38 172	36 074

1) From national statistics

Table 24. Nominal catch (metric tons, whole weight) of Catfish in Sub-area I.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976[x]
Belgium	-	-	-	-	-	-	-	-	2	-	
Faroe Islands	-	-	-	-	-	-	-	-	3	-	
German Dem.Rep.	-	-	-	-	78	-	-	-	-	11	
Germany, Fed.Rep.	-		-	-	-	-	4	3	37	90	
Norway	270	213	757	296	305	328	659	605	300	424	
Poland	-	-	-	-	-	-	-	-	-	8	
Portugal	-	-	-	-	-	-	-	-	-	67	
UK (Eng.& Wales)	496	275	320	376	381	421	504	1 060	686	878	
UK (Scotland)	-	-	-	-	-	-	-	-	-	20	
USSR	12 003	5 905	8 815	8 696	9 048	4 403	7 682	16 389	19 346	8 166	
Total	12 769	6 424	9 892	9 368	9 812	5 152	8 849	18 057	20 374	9 664	

[x]Preliminary

Table 25. Nominal catch (metric tons, whole weight) of Catfish in Division IIb.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976*
Belgium	-	-	-	-	-	-	-	-	-	5	
German, Dem. Rep.	-	-	-	-	-	-	-	27	9	189	
Germany, Fed. Rep.	-	-	-	-	-	18	4	15	156	343	
Norway	1	9	10	16	4	-	5	124	200	123	
Poland	-	-	-	-	-	-	-	-	-	19	
U.K. (Eng. & Wal.)	332	109	49	70	128	59	154	391	190	135	
U.K. (Scotland)	-	-	1	-	15	13	15	54	25	4	
USSR	969	2 875	3 667	3 534	3 410	7 261	4 431	5 416	10 729	15 203	
Total	1 302	2 993	3 727	3 620	3 557	7 351	4 609	6 027	11 309	16 021	

*Preliminary.

Table 26. Nominal catch (metric tons, whole weight) of Catfish in Division IIa.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976*
German, Dem. Rep.	-	2	-	-	8	-	7	-	-	2	
Germany, Fed. Rep.	69	77	6	7	14	3	62	126	179	225	
Netherlands	+	+	-	-	-	-	-	-	-	-	
Norway	1 761	1 293	765	1 355	990	1 321	1 735	3 462	1 202	1 334	
Sweden	-	-	-	-	-	-	-	-	-	+[a]	
U.K. (Eng. & Wal.)	131	153	116	138	77	130	138	132	68	80	
U.K. (Scotland)	-	-	+	-	3	1	5	2	1	+	
USSR	567	297	189	1	12	2	6	33	-	30	
Total	2 528	1 822	1 076	1 501	1 104	1 457	1 953	3 755	1 450	1 671	

*Preliminary.

a) IIa includes smaller quantities taken in other areas (IV and IIIa,b,c).

Table 27. Nominal catch (metric tons, whole weight) of Catfish in Sub-areas I and II.

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Belgium									2	5	
Faroe Island									3		
German Dem.Rep.		2			86		7	27	11	189	
Germany,Fed.Rep.	69	108	6	7	14	21	70	144	370	658	
Netherlands	+	+									
Norway	2 032	1 515	1 532	1 667	1 299	1 649	2 399	4 191	1 702	1 881	
Sweden										+	
Poland										27	
U.K. (Eng.&Wal.)	959	537	485	584	586	610	796	1 583	944	1 093	
U.K. (Scotland)			1		18	14	20	56	26	24	
USSR	13 539	9 077	12 671	12 231	12 470	11 666	12 119	21 838	30 075	23 399	
Portugal										67	
Total	16 599	11 239	14 695	14 489	14 473	13 960	15 411	27 839	33 133	27 356	

Table 28. Nominal catch (in metric tons) of Redfish by countries (Sub-area I, Divs.IIa and IIb combined).

Country	Year 1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Belgium										30	28	2
Faroe Isl.						60		9	32	6	67	137
France	897									1116		
German Dem.Rep.	151	976	311	921	1069	7 149	14786	9972	11756	28275	28020	22 636
Germany, F.R.	4766	5389	5550	3258	5573	2416	3076	1697	3479	6616	5182	7 894
Netherlands	345	33			20							127
Norway	6617	6931	5205	4024	3904	3832	4644	6776	7714	7055	4966	7 305
Poland					5973	4631	2532	1112	215	1269	4711	4 137
Portugal											331	3 463
Spain											1194	3 398
U.K.	4899	6546	5607	5058	5224	4554	4002	4379	4791	3509	2746	4 961
USSR	22300	15900	7300	5500	9100	13100	29800	22700	31800	48800	231000	263 546
Total	39975	35775	23973	18761	30863	35625	58840	46645	59787	96676	278245	317 606

Table 29. Nominal catch (in metric tons) of Redfish by countries in Sub-area I.

Country	Year 1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Belgium										30		2
Faroe Isl.									6	6		
France										26		
German Dem.Rep.			81	25	23		78	36		358	201	90
Germany, F.R.		7	354			133	148	7	76	1086	483	635
Netherlands												
Norway	333	159	242	464	365	141	316	1000	1917	194	482	739
Poland					5973	6	1	22			93	47
Portugal											331	478
Spain											820	301
U.K.	1016	1706	1419	1163	1385	1384	1406	1363	1894	1320	1048	1 392
USSR	4974	4511	1640	1076	3647	2281	3743	4403	4885	9318	30750	12 411
Total	6323	6383	3736	2728	11393	3945	5692	6831	8778	12338	34208	16 095

Table 30. Nominal catch (in metric tons) of Redfish by countries in Division IIa.

Country	Year 1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Belgium												
Faroe Isl.						60		9	22		67	137
France	897									980		
German Dem.Rep.	34	285	26	69	812	2243	12339	8963	11474	27153	22778	16 921
Germany, F.R.	4766	5382	5196	3258	5573	2165	1188	1466	2207	4167	4263	6 722
Netherlands	345	33			20							127
Norway	6129	6772	4961	3518	3510	3679	4277	5720	5564	6837	4444	6 515
Poland						269	1605	784	156	869	920	217
Portugal												2 849
Spain											153	2 082
U.K.	2927	4373	3781	3820	3578	2741	2463	2680	2125	1991	1621	2 191
USSR	13991	8565	4715	3779	14	142	209	291	131	14	39138	20 307
Total	29089	25410	18679	14444	13507	11299	22081	19913	21679	42011	73384	58 796

Table 31. Nominal catch (in metric tons) of Redfish by countries in Division IIb.

Country	Year 1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Belgium											28	
Faroe Isl.									4			
France	a)									110		
German Dem.Rep.	117	691	204	827	234	4789	2369	973	282	764	5041	5 625
Germany,F.R.						118	1740	224	1196	1344	436	537
Netherlands												
Norway	155		2	42	29	12	51	56	233	24	40	51
Poland						4356	926	306	59	400	3698	3 873
Portugal												136
Spain											221	1 015
U.K.	956	467	407	75	261	429	133	336	772	198	77	650
USSR	3356	2813	914	622	5483	10668	25887	17953	26813	39455	161062	230 828
Total	4584	3971	1527	1566	6007	20372	31106	19848	29359	42295	170631	242 715

a) I and IIb included in IIa.

Table 32. Herring summer and autumn fishery. Norwegian spring spawners. Catch (in thousands of tons) of adult non-spawning herring 1950-70.

Year	Iceland	Norway	USSR	Faroes	Germany (F.R.of)	Total
1950	30.7	10.1	14.0	-	-	54.8
1951	48.9	14.3	41.7	-	-	104.9
1952	9.2	19.6	61.0	-	-	89.8
1953	31.5	22.1	101.5	16.2	-	171.3
1954	15.2	11.4	133.3	27.4	-	187.3
1955	18.1	13.9	168.2	12.9	-	213.1
1956	41.2	14.8	188.8	23.0	-	267.8
1957	18.2	17.5	239.9	16.2	-	291.8
1958	22.6	11.4	306.1	15.8	-	355.9
1959	34.5	10.5	314.9	13.0	-	372.9
1960	26.7	18.3	365.7	9.4	-	420.1
1961	85.0	42.0	207.7	16.9	-	351.6
1962	176.2	72.1	159.6	9.8	-	417.7
1963	177.5	68.9	278.7	12.9	-	538.0
1964	367.4	80.1	231.9	18.3	-	697.7
1965	540.0	33.1	324.4	31.5	5.6	934.6
1966	691.4	37.0	296.6	44.0	22.7	1 091.7
1967	359.3	52.1	236.2	17.7	7.4	672.7
1968	75.2	30.1	111.3	10.6	1.1	228.3
1969	0.1	0.7	0.5	2.0	0.3	3.6
1970	0.0	0.0	>0.1	0.0	0.0	>0.1

This fishery took place mainly in the feeding and wintering areas as shown in Figures 16-18.

Table 33. Herring winter fishery. Norwegian spring spawners. Catch (in thousands of tons) of Norwegian winter herring 1950-70.

Year	Norway	USSR	Faroes	Iceland	Germany (F.R.of)	Total
1950	771.3	-	-	-	-	771.3
1951	888.0	1.3	-	-	-	889.3
1952	820.5	8.9	-	-	-	829.4
1953	670.1	8.5	-	-	-	678.6
1954	1 092.2	26.7	0.2	-	-	1 119.1
1955	965.4	38.8	0.2	-	-	1 004.4
1956	1 145.9	46.2	0.7	-	-	1 192.8
1957	795.6	60.1	0.8	-	-	856.5
1958	345.3	81.9	1.9	-	-	429.1
1959	416.4	93.1	0.7	-	-	510.2
1960	300.1	99.3	1.6	-	-	401.0
1961	69.6	77.3	-	-	-	146.3
1962	84.1	49.4	-	-	-	133.5
1963	61.5	71.3	-	-	-	132.8
1964	286.3	133.9	-	-	-	420.2
1965	226.4	164.8	-	-	-	391.2
1966	460.9	150.8	16.7	-	3.4	631.8
1967	371.6	67.7	17.2	-	2.3	458.8
1968	25.6	13.0	5.5	-	0.7	44.8
1969	14.9	2.7	2.4	0.5	0.0	20.5
1970	20.3	0.0	0.6	0.0	0.0	20.9

This fishery took place mainly in the spawning areas as shown in Figures 16-18.

Table 34. Total catch of Norwegian spring spawning Herring, 1950-70. Catch (in thousands of tons) of adults and pre-recruits.

Year	Iceland	Norway	USSR	Faroes	Germany (F.R. of)	Total
1950	30.7	781.4	14.0	-	-	826.1
1951	48.9	902.3	43.0	-	-	994.2
1952	9.2	840.1	69.9	-	-	919.2
1953	31.5	692.2	110.0	16.2	-	849.9
1954	15.2	1 103.6	160.0	27.6	-	1 306.4
1955	18.1	979.3	207.0	13.1	-	1 217.5
1956	41.2	1 160.7	235.0	23.7	-	1 460.6
1957	18.2	813.1	300.0	17.0	-	1 148.3
1958	22.6	356.7	388.0	17.7	-	785.0
1959	34.5	426.9	408.0	13.7	-	883.1
1960	26.7	318.4	465.0	11.0	-	821.1
1961	85.0	111.0	285.0	16.9	-	497.9
1962	176.2	156.2	209.0	9.8	-	551.2
1963	177.5	130.4	350.0	12.9	-	670.8
1964	367.4	366.4	365.8	18.3	-	1 117.9
1965	540.0	259.5	489.2	31.5	5.6	1 325.8
1966	691.4	497.9	447.4	60.7	26.1	1 723.5
1967	359.3	423.7	303.9	34.9	9.7	1 131.5
1968	75.2	55.7	124.3	16.1	1.8	273.1
1969	0.6	15.6	3.2	4.4	0.3	24.1
1970	0.0	20.3	0.0	0.6	0.0	20.9

Table 35. Total catches (in thousands of tons) of Norwegian spring spawning Herring during the period 1950-76.

Year	Winter herring	Summer and autumn herring	Total adult herring	Small and fat herring	Grand Total
1950	771.3	54.8	826.1	106.9	933.0
1951	889.3	104.9	994.2	284.2	1 278.4
1952	829.4	89.8	919.2	335.6	1 254.8
1953	678.6	171.3	849.9	240.7	1 090.6
1954	1 119.1	187.3	1 306.4	338.1	1 644.5
1955	1 004.4	213.1	1 217.5	142.3	1 359.8
1956	1 192.8	267.8	1 460.6	198.8	1 659.4
1957	856.5	291.8	1 148.3	171.2	1 319.5
1958	429.1	355.9	785.0	201.6	986.6
1959	510.2	372.9	883.1	228.0	1 111.1
1960	401.0	420.1	821.1	280.7	1 101.8
1961	146.3	351.6	497.9	332.2	830.1
1962	133.5	417.7	551.2	297.4	848.6
1963	132.8	538.0	670.8	313.7	984.5
1964	420.2	697.7	1 117.9	163.9	1 281.8
1965	391.2	934.6	1 325.8	221.9	1 547.7
1966	631.8	1 091.7	1 723.5	231.5	1 955.0
1967	458.8	672.7	1 131.5	545.7	1 677.2
1968	44.8	228.3	273.1	439.1	712.2
1969	20.5	3.6	24.1	43.7	67.8
1970	20.9	-	20.9	41.4	62.3
1971	6.9	-	6.9	14.2	21.1
1972	-	-	-	13.2	13.2
1973	-	-	-	6.8	6.8
1974	-	-	-	6.3	6.3
1975	-	-	-	3.1[1)]	3.1[1)]
1976	-	-	-		

[1)] The catch in 1975 consisted of adult and juvenile herring caught in Norwegian inshore waters during autumn.

Table 36. Annual catches (in tons) of Capelin from the Barents Sea 1964-77.

Year	Norway			U.S.S.R.	Other countries (Poland, Iceland, Faroe Islands)	Distribution in percentage		
	Winter	Summer	Total			Norway	USSR	Others
1964	19 626		19 626	50		99.7	0.3	
1965	217 324		217 324	7 200		96.8	3.2	
1966	379 626		379 626	9 400		97.6	2.4	
1967	402 819		402 819	5 700		98.6	1.4	
1968	482 783	39 388	522 171	15 400		97.1	2.9	
1969	435 816	243 119	678 935	500		99.9	0.1	
1970	968 668	332 190	1 300 858	13 057		99.0	1.0	
1971	1 302 717	68 990	1 371 707	20 832		98.5	1.5	
1972	1 207 596	347 011	1 554 607	37 004		97.7	2.3	
1973	1 085 980	204 846	1 290 826	45 007		96.6	3.4	
1974	745 567	239 951	985 518	162 495		85.8	14.2	
1975	556 107	358 602	914 709	431 314	42 886	66.0	31.0	3.0
1976	1 218 091	711 476 x)	1 929 567 x)					
1977	1 372 000	(approx.) x)						

Source: Norway Feitsildfiskernes Salgslag

USSR Bulletin Statistique des Pêches Maritimes

x) Preliminary statistics.

Table 37. Calculated number of fish (N) and total weight (W) of fish at each age of the Barents Sea Capelin stock in the autumn 1974-76. The numbers of 1 year old fish are unreliable as this age is not completely covered by surveys. (N x 10^{-11}; W x 10^{-5}).

Year	Age in years (no. of rings in otoliths)								Total		Spawning stock
	1		2		3		4 and older				
	N	W	N	W	N	W	N	W	N	W	W
1974	3.0	10.5	5.5	28.9	1.6	13.3	0.03	0.5	10.1	53.2	8
1975	2.7	8.6	3.4	22.0	2.4	24.6	0.6	9.5	9.1	64.7	18
1976	1.7	4.8	2.4	19.2	1.4	16.8	0.7	11.1	6.2	51.9	18

Table 38. Nominal catch (metric tons) of Cod in Division Vb, 1967-77.

Country	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977*
Belgium	-	-	-	-	-	-	-	-	-	9	-
Faroe Islands	7 835	13 763	15 718	15 245	12 754	12 143	13 276	13 237	22 986	28 959	29 042
France	871	2 519	2 557	2 616	820	224	1 472	567	1 612	1 607	1 271
German Dem.Rep.	63	-	-	-	-	-	-	-	-	-	-
Germany,Fed.Rep.	845	1 562[a]	403[a]	443[a]	580	451	310	292	458	247	285
Netherlands	-	-	-	-	2	-	-	-	60	36	2
Norway	650	686	483	238	881	266	115	446	1 353	1 283	967
Poland	-	-	-	-	-	-	419	320	432	496	-
Spain	-	-	-	-	-	51	55	60	85	33	-
U.K. (Engl.&Wales)	7 996	7 096	6 717	3 707	3 485	3 019	5 079	3 708	3 287	3 056	965
U.K. (Scotland)	8 546	8 524	12 249	9 790	9 102	6 483	6 756	8 019	8 619	6 403	3 500
Total	26 806	34 150	38 127	32 039	27 624	22 637	27 482	26 649	38 892	42 129	36 032

* Preliminary

a) Includes miscellaneous products

Table 39. Nominal catch (metric tons) of Haddock in Division Vb, 1967-77.

Country	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977*
Belgium	-	-	-	-	-	-	-	-	-	6	-
Denmark	8	-	-	-	-	-	-	-	-	-	-
Faroe Islands	5 246	6 751	11 122	11 791	10 488	8 314	6 018	4 811	8 757	12 714	19 938
France	1 091	2 286	3 314	2 006	815	1 496	3 535	1 461	2 298	2 542	921
German Dem.Rep.	3	-	-	-	-	-	-	-	-	-	-
Germany,Fed.Rep.	24	36	73	14	19	25	46	70	173	22	41
Netherlands	-	-	-	-	29	-	-	-	383	175	32
Norway	-	-	-	-	-	-	-	5	56	20	53
Poland	-	-	-	-	-	-	1 190	685	544	448	...
Spain	-	-	-	-	-	-	32	52	-	-	-
U.K.(Engl.&Wales)	2 347	2 445	1 976	1 137	2 323	1 371	2 426	1 617	2 426	2 284	911
U.K.(Scotland)	4 656	6 339	6 815	6 421	5 762	4 109	4 788	6 072	6 078	8 000	3 500
Total	13 372	17 857	23 300	21 369	19 436	15 315	18 035	14 773	20 715	26 211	25 396

* Preliminary

Table 40. Nominal catch (metric tons) of Lemon Sole in Division Vb, 1960-76.

Year	Faroe Islands	France	UK England	UK Scotland	Others	Total
1960	-	-	351	1 026	-	1 377
1961	-	-	156	1 009	-	1 165
1962	-	-	187	910	-	1 097
1963	-	-	142	706	-	848
1964	-	27	112	305	-	444
1965	-	42	110	393	-	545
1966	-	49	99	297	-	445
1967	-	14	104	321	-	439
1968	-	20	84	404	-	508
1969	-	-	77	362	2	441
1970	-	-	68	424	-	492
1971	590	-	76	303	-	969
1972	300	-	35	244	-	579
1973	1 190	-	126	393	-	1 709
1974	607	-	137	503	-	1 247
1975	971	-	103	369	1	1 444
1976	813	-	120	312	-	1 245

Table 41. Nominal catch (metric tons) of Redfish by countries in Division Va, 1965-76.

Countries	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Belgium	**3841**	**3800**	**3788**	**4117**	**3360**	**2204**	**2798**	**2484**	**1622**	**2114**	**1945**	1 522
Fareo Isl.	16		3	2	8		35	9	243	254	82	211
German Dem.Rep.	274	441	341	419	656	827	238	135		11		
Germany,F.R.	73982	73974	66638	62521	55831	48907	46580	43963	38358	36398	33602	32 948
Iceland	23663	16607	17857	24716	24321	23807	29118	26973	26470	27799	32659	34 028
Netherlands	1528	36			2							
Norway		50		20			1	1	4	15	22	31
Poland						259	17	35		18		
Scotland	619	249	279	144	128	138	116	89	28	37	56	26
UK	9764	5913	5742	3727	2174	2810	3436	3608	2923	2482	2368	1 104
USSR	413	5998	435	809	1256	10	31	28	2			
Total	114100	107068	95083	96475	87736	78962	82370	77325	69650	69129	70734	69 864

Table 42. Nominal catches (metric tons) of Redfish by countries in Division Vb, 1965-76.

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Faroe Isl.	1			1	5				121	28	9	33
France	582									300	800	
German Dem.Rep.	55	6	18	45						1	1	
Germany,F.R.	5159	3243	4949	6538	1293	1914	2328	4034	9490	7328	7628	5 255
Netherlands											105	
Norway										10	7	17
U.K.	65	48	46	53	28	33	24	53	85	98	41	59
Total	5862	3297	5013	6637	1326	1947	2352	4087	9696	7765	8591	5 364

Table 43. Nominal catch (metric tons) of Redfish by countries in Sub-area XIV; total nominal catch in ICNAF Sub-area I (West Greenland)

Country	Year 1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Canada												420
Denmark												129
Faroe Isl.									13	43	1	3
German Dem.Rep.	110	99	28		154	409	611	703	841	1275	4490	
Germany,Fed.Rep.	33253	19845	23225	17552	26289	16316	17062	7287	4491	2632	4979	4 403
Iceland	3082	3342	9935	5527	3906	1001	2380	5490	2144	9777	5632	7 410
Norway											63	5
Poland						436	312	464	281	6	276	
U.K.	68	4	10			+	+	5	65	127	56	286
USSR					18		71	21	64	118	9830	101 000
Total XIV	36513	23290	33198	23079	30367	18162	20436	13970	7899	13978	25329	113 656
Total ICNAF Sub-area I (West Greenland)	19052	16758	13210	9606	4252	4101	2756	2988	3319	3324	8629	13 698

Table 44. Nominal catch (metric tons) of Greenland Halibut in Sub-areas V and XIV, 1967-76.

Country	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Faroe Islands	-	-	-	4 122	1 316	1 180	188	48	8	375
German Dem.Rep.	5 282[1]	6 315[1]	8 665[1]	17 939[1]	6 808[1]	7 487[1]	9 126	25 801	16 963	-
Germany, Fed.Rep.of	4 314	2 019	1 686	-	1 163	1 529	1 120	1 949	1 388	2 219
Greenland	-	2	+	-	2	3	4	2	1	1
Iceland	1	1	5 880	7 345	5 020	4 640	2 118	2 843	1 212	1 689
Norway	-	-	-	338	369	186	-	-	7	7
Poland	-	-	-	1 859	8 809	7 878	3 131	1 542	1 072	-
UK (Eng. & Wales)	-	-	-	-	-	2 236	3 710	2 323	1 209	1 680
USSR	21 702[1]	13 535[1]	8 006[1]	2 220	5 486	1 333	1 066	1 772	1 634	74
Total	31 298	21 872	24 237	33 823	28 973	26 473	20 463	36 280	23 494	6 045

1) From national statistics.

Table 45. Annual catch (thousands of tons) of Icelandic Capelin by areas (fisheries), 1964-77.

Year	Coastal off S and SW Iceland February-April	Offshore off E, NE and N Iceland January & February	Offshore off NE and NW Iceland July-December	Total catch
1964	8.6			8.6
1965	49.7			49.7
1966	124.5			124.5
1967	97.2			97.2
1968	78.1			78.1
1969	170.6			170.6
1970	188.8	2.0		190.8
1971	182.9			182.9
1972	276.5			276.5
1973	345.3	95.6		440.9
1974	433.8	28.1		461.9
1975	335.6	122.0	3.1	460.7
1976	252.1	86.6	111.4	450.1
1977	300.0	245.0		545.0

Table 46. Herring. Total catch of Icelandic spring spawners.

Year	North coast	South coast	Total
1950	5.5	22.2	24.7
1951	8.2	12.0	20.2
1952	1.1	11.2	12.3
1953	7.3	13.1	20.4
1954	10.4	10.7	21.1
1955	11.4	10.0	21.4
1956	27.4	20.4	47.8
1957	69.0	13.5	82.5
1958	72.9	10.8	83.7
1959	135.2	14.7	149.9
1960	98.8	19.0	117.8
1961	169.5	42.0	211.5
1962	220.3	59.9	274.2
1963	71.4	32.9	104.3
1964	65.2	36.3	101.5
1965	25.2	43.7	68.9
1966	13.7	11.3	25.0
1967	2.4	12.9	15.3
1968	0.1	4.2	4.3
1969	-	3.6	3.6
1970	-	0.4	0.4
1971		0.2	0.2

Table 47. Herring. Total catch of Icelandic summer spawners.

Year	North coast	South coast	Total
1950	1.5	12.1	13.6
1951	1.8	14.0	15.8
1952	0.9	9.6	10.5
1953	3.8	13.8	17.6
1954	1.0	10.0	11.0
1955	0.6	13.7	14.3
1956	3.4	10.2	13.6
1957	13.4	9.4	22.8
1958	9.8	23.7	33.5
1959	21.3	13.7	35.0
1960	17.9	10.6	28.5
1961	3.9	70.1	74.0
1962	2.4	90.5	92.9
1963	8.2	122.1	130.3
1964	3.9	82.6	86.5
1965	2.9	120.0	122.9
1966	2.6	51.8	54.4
1967	0.4	67.3	67.7
1968		16.8	16.8
1969		19.4	19.4
1970		15.9	15.9
1971		11.5	11.5
1972		0.3	0.3
1973		0.2	0.2
1974		1.2	1.2
1975		12.8	12.8
1976		17.8	17.8

Table 48. Nominal catch (in thousand tons) of Cod. ICES Sub-area XIV, 1962-76.

(Data for 1962-75 from Bulletin Statistique)

COD	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Faroe Islands											0.9	0.2	0.7	0.6	0.4
German Dem.Rep.												+	+	0.3	
Germany, F.R.	14.3	13.9	30.6	11.0	7.8	12.1	8.3	12.6	13.9	25.6	21.6	9.3	2.3	1.6	7.1
Greenland	0.9	0.9	1.1	0.9	0.9	0.7	0.6	0.6	0.5	0.5	0.3	0.2	+	0.2	.4
Iceland	0.3	1.8	2.9	4.7	4.0	10.5	6.7	4.5	5.5	4.6	3.2	1.4	3.0	0.8	3.1
Norway														1.9	.4
Poland									0.8	0.4	0.3	+	+	+	
U.K.	1.8	0.8	1.0	0.9	0.2	1.4	+		0.1	+	0.2	0.7	0.5	0.6	1.5
U.S.S.R.		5.7				+		+	+	0.3	0.1				0.1
Total	17.3	23.1	35.6	17.5	12.9	24.7	15.7	17.8	20.9	31.5	26.6	11.8	6.6	6.0	13.0

Table 49. Nominal catch (metric tons) of Saithe in Sub-area VII, 1966-76.
(Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976*
Belgium	102	91	35	51	35	30	43	21	53	34	29
Denmark	-	-	-	-	-	-	-	-	-	1	
France	7 789	9 615	7 209	10 123	10 640	9 200	10 917	4 968	4 249	3 648	2 406
German Dem. Rep.	-	8	-	-	78	-	-	5	-	-	
Germany, Fed. Rep.	-	-	4	1	4	2	-	+	-	4	-
Netherlands	306	252	298	198	502	98	117	74	75	106	
Poland	-	-	-	-	-	3	4	101	1	78	43
Spain	-	-	-	-	-	-	-	-	490	603	
U.K. (England & Wales)	288	334	287	397	476	420	359	308	299	204	
U.K. (N. Ireland)	168	179	204	438	604	383	356	608	432	319	292
U.K. (Scotland)	1	4	3	13	16	14	9	7	8	61	7
U.S.S.R.	-	-	-	58	-	67	55	54	49	68	63
Total	8 654	10 483	8 040	11 279	12 355	10 217	11 860	6 146	5 656	5 126	

* Preliminary.

Table 50. Landings (in thousand metric tons) of Blue Whiting by ICES fishing areas, 1966-77.

		1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977*
I	Barents Sea	-	-	-	-	+	-	-	-	-	+	0.2	-
IIa	Norwegian Sea	-	-	-	10.1	14.8	31.0	+	0.9	+	7.2	0.8	0.4
IIb	Bear Island	-	-	-	-	-	0.4	-	+	+	2.5	1.6	7.5
IIIa	Skagerrak	-	-	-	-	-	-	-	-	-	-	-	5.8
IVa	N. North Sea	?	?	?	?	?	0.6+	0.2+	5.9+	3.1+	38.9	41.0	21.6
IVb	Central North Sea	-	-	-	-	-	-	0.1	+	0.1	+	+	-
Va	Iceland	-	-	0.1	+	1.0	4.9	0.6	2.9	5.2	1.5	10.3	10.5
Vb	Faroe	-	-	-	-	-	-	+	2.8	0.4	2.5	35.0	92.6
VIa	West of Scotland	-	-	-	-	-	6.4	11.3	11.7	14.0	26.8	42.2	13.8
VIb	Rockall	-	-	-	-	-	+	0.3	+	+	+	0.2	-
VIIb,c	West of Ireland	-	-	-	4.2	0.4	12.0	3.9	0.8	0.7	1.2	3.8	0.8
VIId,e	Channel	-	1.9	-	-	-	-	+	0.1	-	+	0.8	-
VIIg-k	SW approaches	-	-	-	-	6.4	9.5	13.7	8.6	8.1	10.5	12.4	0.2
VIII	Biscay	19.7	19.6	19.7	16.4	9.8	?	4.1	3.8	3.8	4.0	4.4	-
IX	Portuguese waters	0.9	1.6	1.1	0.6	0.5	?	+	+	+	0.3	0.2	-
X	Azores	-	-	-	-	-	-	-	0.2	-	-	-	-
XIVb	Southeast Greenland	-	-	-	-	-	-	-	-	-	-	-	0.9
Total		20.6	23.0	20.9	31.3	32.9	64.8	34.4	38.0	35.6	95.6	152.9	154.1

*) Preliminary.

Table 51. Landings ('000 tons) of Blue Whiting by national zones in 1975, 1976 and 1977.

	1975	1976*	1977*
Economic zone			
EEC	38.5	59.4	21.0
Faroe	2.5	35.0	92.6
Iceland	1.5	10.3	11.4
Norway	48.6	41.8	21.5
Spain	4.3	4.6	
Spitzbergen/ Bear Island		1.8	7.5

* Provisional.

Table 52. Nominal catch (metric tons) of Ling in Sub-areas I+II, 1966-76.
(Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
France	412	1 972	1 401	2 166	-	-	1 422	270	11	-	
German Dem.Rep.	-	-	-	-	-	-	-	8	11	10	
Germany, Fed.Rep.	53	47	30	17	32	32	72	96	131	171	
Netherlands	-	1	-	-	-	-	-	-	-	-	
Norway	4 908	4 381	7 184	4 914	6 769	6 644	9 250	9 503	10 914	5 673	
Sweden	-	-	-	-	-	-	-	-	-	223[a]	
UK (Eng. & Wales)	127	115	67	53	67	88	92	108	100	95	
UK (Scotland)	-	-	-	-	1	1	2	3	4	5	
Total	5 500	6 516	8 682	7 150	6 869	6 765	10 838	9 988	11 171	6 177	

Table 53. Nominal catch (metric tons) of Ling in Sub-area IV and Div.IIIa,1966-76.
(Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Belgium	22	24	32	16	15	4	71	23	44	72	
Denmark	462	353	387	437	318	460	507	584	590	694	
Faroe Islands	-	-	-	+	5	15	37	61	57	7	
France	1 430	1 072	1 910	693	1 876	3 013	3 699	4	531	380	
German, Dem.Rep.	-	-	-	-	-	-	-	44	6	14	
Germany, Fed.Rep.	202	319	212	156	96	135	177	353	342	313	
Iceland	-	-	-	-	-	-	-	+	-	-	
Netherlands	218	220	208	136	138	213	192	189	164	124	
Poland	-	-	-	-	-	-	-	19	31	-	
Norway	6 850	4 384	2 791	5 528	2 947	5 621	6 208	6 820	4 384	6 574	
Spain	-	-	-	-	-	-	109	-	-	-	
Sweden	198	231	175	153	135	117	100	95	110	571	
UK (Eng. & Wales)	461	301	338	250	220	283	366	251	387	331	
UK (Scotland)	337	496	784	614	374	781	1 165	741	810	555	
USSR	-	627	-	-	-	2	-				
Total	10 180	8 026	6 629	7 983	6 124	10 644	12 631	9 184	7 456	9 635	

a) IIa includes smaller quantities taken in other areas than IIa (IV and IIIa,b,c,d)

Table 54. Nominal catch (metric tons) of Ling in Division Va, 1966-76.
(Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Belgium	1 519	1 284	1 364	1 370	1 977	1 989	1 159	1 080	681	736	
Faroe Islands	132	60	38	16	134	672	561	984	890	732	
France	-	24	-	-	20	375	-	-	-	23	
Germany, Fed.Rep.	1 259	1 337	1 612	1 533	1 499	1 196	610	586	486	375	
Iceland	4 559	7 531	8 697	8 677	8 345	8 867	6 085	3 564	3 868	3 748	
Netherlands	+	-	-	1	-	-	-	-	-	-	
Norway	1 030	1 170	1 929	1 904	1 247	883	619	418	318	522	
UK (Eng. & Wales)	1 179	1 579	784	571	1 019	1 362	1 110	819	511	541	
UK (Scotland)	191	167	93	67	121	47	33	10	21	21	
USSR	163	-	9	-	-	-	-	-	-	-	
Total	10 032	13 152	14 526	14 139	14 362	15 391	10 177	7 461	6 775	6 698	

Table 55. Nominal catch (metric tons) of Ling in Division Vb, 1966-76.
(Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976*)
Faroe Islands	416	736	1 209	486	699	752	1 572	1 428	1 004	1 281	1 682
France	1 827	23	177	195	578	728	866	398	296	345	
German Dem.Rep.	-	-	-	-	-	-	-	-	9	1	
Germany, Fed.Rep.	39	59	82	49	29	54	74	170	131	94	28
Netherlands	-	-	-	-	-	1	-	-	-	13	
Norway	2 115	3 203	3 340	1 952	1 737	2 898	3 958	3 638	2 395	2 297	3 500
Poland	-	-	-	-	-	-	-	11	4	2	
Spain	-	-	-	-	-	-	71	-	-	-	
UK (Eng. & Wales)	276	172	152	225	164	152	146	268	305	231	
UK (Scotland)	496	664	679	602	883	879	772	850	575	499	
Total	5 169	4 857	5 639	3 509	4 090	5 464	7 459	6 763	4 719	4 763	5 210

*) Preliminary

Table 56. Nominal catch (metric tons) of Ling in Division VIa, 1966-76.
(Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Belgium	4	3	5	2	2	8	12	73	11	2	
Faroe Islands	-	-	-	-	-	-	-	47	-	19	
France*	351	827	3 079	2 572	1 974	319	3 041	21 502	18 870	8 859	
Germany, Fed.Rep.	-	3	5	9	1	2	5	-	2	2	
Netherlands	-	-	+	-	-	-	4	-	1	1	
Norway	5 968	8 925	9 602	3 745	4 674	3 866	5 089	4 530	6 113	3 345	
Poland	-	-	-	-	-	-	-	17	-	-	
Spain	-	-	-	-	-	-	2 211	2 058	2 918	3 124	
Sweden	668	1 783	2 371	1 760	1 241	1 088	1 160	893	739	-	
UK (Eng. & Wales)	797	654	574	323	228	99	130	64	58	62	
UK (Scotland)	186	254	273	248	205	121	146	186	199	202	
Total	7 974	12 449	15 909	8 659	8 325	5 503	11 798	29 370	28 911	15 616	

*) Mainly Blue Ling.

Table 57. Nominal catch (metric tons) of Ling in Division VIb, 1966-76.
(Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Faroe Islands	-	-	-	-	-	-	-	15	1 453	356	
France	539	470	366	252	-	590	657	708	822	98	
Norway	-	-	3	-	-	-	-	-	140	790	
UK (Eng. & Wales)	-	-	-	22	34	24	14	10	-	-	
UK (Scotland)	497	138	92	138	499	663	1 117	727	291	370	
USSR	-	-	-	-	-	-	2	-	-	-	
Total	1 036	608	461	412	533	1 277	1 790	1 460	2 706	1 614	

Table 58. Nominal catch (metric tons) of Ling in Sub-area VII, 1966-76.
(Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Belgium	50	82	20	16	15	14	65	17	83	76	
Faroe Islands	-	-	-	-	-	-	-	1	-	-	
France	2 983	3 688	2 669	2 661	3 983	4 150	4 422	4 282	1 868	3 231	
Germany, Fed.Rep.	-	-	-	+	+	1	-	+	-	-	
Netherlands	7	6	3	2	1	2	2	-	-	-	
Norway	-	-	-	-	-	-	-	-	48	629	
Spain	-	-	-	-	-	-	893	1 036	1 792	2 565	
UK (Eng. & Wales)	164	166	215	212	267	321	228	274	407	665	
UK (N. Ireland)	-	-	2	1	3	3	15	18	4	10	
UK (Scotland)	-	+	-	+	+	1	+	+	2	1	
Total	3 204	3 942	2 909	2 892	4 269	4 492	5 625	5 628	4 204	7 177	

Table 59. Nominal catch (metric tons) of Ling in Sub-area VIII,
1966-76 (Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
France	461	500	409	326	215	192	220	313	441	311	
Spain	5 460	3 583	4 230	2 734	2 929	-	-	-	-	-	
Total	5 921	4 083	4 639	3 060	3 144	192	220	313	441	311	

Table 60. Nominal catch (metric tons) of Ling in Sub-area XIV, 1966-76. (Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Faroe Islands	-	-	-	-	-	-	-	1	66	-	
German Dem.Rep.	-	-	-	-	-	-	-	-	2	1	
Germany, Fed.Rep.	16	39	99	71	34	17	16	15	+	5	
Iceland	+	2	-	11	-	2	-	-	4	2	
Norway	-	-	-	-	-	-	-	-	-	1	
Poland	-	-	-	-	-	-	1	10	-	-	
UK (Eng. & Wales)	-	1	-	-	-	+	1	6	5	3	
USSR	-	-	-	-	27	-	-	-	-	-	
Total	16	42	99	82	61	19	18	32	77	12	

Table 61. Nominal catch (metric tons) of Blue Ling in Sub-areas I+II, 1966-76. (Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Germany, Fed.Rep.	34	24	13	15	9	2	29	10	29	22	
Norway	1 790	1 411	1 456	741	736	600	741	1 100	1 737	2 032	
Sweden	-	-	-	-	-	-	-	-	-	+[a]	
UK (Eng. & Wales)	-	-	-	-	-	-	+	+	+	+	
Total	1 824	1 435	1 469	756	745	602	770	1 110	1 766	2 054	

a) IIa includes smaller quantities taken in other areas than IIa (IV and IIIa,b,c,d)

Table 62. Nominal catch (metric tons) of Blue Ling in Sub-area IV and Div. IIIa, 1966-76. (Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Germany, Fed.Rep.	-	6	+	3	+	-	+	84	12	6	
Norway	286	217	293	322	128	192	225	410	219	370	
Sweden	-	-	-	-	-	-	3	5	9	12	
UK (Eng. & Wales)	-	-	-	-	-	-	1	+	+	2	
Total	286	223	293	325	128	192	229	499	231	390	

Table 63. Nominal catch (metric tons) of Blue Ling in Division Va, 1966-76.
(Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Faroe Islands	-	-	-	-	-	10	-	74	34	69	
Germany, Fed.Rep.	3 411	2 651	2 531	2 043	2 061	3 041	2 271	1 678	1 959	1 418	
Iceland	134	191	199	339	394	705	586	548	331	434	
Norway	-	-	-	56	102	22	2	6	140	366	
UK (Eng. & Wales)	-	-	-	-	-	-	57	61	32	89	
Total	3 545	2 842	2 730	2 438	2 557	3 778	2 916	2 367	2 496	2 376	

Table 64. Nominal catch (metric tons) of Blue Ling in Division Vb, 1966-76.
(Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976 *)
Faroe Islands	-	-	-	-	-	-	-	51	43	18	20
France	839	-	-	-	-	-	-	-	390	2 281	6 220
Germany, Fed.Rep.	...	1 006	1 838	303	348	1 367	2 730	3 009	1 808	1 528	442
Norway	430	238	823	798	2 718	557	1 203	4 003	1 554	2 492	1 330
UK (Eng. & Wales)	-	-	-	-	-	-	+	4	3	1	
Total	1 269	1 244	2 661	1 101	3 066	1 924	3 933	7 067	3 798	6 320	8 012

*) Preliminary.

Table 65. Nominal catch (metric tons) of Blue Ling in Sub-area VI, 1966-76.
(Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Faroe Islands	-	-	-	-	-	-	-	-	33	1	
Germany, Fed.Rep.	-	37	-	6	-	-	-	-	1 218	2 941	
Norway	20	35	126	112	176	15	14	25	371	57	
UK (Eng. & Wales)	-	-	-	-	-	-	+	+	164	8	
Total	20	72	126	118	176	15	14	25	1 786	3 007	

Table 66. Nominal catch (metric tons) of Blue Ling in Sub-area XIV, 1966-76. (Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Germany, Fed.Rep.	176	106	76	35	33	15	65	50	90	285	
Iceland	-	+	-	-	-	-	-	10	6	90	
Norway	-	-	-	-	-	-	-	-	-	3	
Poland	-	-	-	-	-	44	-	-	-	-	
UK (Eng. & Wales)	-	-	-	-	-	-	+	+	+	+	
Total	176	106	76	35	33	59	65	60	96	378	

Table 67. Nominal catch (metric tons) of Tusk (Cusk) in Sub-areas I+II, 1966-76. (Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
German Dem.Rep.	-	-	-	-	-	-	-	-	-	5	
Germany, Fed.Rep.	117	109	48	29	45	25	55	42	61	92	
Netherlands	+	-	-	1	-	-	-	-	-	-	
Norway	16 656	17 430	16 746	9 629	12 045	10 506	12 639	18 811	23 679	13 693	
Sweden	-	-	-	-	-	-	-	-	-	+[a]	
UK (Eng. & Wales)	148	155	110	89	150	137	176	151	145	182	
UK (Scotland)	-	-	-	-	1	2	4	6	8	15	
Total	16 921	17 694	16 904	9 748	12 241	10 670	12 874	19 010	23 893	13 987	

a) IIa includes smaller quantities taken in other areas than IIa (IV and IIIa,b,c,d).

Table 68. Nominal catch (metric tons) of Tusk (Cusk) in Sub-area IV and Div.IIIa,1966-76. (Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Belgium	+	-	+	+	-	1	-	-	-		
Denmark	7	-	3	+	+	+	+	+	1	3	
Faroe Islands	-	-	-	4	-	-	1	12	13	5	
Germany, Fed.Rep.	37	69	25	32	7	20	11	38	21	39	
Netherlands	6	225	9	19	7	18	16	20	21	30	
Norway	1 746	1 145	1 413	3 271	1 545	1 552	2 587	3 455	3 258	2 659	
Sweden	-	...	...	-	14	13	13	10	14	20	
UK (Eng. & Wales)	33	31	20	23	18	13	29	22	22	17	
UK (Scotland)	53	48	52	47	28	37	56	43	41	19	
Total	1 882	1 518	1 522	3 396	1 619	1 654	2 713	3 600	3 391	2 792	

Table 69. Nominal catch (metric tons) of Tusk (Cusk) in Division Va, 1966-76.
(Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Belgium	61	73	75	57	71	83	-	-	-	-	
Faroe Islands	286	374	66	29	190	1 644	1 648	3 363	3 172	2 445	
Germany, Fed.Rep.	765	754	690	712	761	691	558	576	375	384	
Iceland	2 107	2 699	4 604	4 075	4 357	3 793	2 815	2 366	1 857	1 673	
Netherlands	+	-	-	+	-	-	-	-	-	-	
Norway	801	770	914	1 201	1 288	1 526	959	911	893	975	
UK (Eng. & Wales)	352	300	228	118	256	341	468	387	224	244	
UK (Scotland)	203	162	55	26	64	34	12	4	6	10	
Total	4 575	5 132	6 632	6 218	6 987	8 112	6 460	7 607	6 527	5 731	

Table 70. Nominal catch (metric tons) of Tusk (Cusk) in Division Vb, 1966-76.
(Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976*)
Faroe Islands	1 488	2 070	2 798	1 454	1 028	1 489	1 918	3 402	1 541	2 166	2 967
Germany, Fed.Rep.	76	116	106	36	19	51	133	137	137	154	23
Netherlands	-	-	-	-	-	-	-	-	-	4	
Norway	1 221	2 729	2 096	1 302	1 475	1 872	2 421	3 066	1 841	1 848	2 300
UK (Eng. & Wales)	21	18	23	16	11	13	16	36	22	36	
UK (Scotland)	482	432	549	412	515	419	386	531	403	344	
Total	3 288	5 365	5 572	3 220	3 048	3 844	4 874	7 172	3 944	4 552	5 290

*) Preliminary.

Table 71. Nominal catch (metric tons) of Tusk (Cusk) in Division VIa, 1966-76.
(Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Belgium	-	-	-	-	-	+	-	-	-	-	
Faroe Islands	-	-	-	-	-	-	-	34	-	-	
Germany, Fed.Rep.	-	-	-	2	7	+	+	+	6	14	
Norway	1 238	1 553	2 073	783	1 319	1 204	647	852	2 860	621	
Sweden	47	-	-	-	-	-	-	-	-	-	
UK (Eng. & Wales)	65	55	37	22	20	12	20	12	3	3	
UK (Scotland)	2	1	40	4	1	1	1	1	1	1	
Total	1 352	1 609	2 150	811	1 347	1 217	668	899	2 870	639	

Table 72. Nominal catch (metric tons) of Tusk (Cusk) in Division VIb, 1966-76. (Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Faroe Islands	-	-	-	-	-	-	-	2	470	192	
Norway	-	-	62	-	-	-	-	-	16	157	
UK (Eng. & Wales)	-	-	-	2	4	6	6	7	-		
UK (Scotland)	124	52	65	136	168	227	448	298	158	231	
Total	124	52	127	138	172	233	454	307	644	580	

Table 73. Nominal catch (metric tons) of Tusk (Cusk) in Sub-area XIV, 1966-76.
(Data for 1966-75 from Bulletin Statistique.)

Country	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Faroe Islands	-	-	-	-	-	-	-	16	259	29	
Germany, Fed.Rep.	31	17	19	69	28	19	15	9	2	17	
Iceland	1	21	269	174	55	71	24	-	15	13	
Norway	-	-	-	-	-	-	-	-	-	138	
UK (Eng. & Wales)	-	1	-	-	-	-	+	2	1	+	
Total	32	39	288	243	83	90	39	27	277	197	

Table 74. Nominal catch (metric tons) of Halibut in ICES Sub-areas and Divisions, 1967-76. (Data from Bulletin Statistique.)

Division or Sub-area	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
I	235	257	84	85	99	87	87	62	38	42
IIa	2 145	1 910	2 103	1 825	1 534	1 356	1 552	1 368	1 185	1 064
IIb	12	2	2	61	5	4	7	23	17	1
IIIa	121	183	52	36	28	25	24	25	44	51
IV	480	589	539	351	372	387	350	463	364	222
Va	2 805	2 091	2 077	3 212	3 112	2 325	2 000	1 762	1 894	2 297
Vb	1 410	1 258	1 057	1 080	913	621	895	728	675	837
VI	274	306	228	233	206	205	161	155	241	131
VII	3	1	0	0	0	+	+	+	+	+
VIII	0	0	0	0	0	0	0	0	0	0
IX	0	0	0	0	0	0	0	0	0	0
XIV	177	234	215	74	77	67	71	76	114	147

Table 75. Landings of Hake in Divisions IVa and VIa (nominal weight x 10^{-3}).

Year	England and Wales (1)	Scotland (1)	France (1)	Spain (1)	Other countries (1)	Total (1)	France (2)	Spain (2)	Total (2)
1961	7.1	3.3	1.5	0	0.8	12.6	5.3	0	16.4
1962	7.1	5.0	0.6	0	0.3	13.1	4.9	0	17.3
1963	6.4	4.3	1.5	0	0.6	12.7	4.0	0	15.3
1964	5.8	2.8	3.2	0	0.5	12.3	4.6	0	13.6
1965	4.6	2.6	3.7	0	0.5	11.4	3.3	0	11.0
1966	2.6	2.6	3.0	0	0.6	8.7	3.2	0	9.0
1967	1.8	2.1	2.9	0	0.5	7.3	3.2	0	7.6
1968	1.9	2.5	2.5	0	0.7	7.7	2.5	0	7.6
1969	1.6	2.2	2.7	0	0.6	7.1	3.5	0	8.0
1970	1.1	1.5	1.6	0	1.3	5.4	4.3	0	8.2
1971	0.5	1.7	0.7	0.9	1.4	5.2	3.3	0.2	7.0
1972	0.5	1.9	0.4	6.1	1.3	10.1	3.7	1.2	8.5
1973	0.2	1.9	2.2	6.5	1.7	12.6	3.2	2.4	9.5
1974(3)	0.2	1.7	2.5	7.1	1.3	12.8	2.8	3.6	9.6
1975(3)	0.2	2.0	3.2	6.4	0.6	12.4	3.3	4.9	10.9

(1) From Bulletin Statistique.

(2) From Hake Working Group members.

(3) Provisional.

Table 76. Landings of Hake in Sub-areas VII and VIII (nominal weight x 10^{-3}).

Year	Spain	France	England & Wales	Other countries	Total
1961	47.5	36.8	1.2	0.4	85.9
1962	37.5	34.8	1.2	0.4	73.9
1963	46.0	29.9	1.1	0.3	77.3
1964	39.8	27.8	0.4	0.3	68.3
1965	32.9	24.6	0.3	0.3	58.1
1966	32.1	24.0	0.4	0.4	56.9
1967	36.9	22.0	0.7	0.5	60.1
1968	37.6	20.8	0.7	0.4	59.2
1969	31.7	18.7	0.4	0.4	51.2
1970	40.2	21.7	0.3	0.5	62.7
1971	51.6	20.6	0.3	0.6	73.1
1972	42.7	19.0	0.3	0.6	62.6
1973	47.0	21.5	0.3	0.8	69.6
1974	45.0	19.4	0.3	0.6	65.3
1975	41.5	19.7	0.3	0.9	62.4

Table 77. Landings of Hake in Division IXa (nominal weight x 10^{-3}).

Year	Portugal (1)		France (1) *	Spain (2) **	Total
	Trawl	Gill net and line			
1961	3.9	2.5	0.7	31.7	33.8
1962	4.3	2.1	0.7	35.8	42.9
1963	5.4	1.5	0.7	39.8	47.3
1964	5.5	3.5	0.7	45.8	55.5
1965	6.8	3.6	0.9	46.6	57.8
1966	4.6	3.8	0.6	45.7	54.7
1967	3.4	4.1	0.6	45.1	53.2
1968	3.2	4.0	0.3	37.5	45.1
1969	2.5	4.2	0.5	38.6	45.8
1970	4.9	4.4	0.2	41.8	51.3
1971	4.1	3.9	0.2	2.1	10.2
1972	3.7	4.9	0.0	17.3	25.9
1973	6.6	6.2	0.2	20.8	33.8
1974	3.2	4.9	0.1	14.1	22.3
1975	3.0	5.5	0.1	19.0	27.6

(1) Data from Hake Working Group.

(2) From Bulletin Statistique.

* French landings entirely from 'chalutiers industriels'.

** Spanish landings from trawlers and gill nets.

Table 78. Nominal catch (metric tons) of Megrim by ICES Sub-areas and Divisions 1967-76.
(Data from Bulletin Statistique.)

Division or Sub-area	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
I	0	0	0	0	0	0	+	0	0	+
IIa	13	0	0	0	0	+	+	0	+	+
IIb	0	0	0	0	0	0	0	0	0	0
IIIa	0	23	0	0	0	0	0	+	+	1
IV	806	1 270	1 200	410	542	896	823	626	577	495
Va	414	495	660	638	584	435	405	310	235	168
Vb	219	259	324	109	48	51	15	30	32	28
VI	1 265	1 552	1 648	1 776	1 603	1 928	1 669	3 160	2 413	3 068
VII	6 358	6 433	6 791	5 969	5 030	9 340	9 749	15 046	17 676	18 633
VIII	9 592	9 751	11 650	11 444	8 966	5 533	6 349	1 550	1 139	1 504
IX	359	367	369	289	251	606	1 587	251	299	284
XIV	0	0	4	0	0	+	2	2	1	1

Table 79. Total catch of Pilchard per statistical area (from Bulletin Statistique).

Year / Area	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
IVa	5	11						7			2	-
IVb			1	6	1			4	12			-
IVc	120	33	55	6	5	50	169	152	128	3 064	1 554	30
VIa		4	29	1	1	1	3	287	15	36	11	64
VIIa	139		35	521	387	27	61			287	149	10
VIIf								281	595	22	307	81
VIIb,c		18	1		3						102	47
VIId,e	3 802	1 197	1 345	965	1 020	1 853	2 111	7 839	5 852	4 636	7 231	8 906
VIIg,k	280	601	228	227	168	83	873	604	286	657	2 311	2 091
VIII	39 543	37 566	38 536	32 205	45 709	34 546	50 493	39 603	50 708	38 002	55 211	55 972
IX	184 798	168 985	160 291	131 354	104 835	101 464	133 045	132 803	119 348	88 916	108 402	89 789
X	189	(8 851[x])	121	119	30	56	115	128	346	189	-	2
TOTAL	228 876	217 266	200 642	165 404	152 159	138 080	186 870	181 708	177 290	135 809	175 280	156 992

x) of which 8 732 tons have been declared by France but actually originate from Sub-area VIII.

Table 80. Catch of Horse Mackerel by Sub-areas and Divisions, 1967-76 (tons).
(Data as officially reported to ICES.)

Year	IIa	IIIa	IVa	IVb	IVc	VIa	VIb	VIIa	VIIb,c	VIId,e	VIIf	VIIg-k	VIII	IX	X
1967	-	-	16	117	10	38	-	7	1	39	-	64	48 439	63 851	4 060
1968	-	4	33	1 367	131	88	-	64	-	570	-	2 209	56 393	78 502	3 434
1969	-	-	18	1 063	137	111	-	136	34	1 399	-	13 290	80 565	51 685	3 504
1970	76	-	10 705	1 079	202	100	1	310	1 478	554	-	70 712	95 169	64 714	2 710
1971	-	-	31 395	414	241	2 532	1	18	765	610	-	46 901	26 390	55 203	3 767
1972	1	-	7 590	22	543	1 680	196	4 012	2 104	33 844	4 000	56 276	80 507	63 811	11 187
1973	86	40	39 839	1 720	426	6 497	-	6	205	62 159	6 129	46 108	116 519	43 712	29 708
1974	-	4	25 411	1 790	3 550	3 351	170	16 555	3 875	32 842	3	62 101	59 985	50 771	19 538
1975	141	11	2 408	4 018	3 505	3 332	47	348	635	35 002	22 674	58 687	85 046	45 734	3 485
1976	-	44	5 150	1 898	1 620	4 158	141	52	5 112	43 787	4 218	123 229	126 150	52 369	2 119

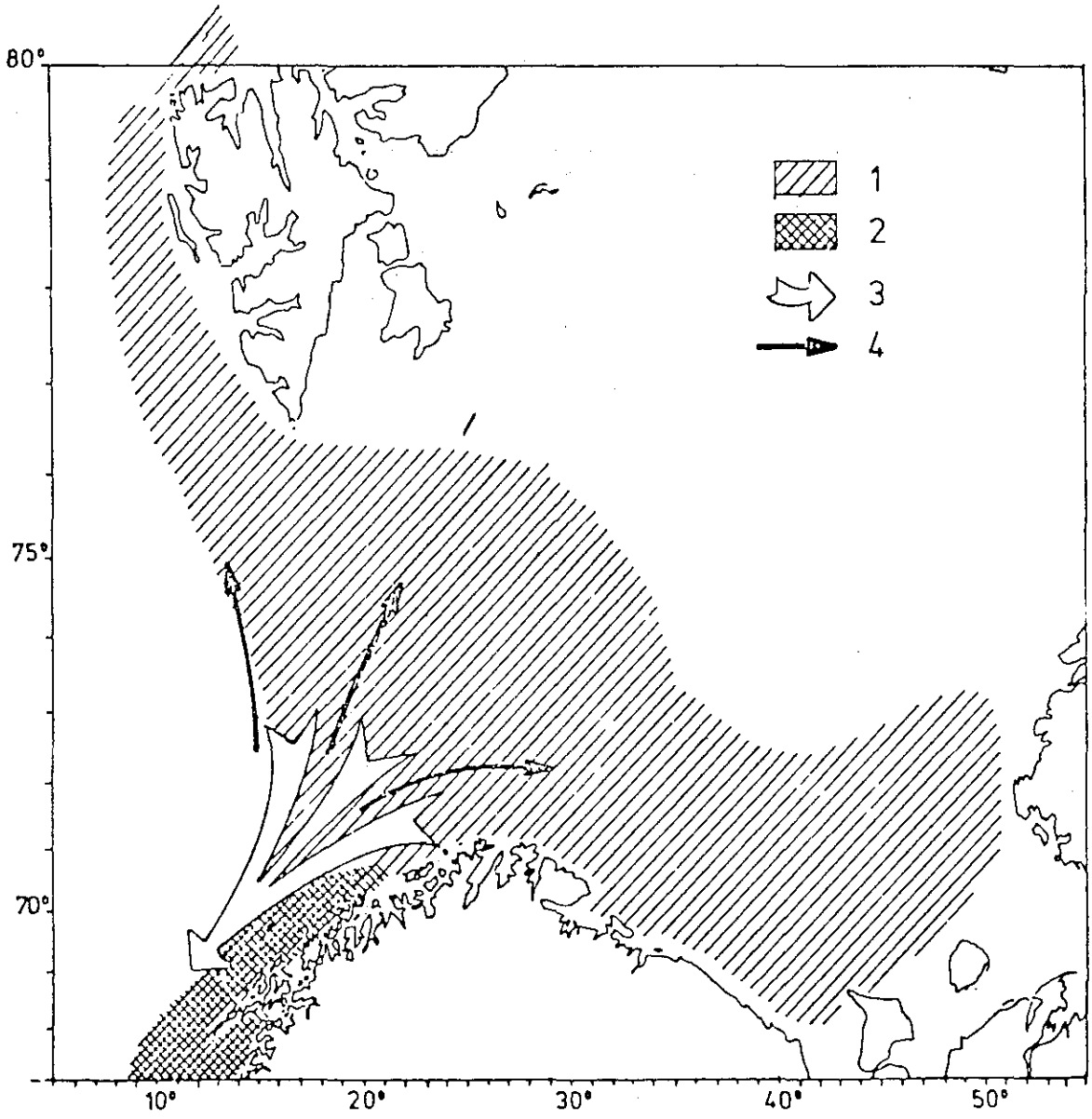


Figure 1. Cod in Sub-areas I and II. The general distribution and migration of mature fish.

1) Feeding area;
2) Spawning area;
3) Spawning migration;
4) Migration of spent fish.

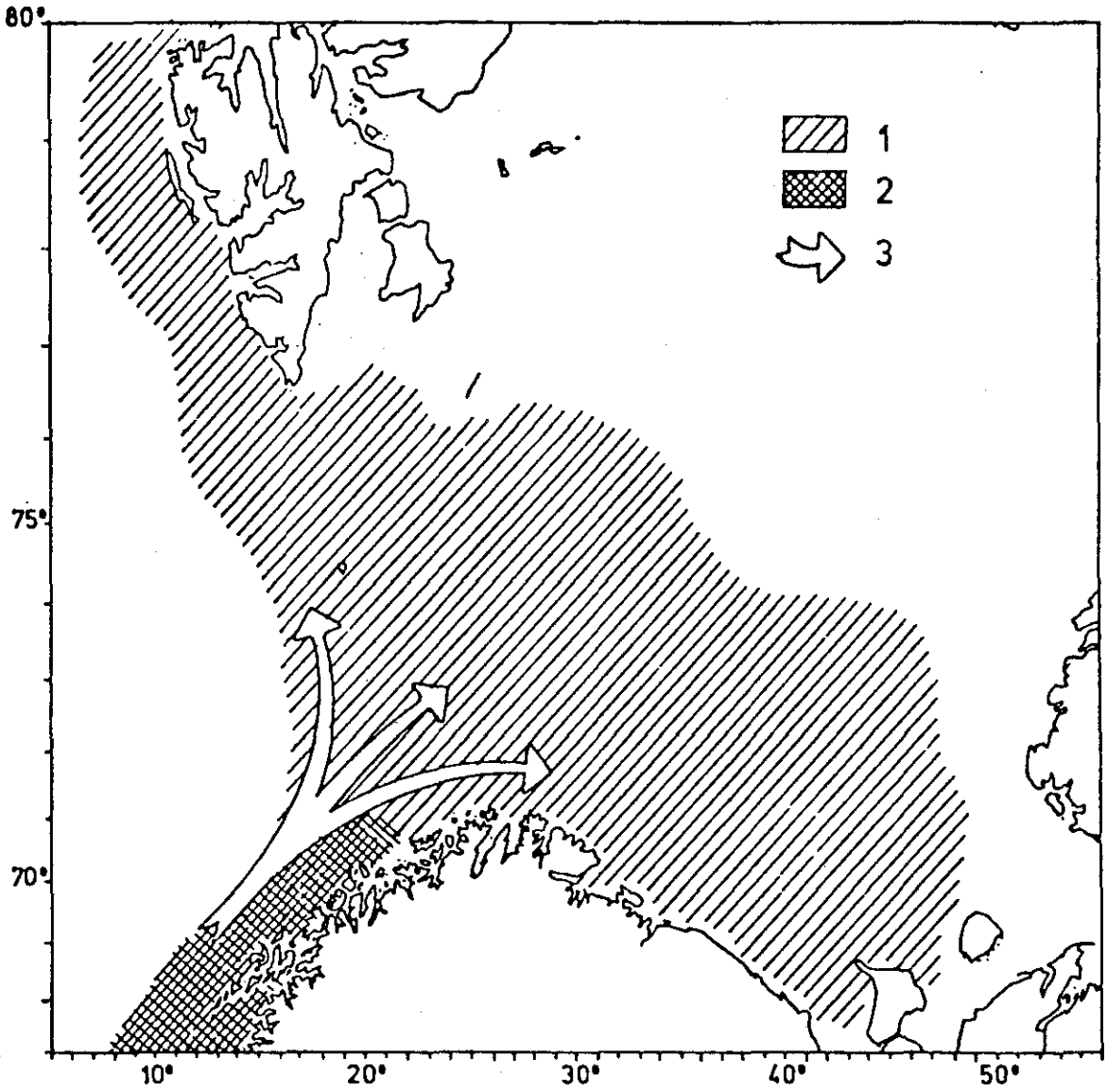


Figure 2. Cod in Sub-areas I and II. The general larval drift.

1) Distribution of 0-group;
2) Distribution of eggs;
3) Larval drift.

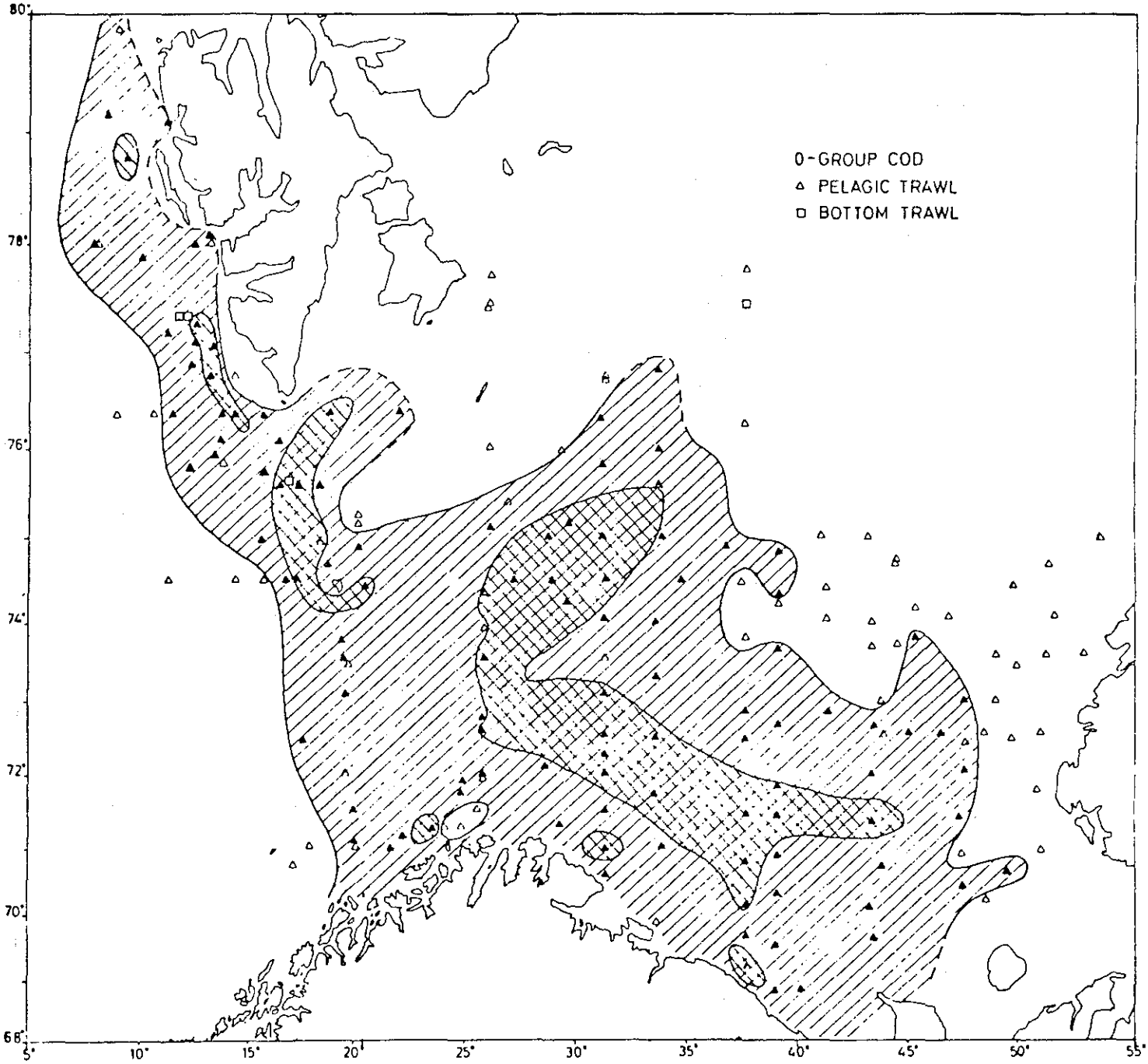


Figure 3. Cod in Sub-areas I and II. Distribution of 0-group cod 1970.

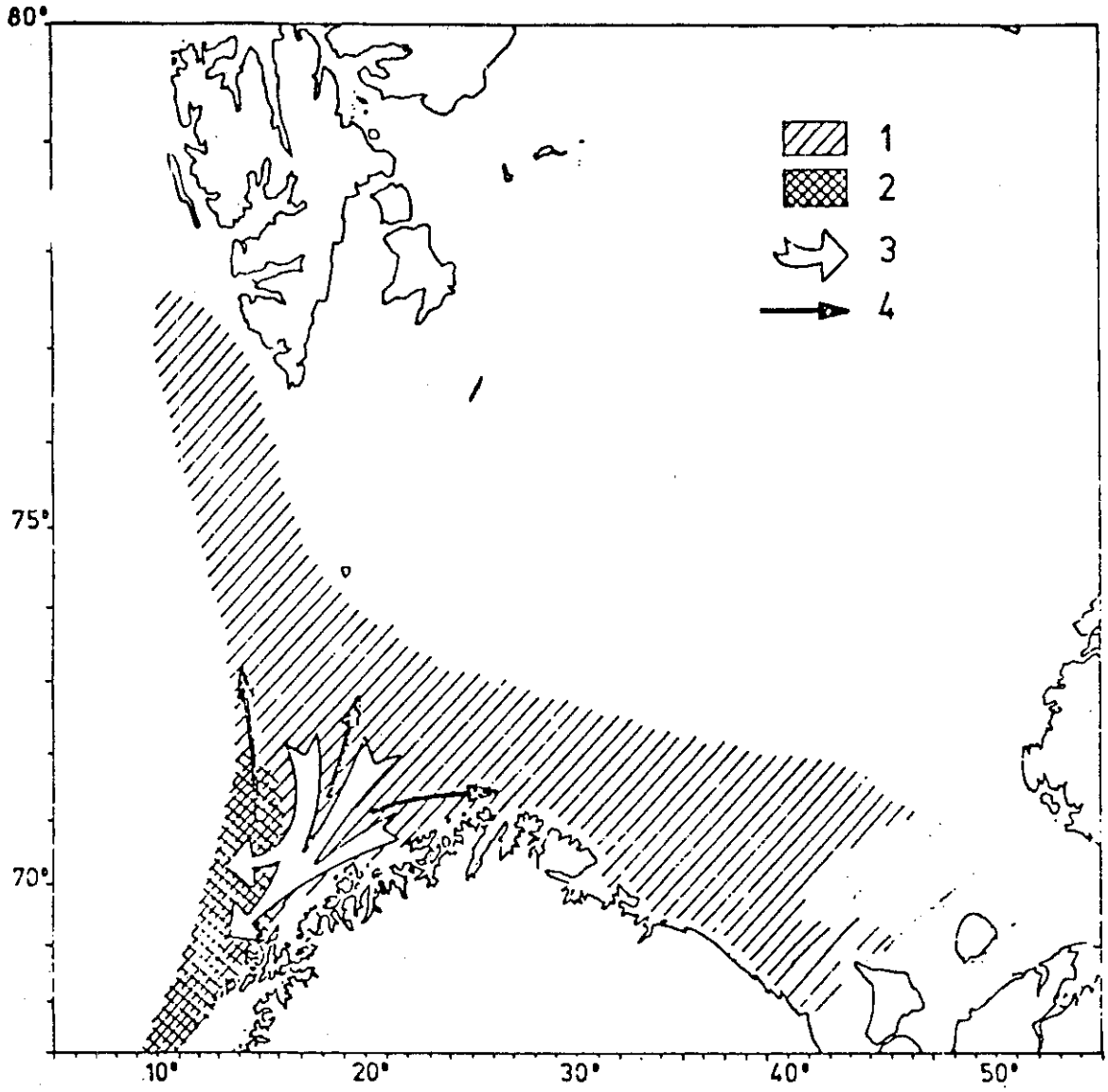


Figure 4. Haddock in Sub-areas I and II. The general distribution and migration of mature fish.

1) Feeding area;
2) Spawning area;
3) Spawning migration;
4) Migration of spent fish.

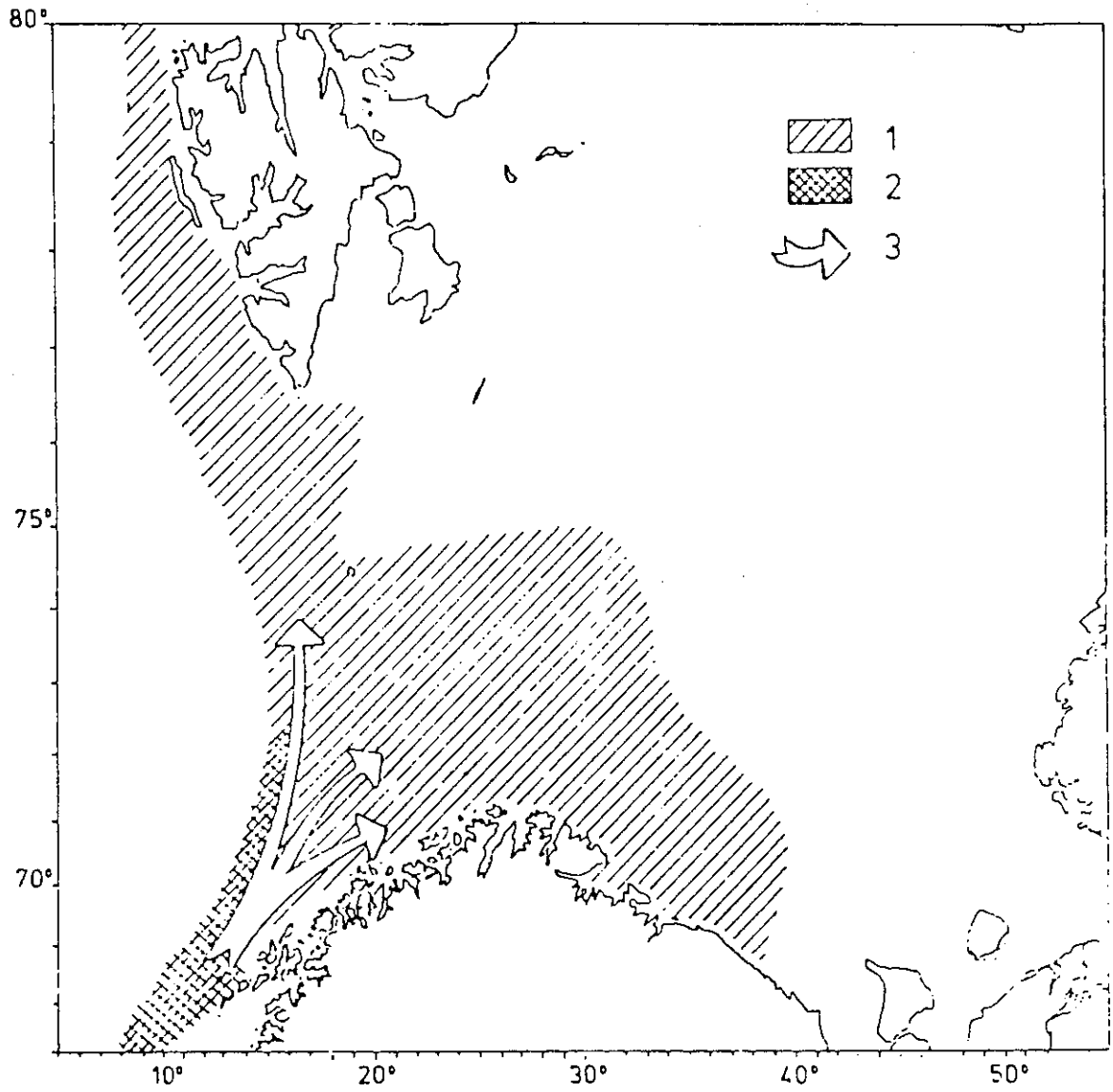


Figure 5. Haddock in Sub-areas I and II. The general larval drift.

1) Distribution of 0-group;
2) Distribution of eggs;
3) Larval drift.

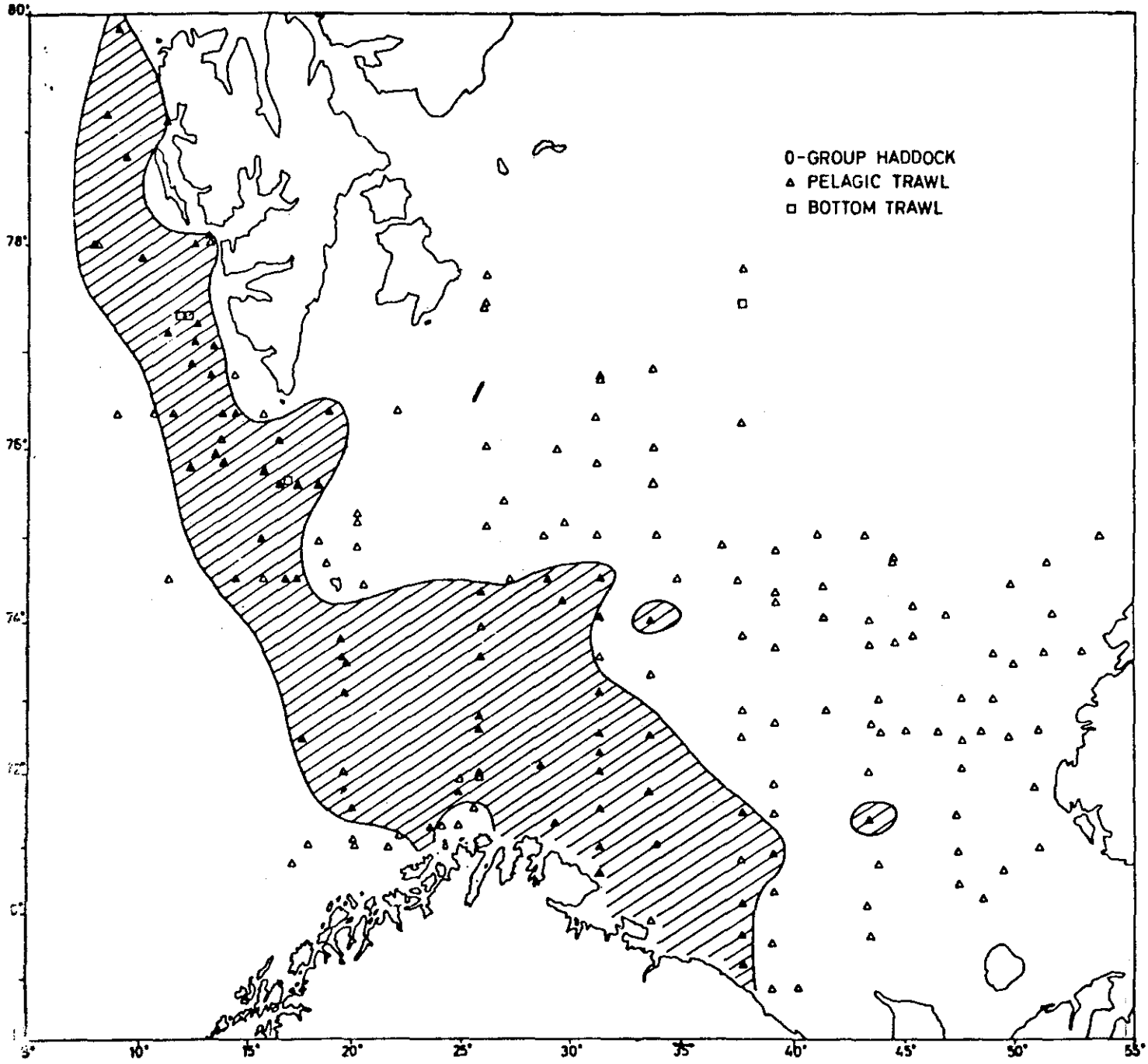


Figure 6. Haddock in Sub-areas I and II.
Distribution of 0-group haddock 1970.

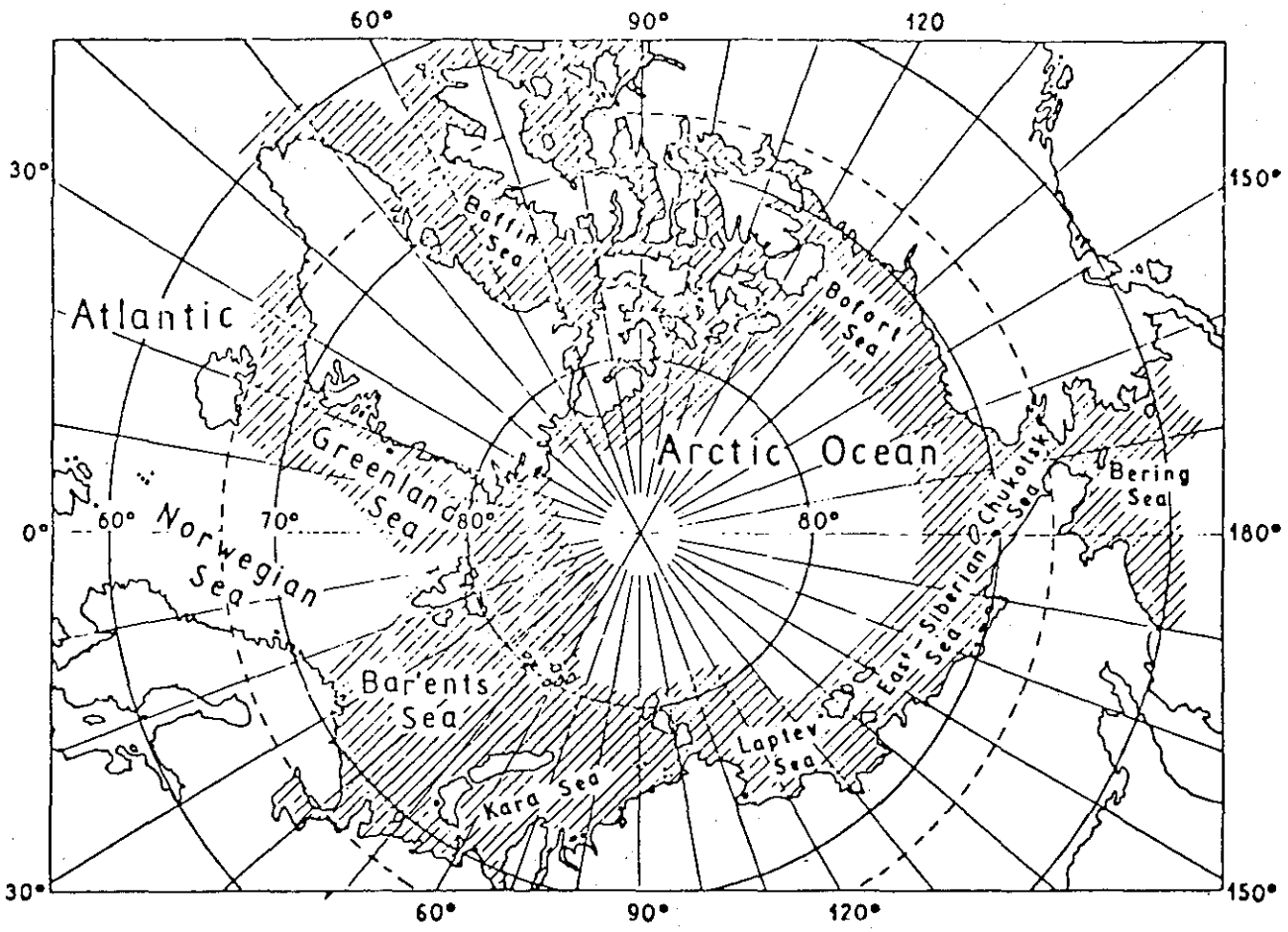


Figure 7. Distribution of Polar cod in the Arctic Seas.

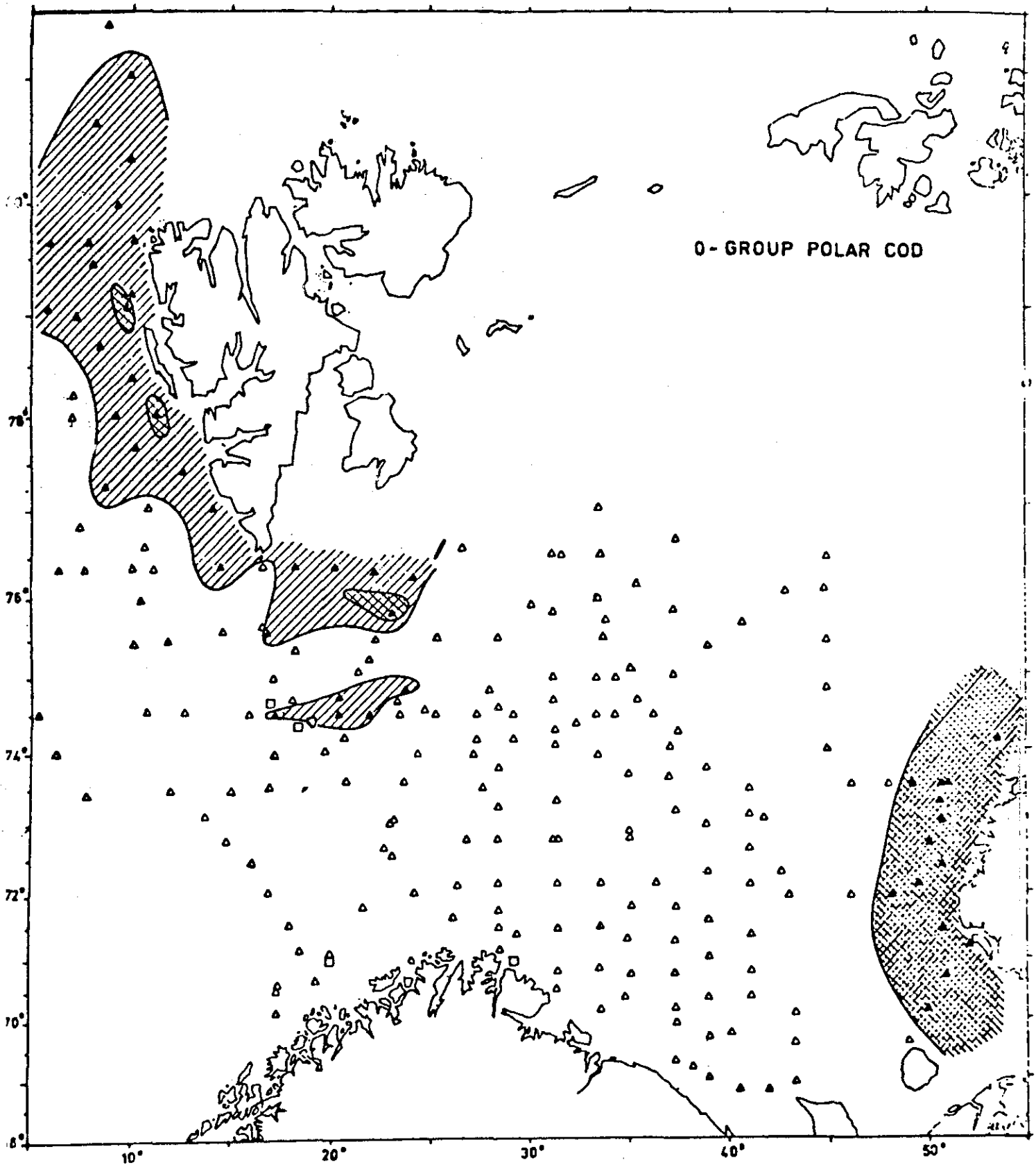


Figure 8. Distribution of 0-group Polar Cod 1974.

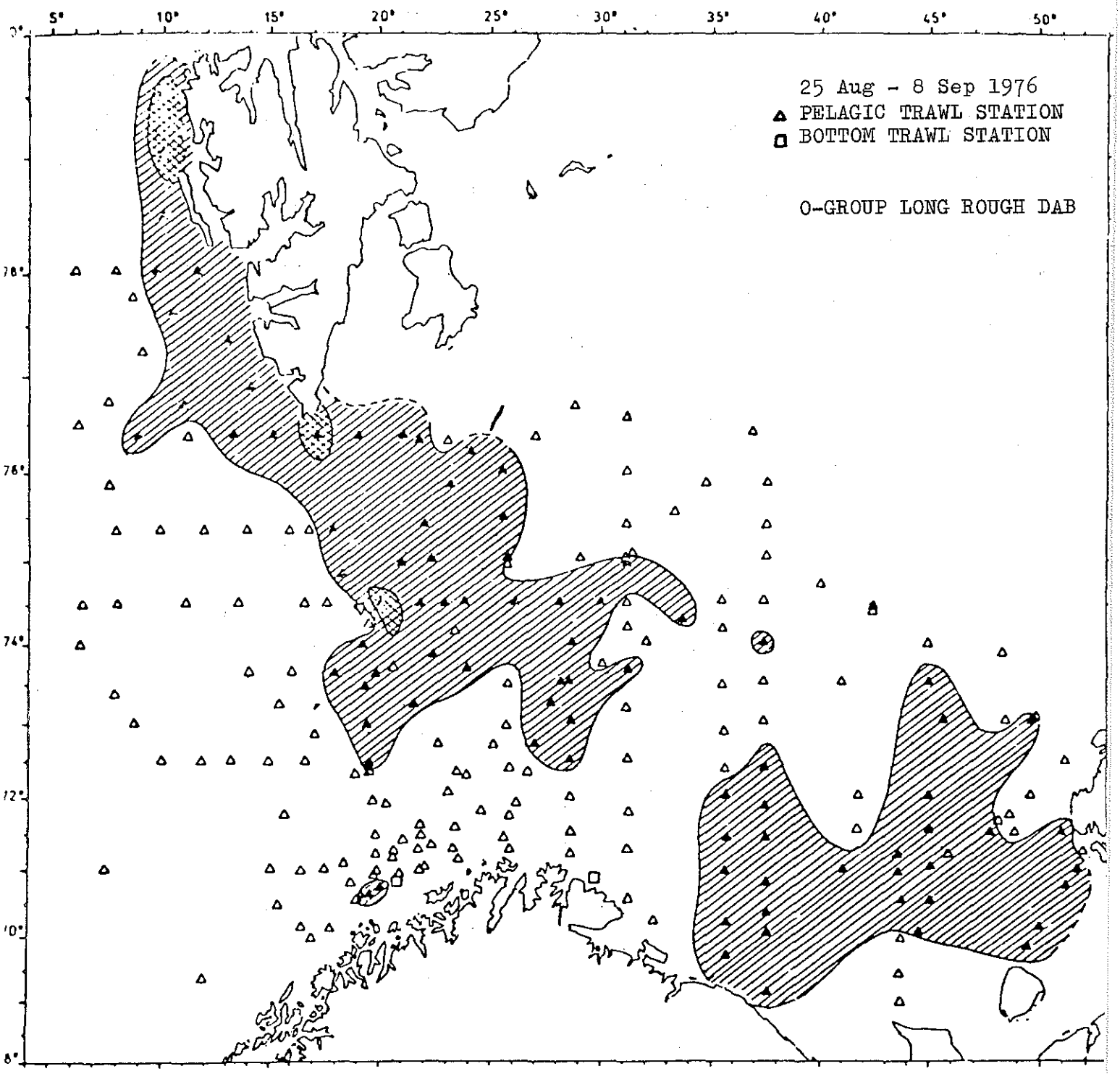


Figure 9. Distribution of 0-group Long Rough Dab 1976.

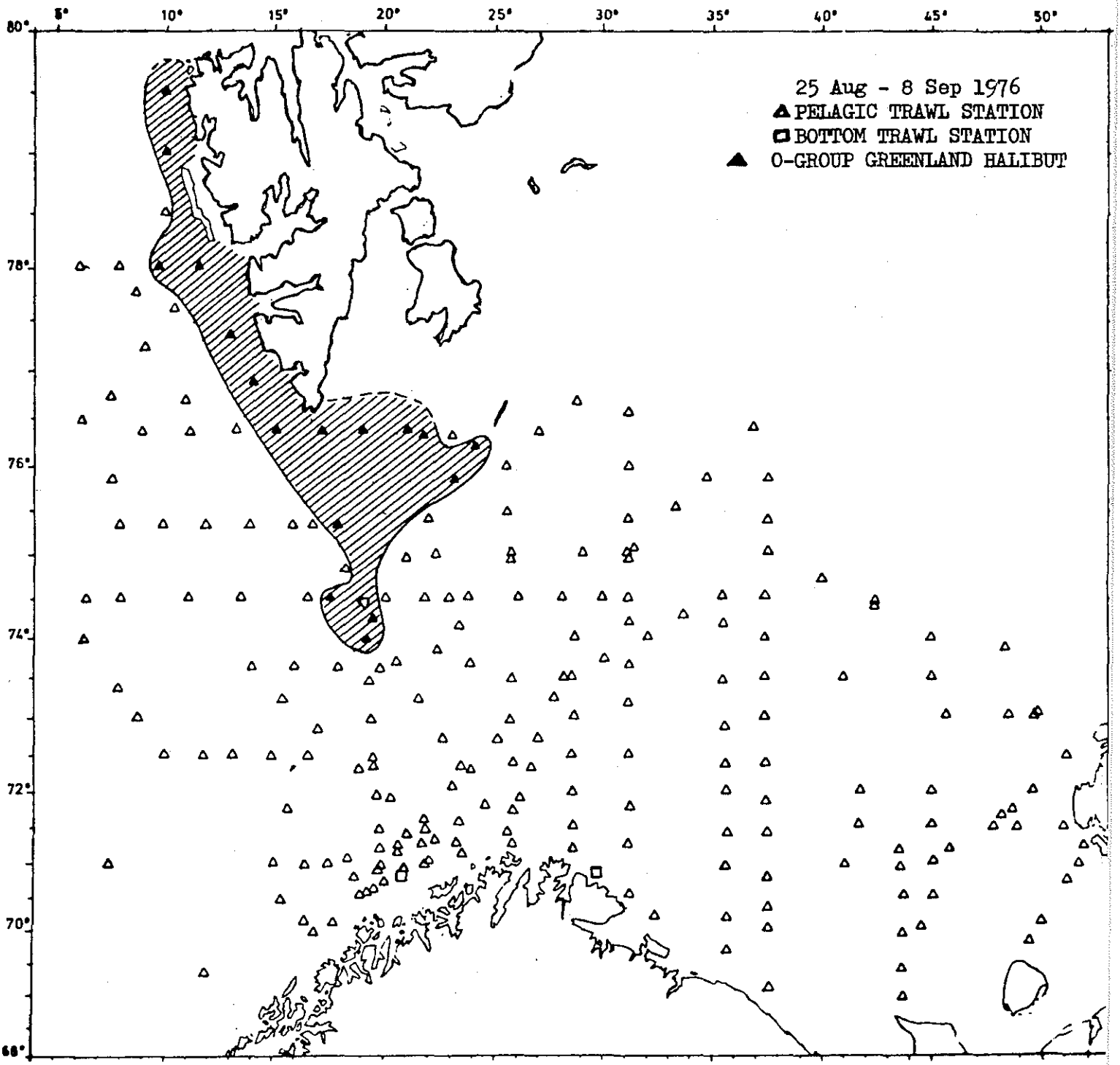


Figure 10. Distribution of 0-group Greenland Halibut.

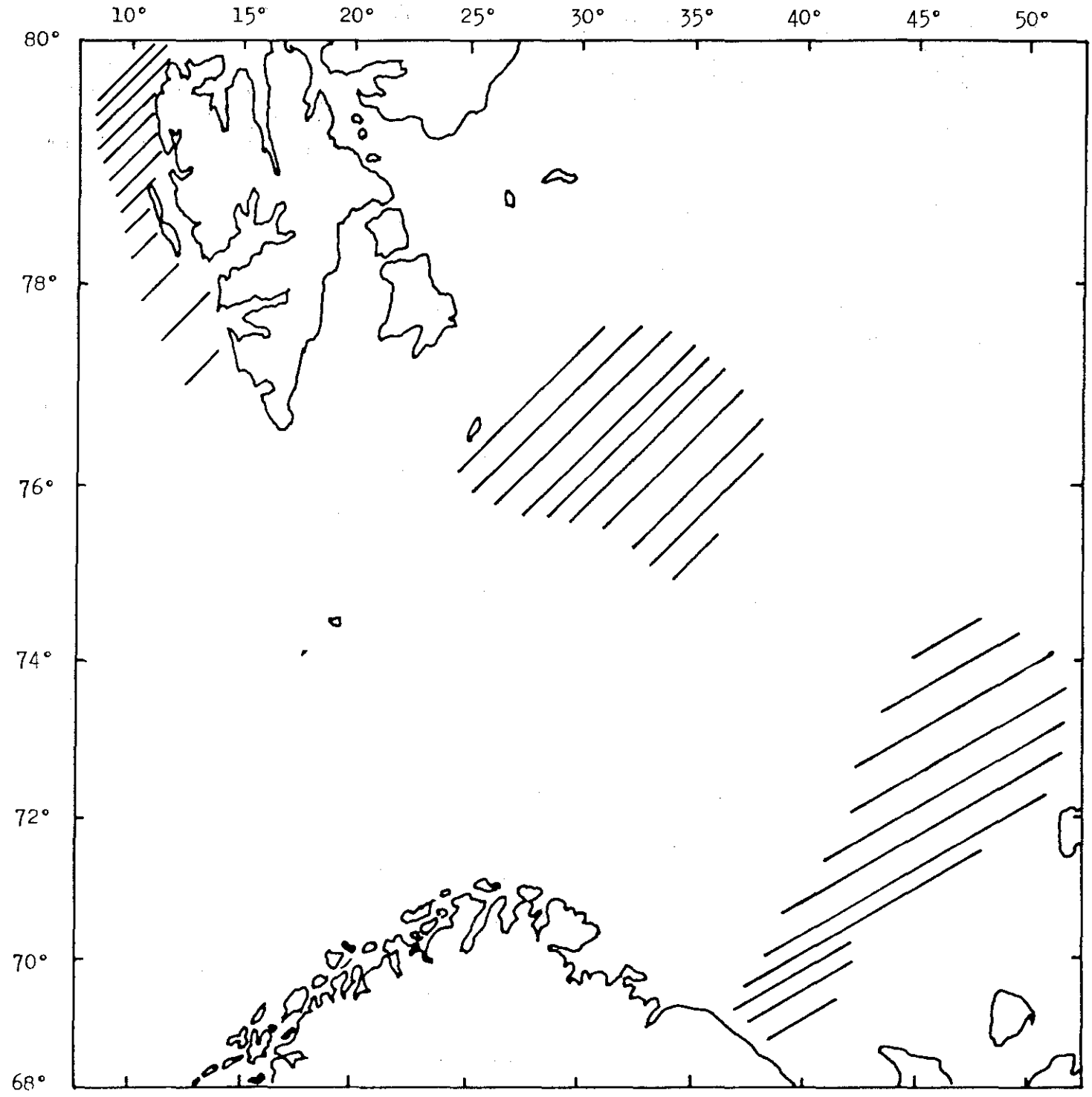


Figure 11. Distribution of juvenile (≤ 30 cm) Greenland Halibut.

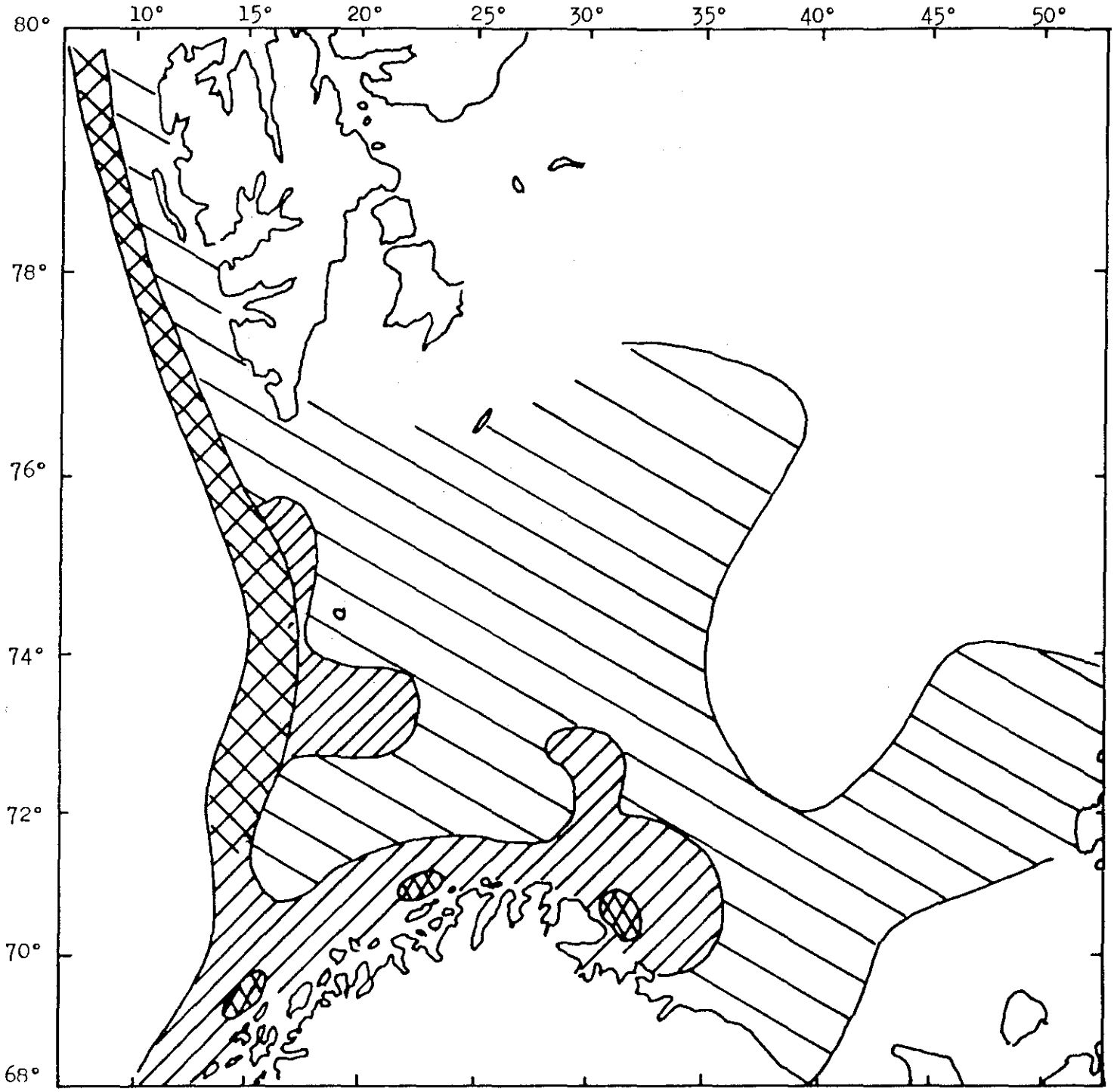


Figure 12. Distribution of adult Greenland Halibut in the Barents Sea. The densest hatched areas are the fishing grounds.

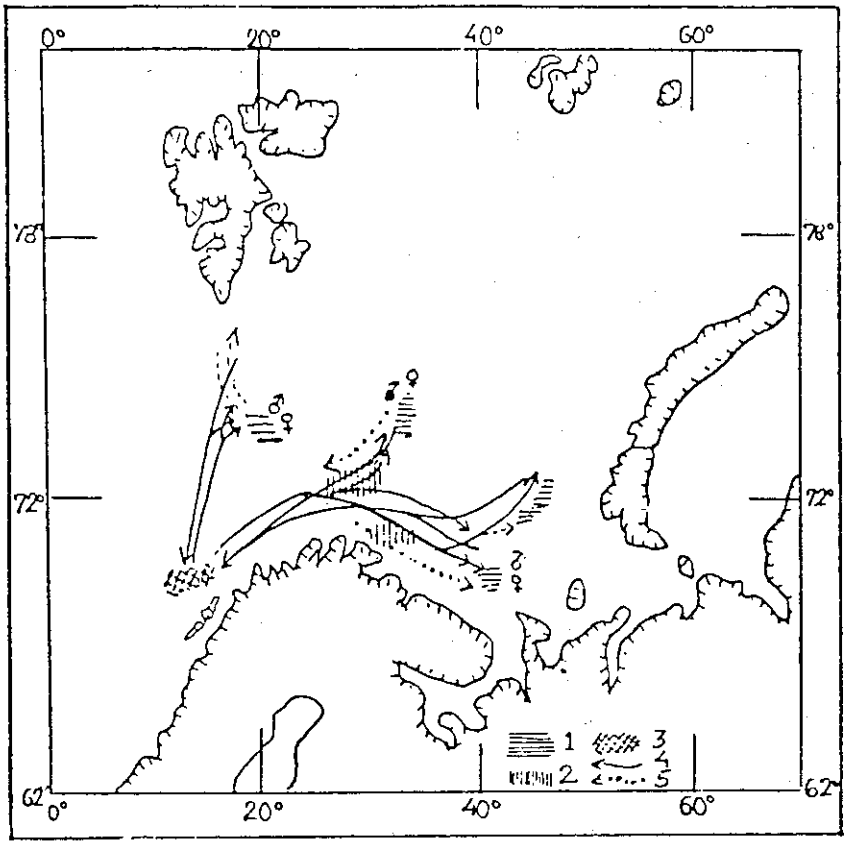


Figure 13. Migrations of Sebastes marinus.

1. Areas of autumn-winter concentrations of males and females.
2. Areas of spring concentrations of males.
3. Spawning areas.
4. Migrations of females.
5. Migrations of males.

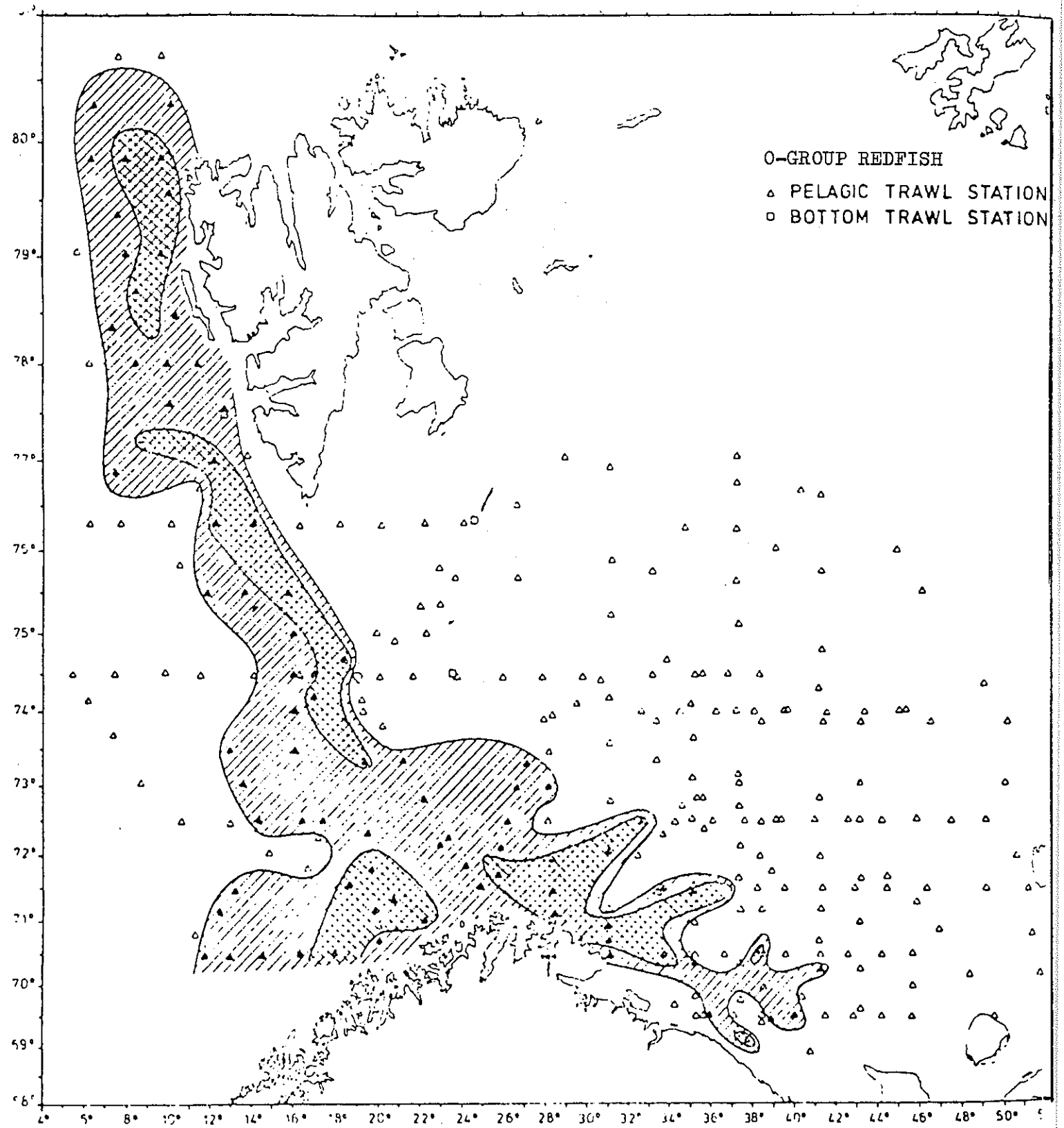


Figure 14. Distribution of 0-group Redfish in the Barents Sea and adjacent waters in August-September 1975.

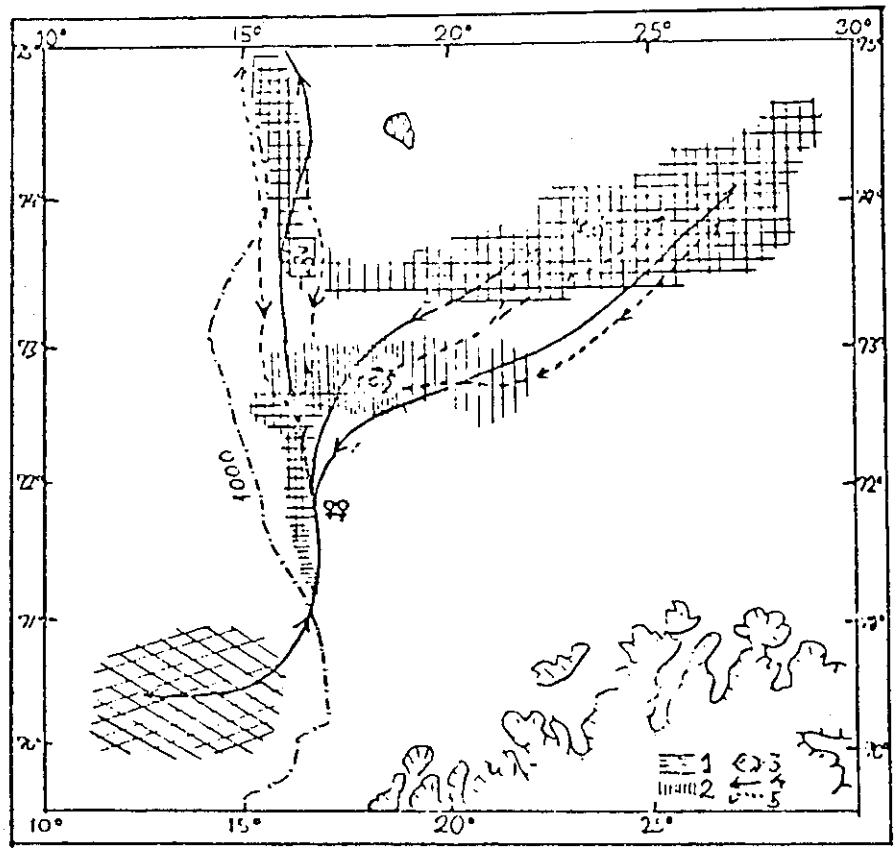


Figure 15. Migrations of Sebastes mentella .

1. Females.
2. Males.
3. Spawning area.
4. Migrations of females.
5. Migrations of males.

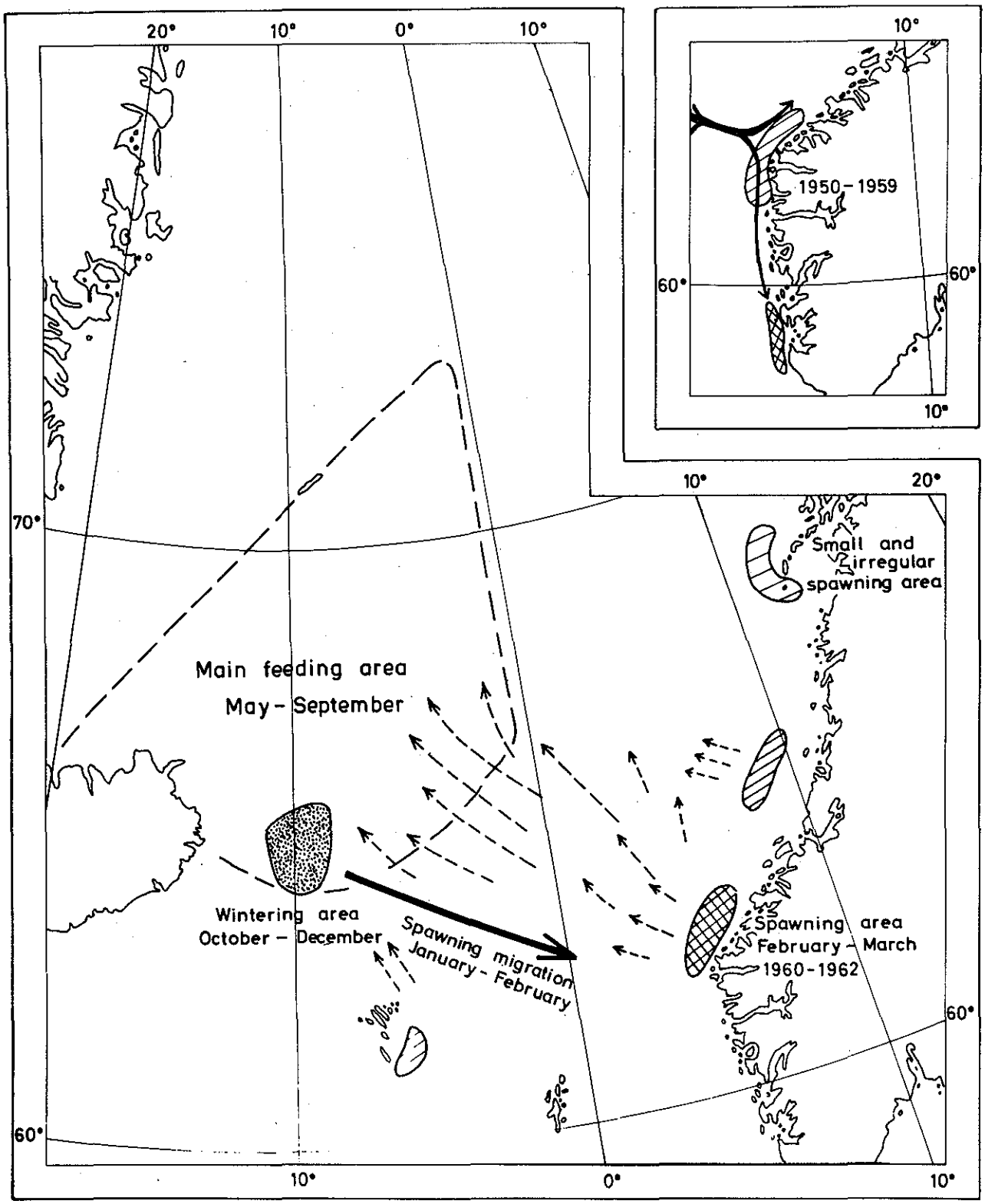


Figure 16. Migration routes of Norwegian spring spawning Herring, 1950-62.

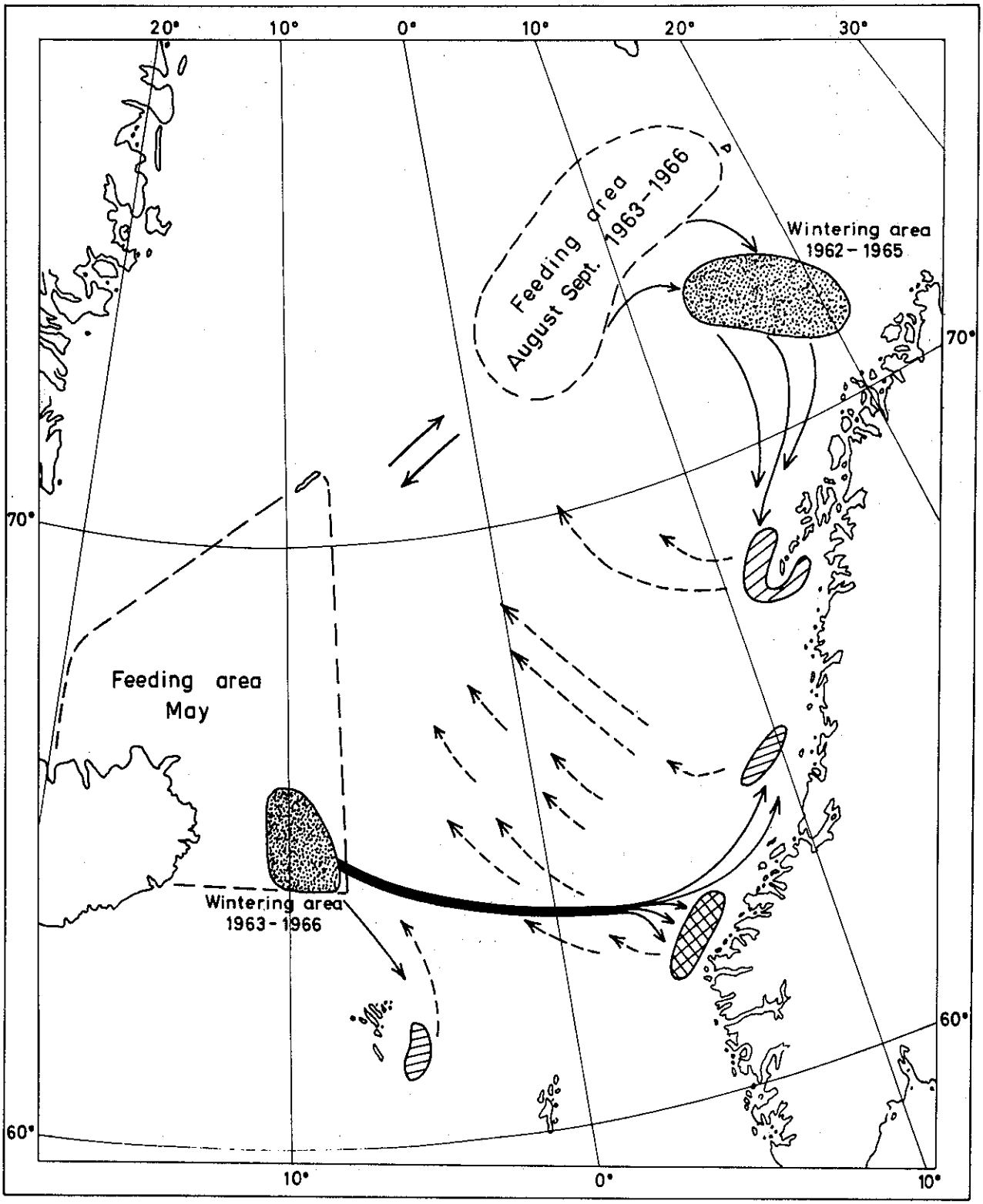


Figure 17. Migration routes of Norwegian spring spawning Herring, 1963-66.

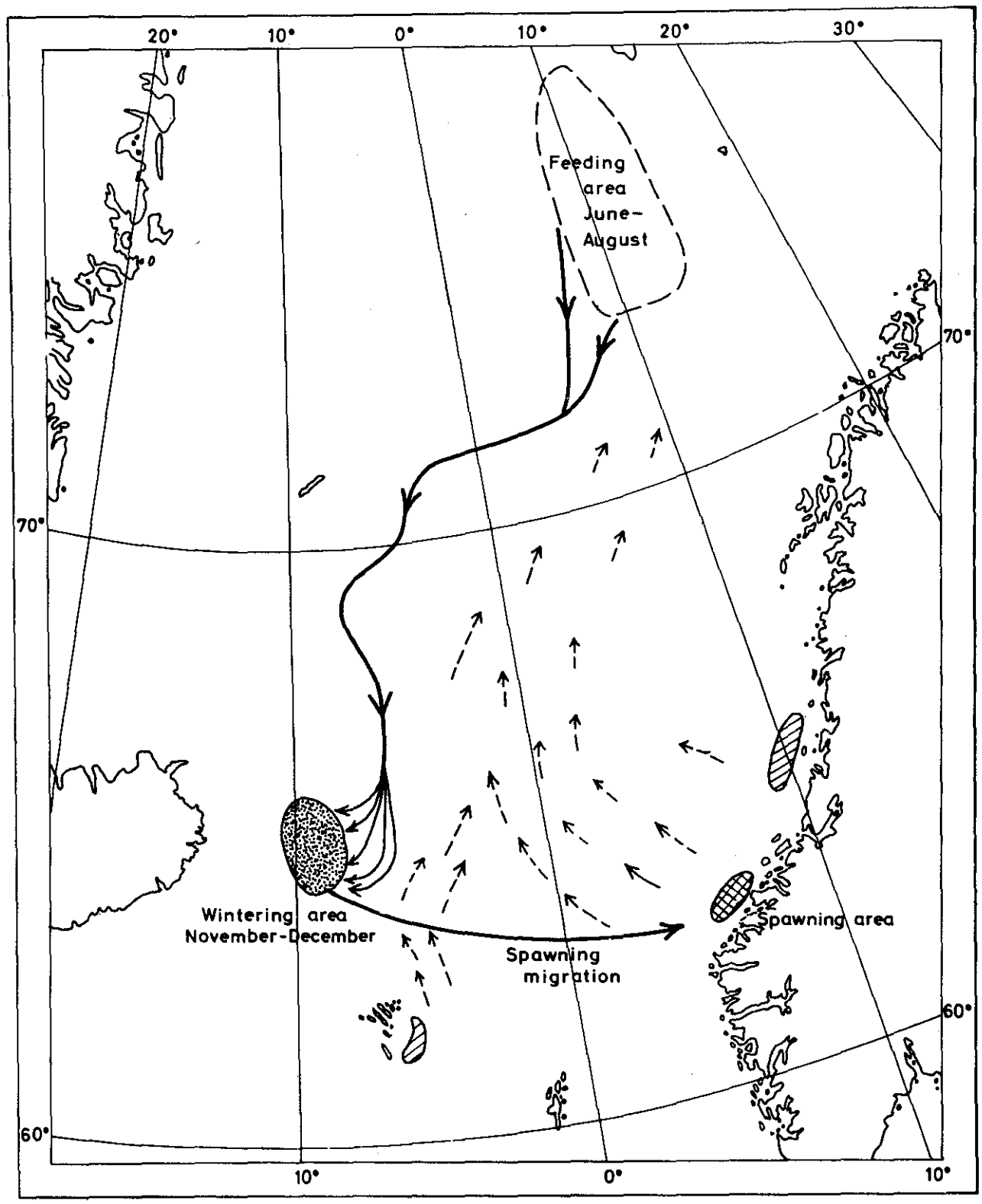


Figure 18. Migration routes of Norwegian spring spawning Herring, 1967-68.

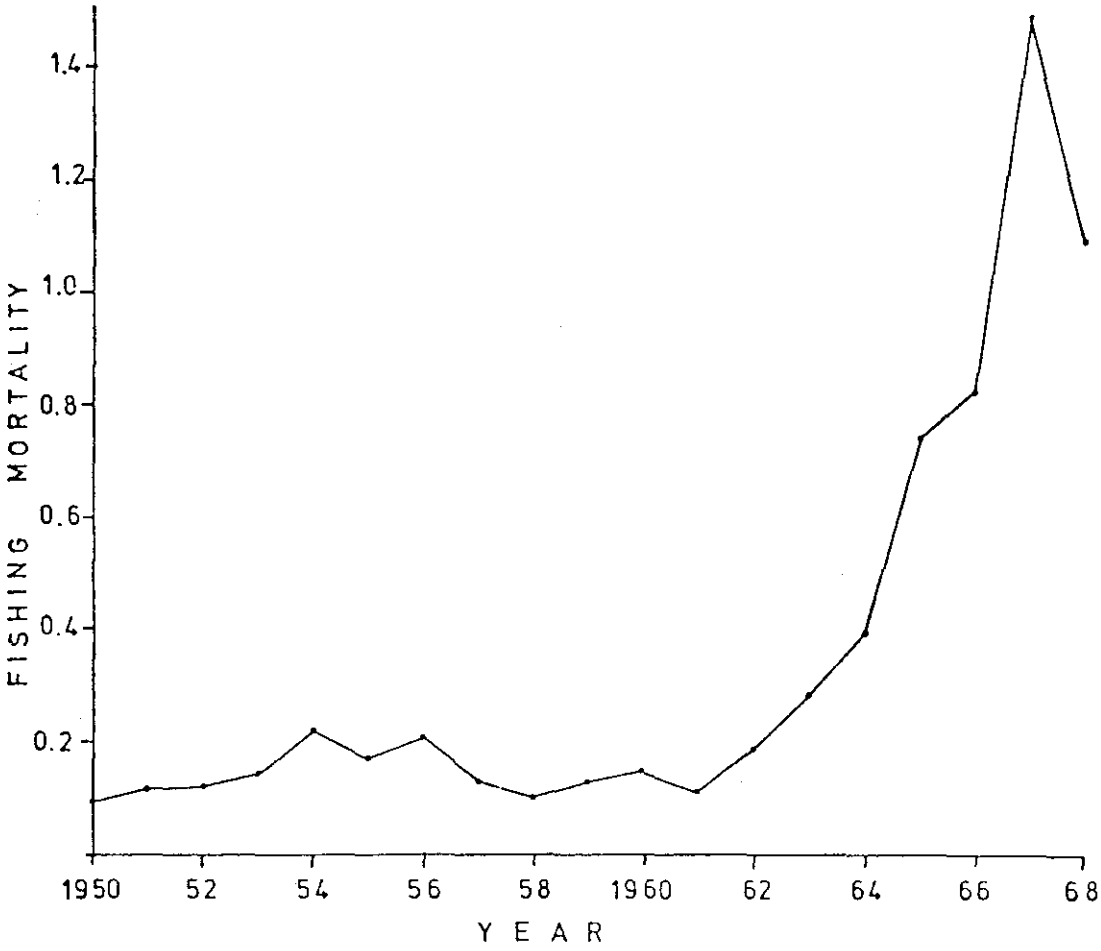


Figure 19. Norwegian spring spawners. Fishing mortality on 7 year old and older herring.

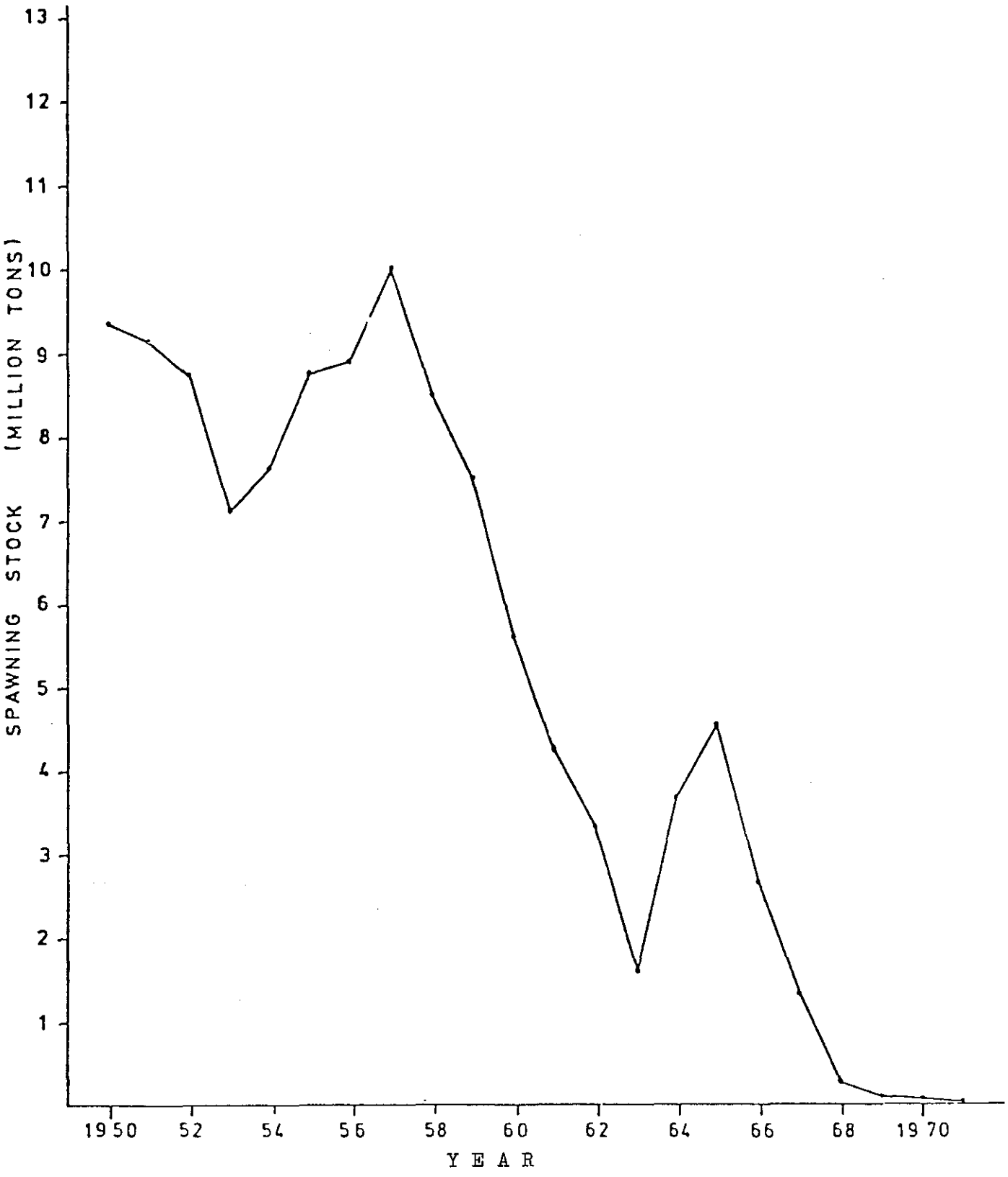


Figure 20. Norwegian spring spawning Herring.
Spawning stock size in weight.

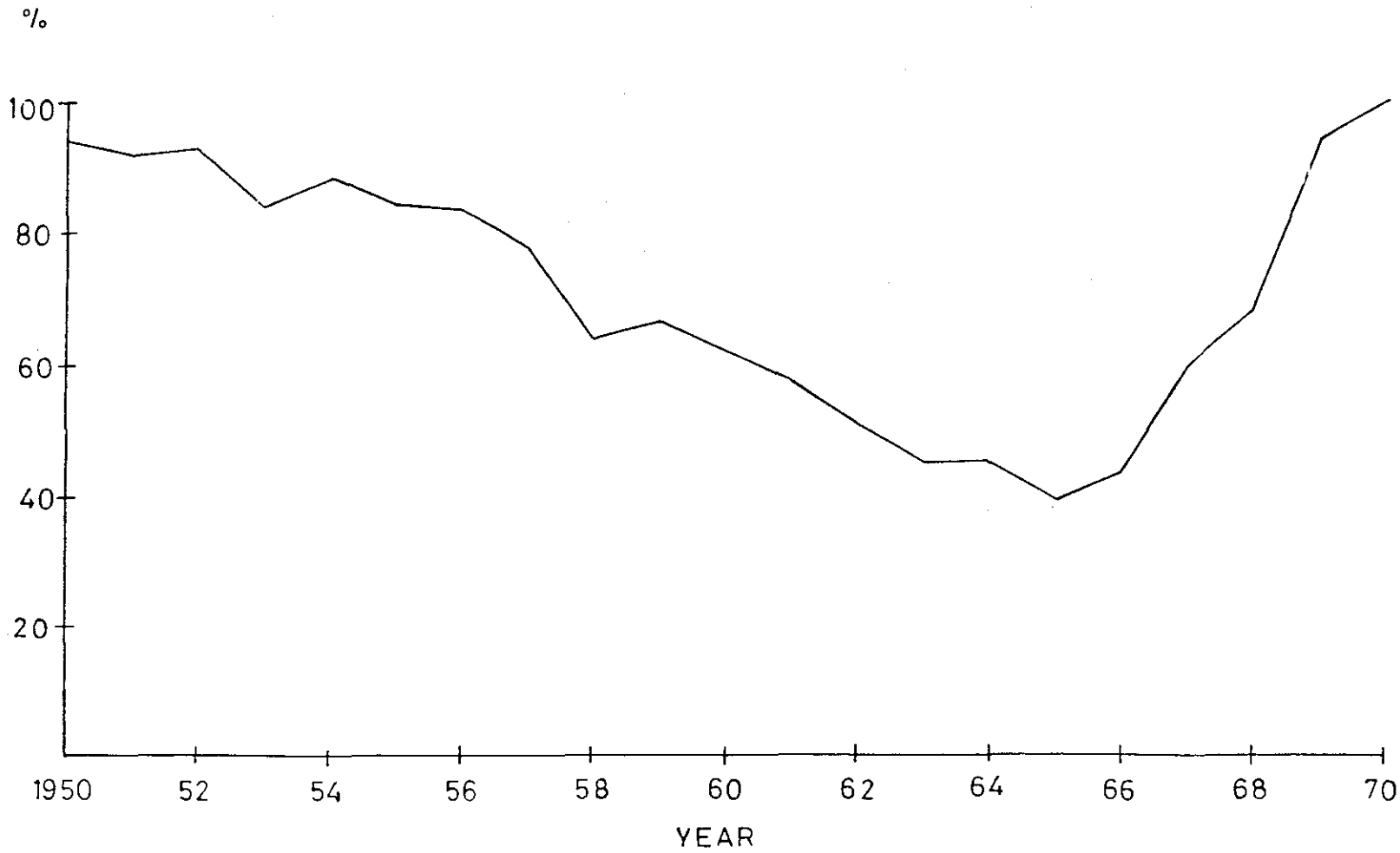


Figure 21. Norwegian spring spawning Herring. Percentage of total catch taken in the winter Herring and small- and fat Herring fisheries.

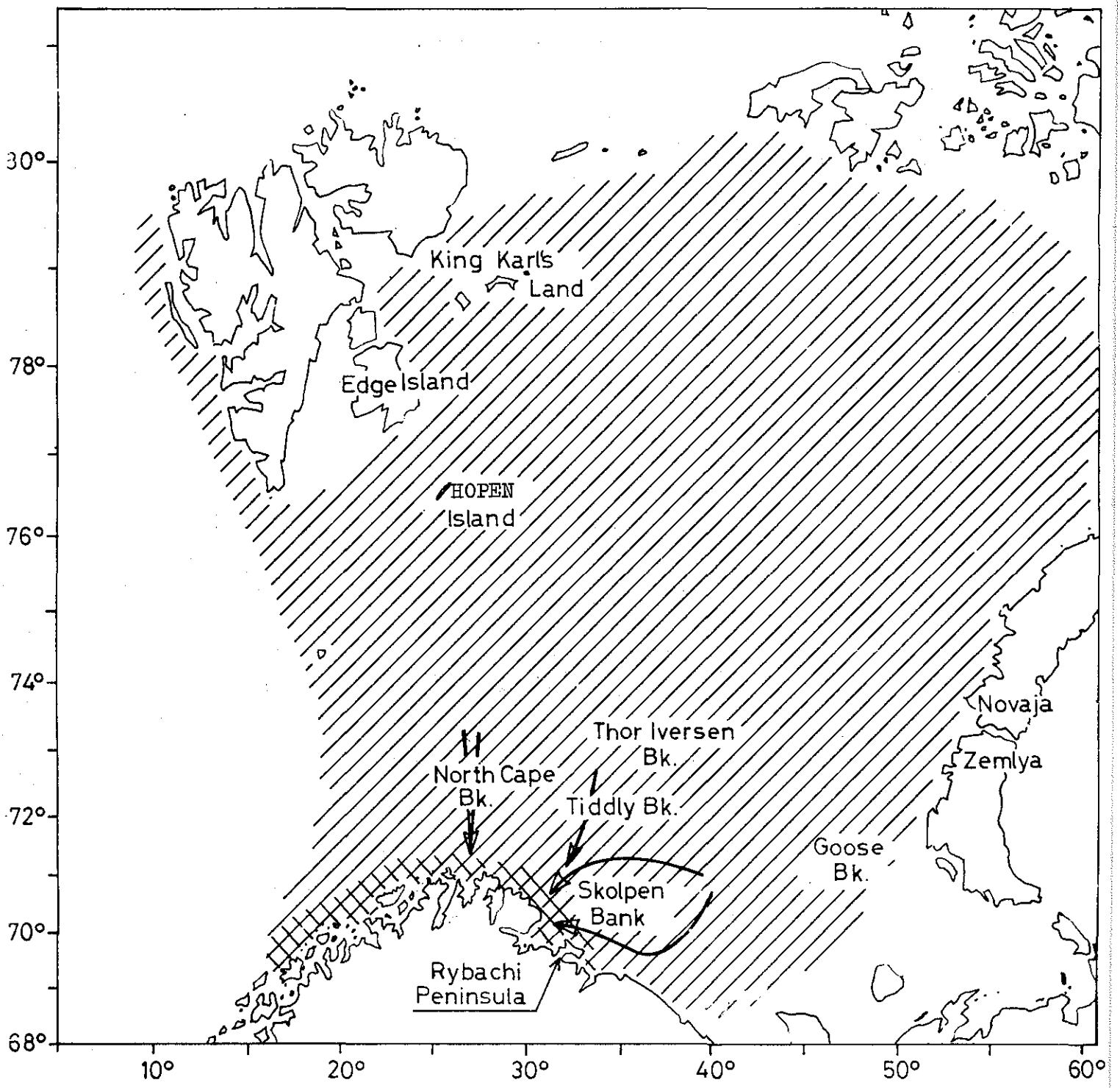


Figure 22. Distribution area of the Barents Sea Capelin (hatched), spawning grounds (cross hatched) and migration routes to the spawning grounds (arrows).

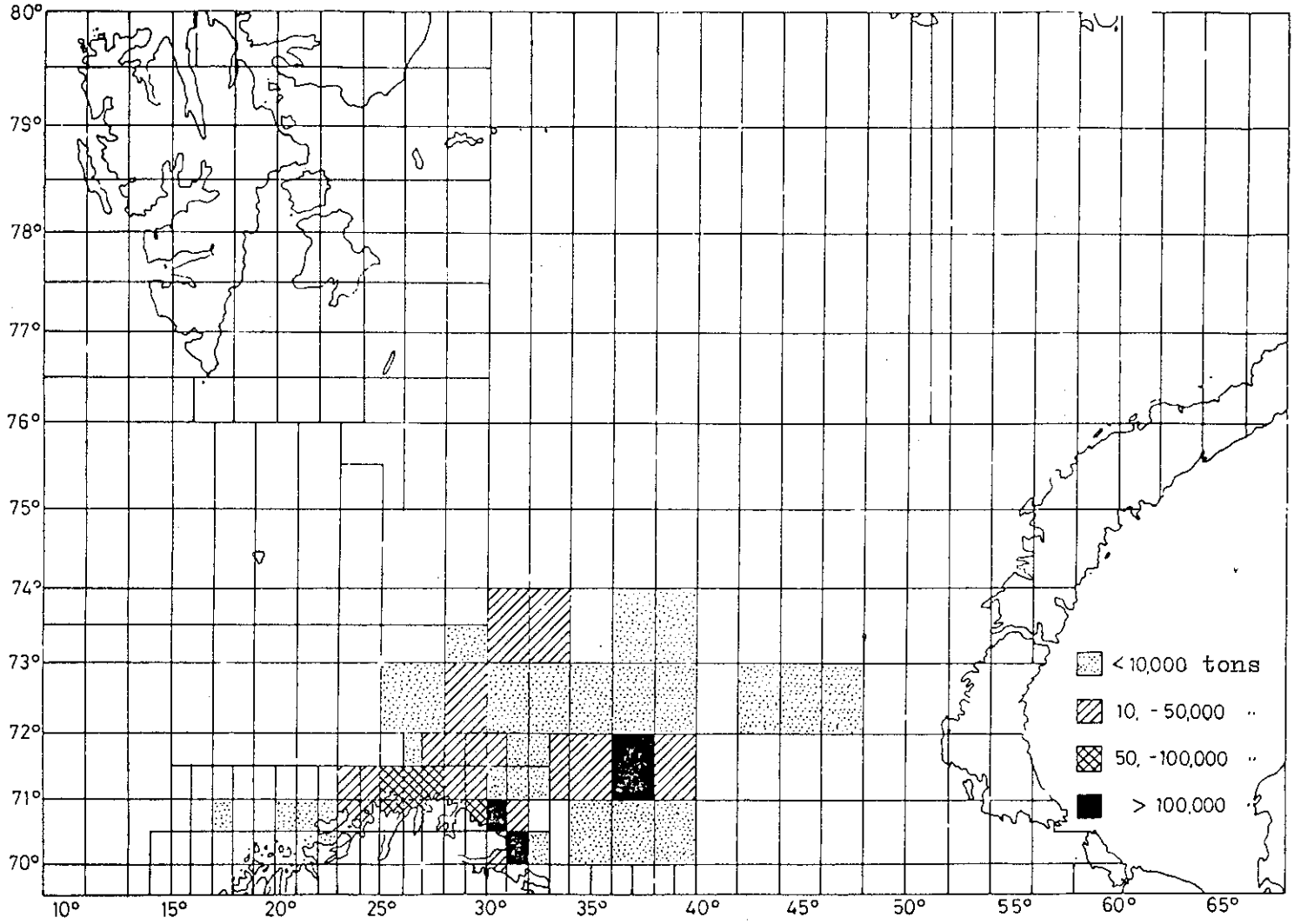


Figure 23. Distribution of catches of Capelin during the winter fishery 1976 in Sub-areas I and II.

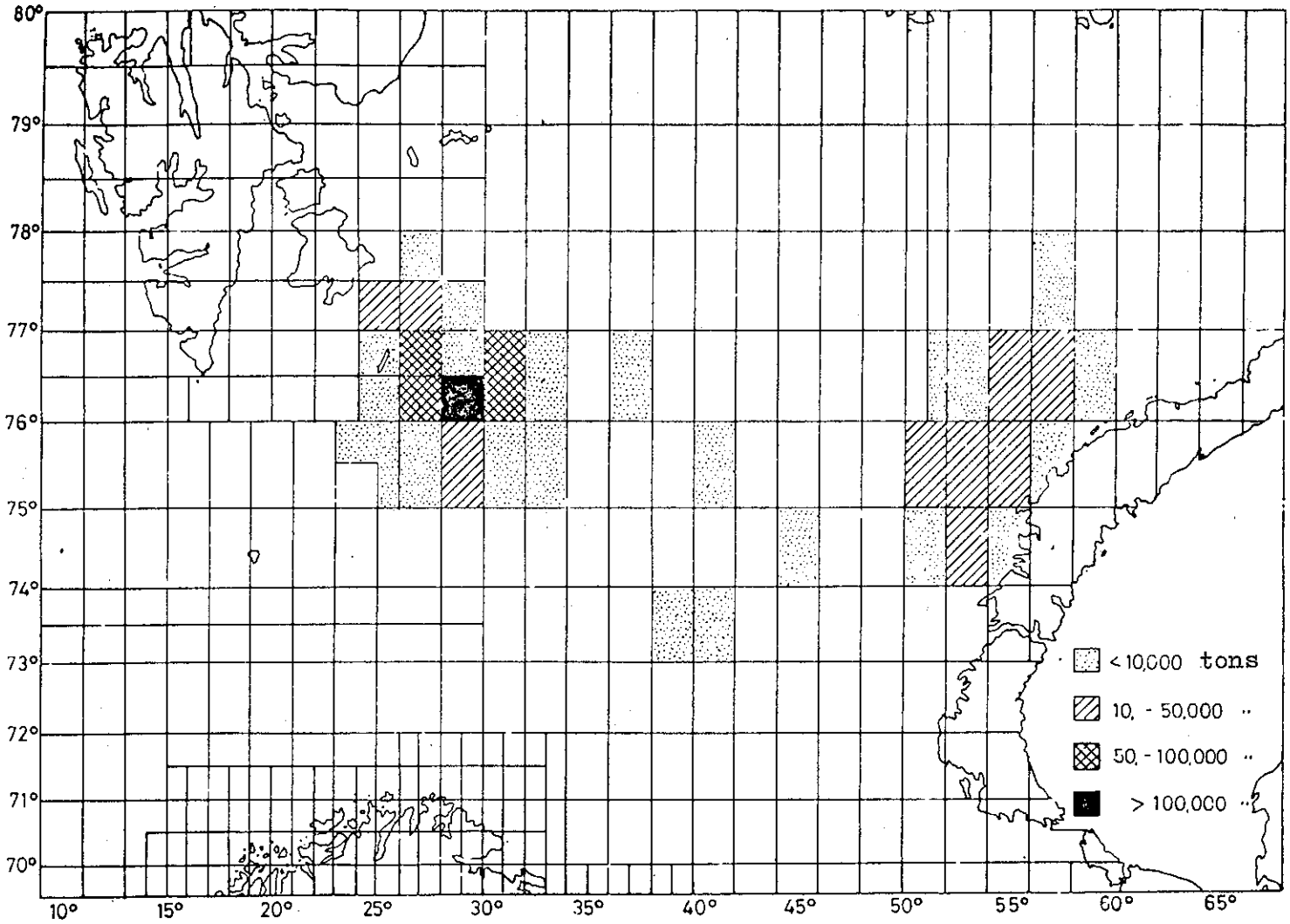


Figure 24. Distribution of catches of Capelin during the summer fishery 1976 in Sub-areas I and II.

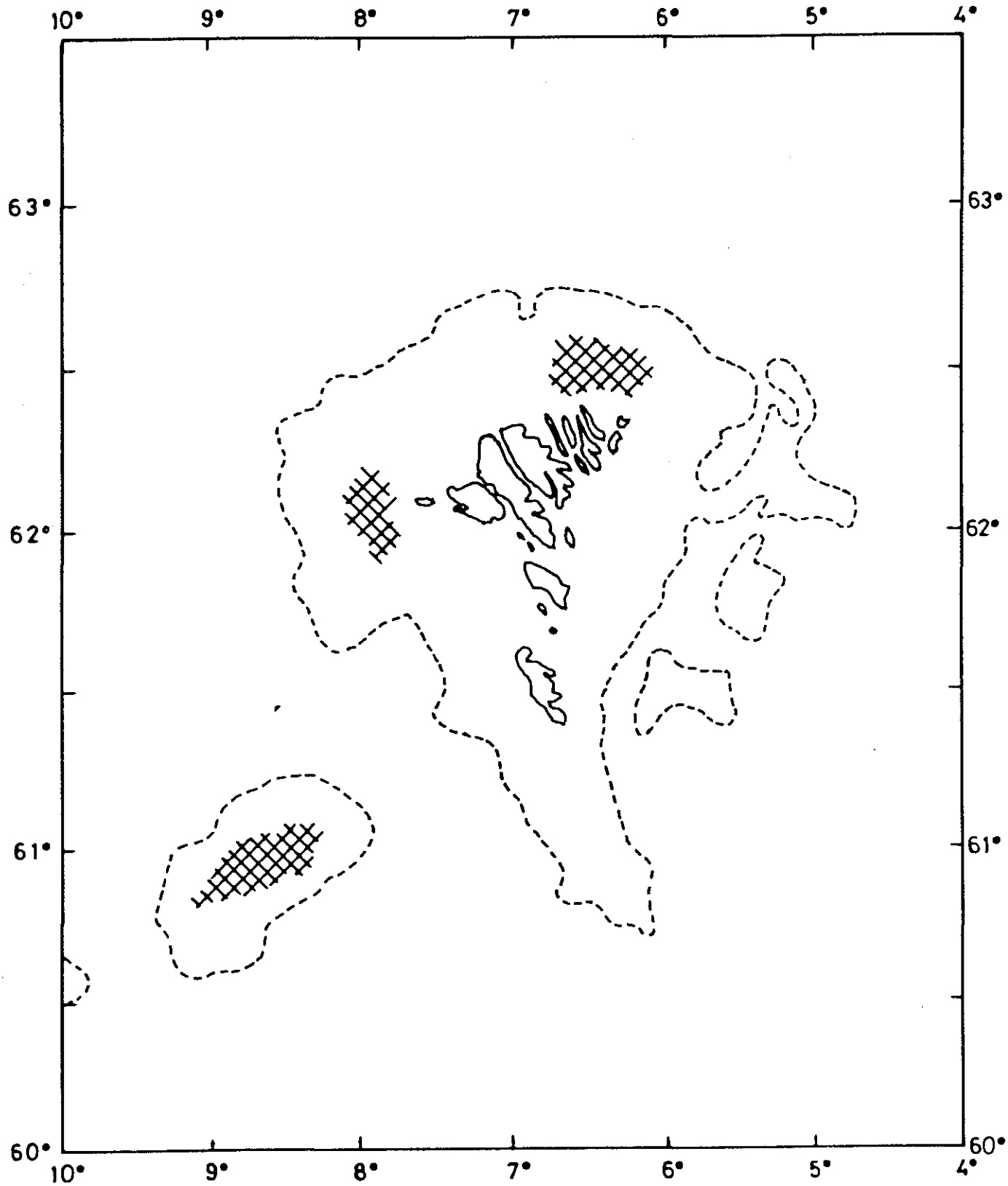


Figure 25. Main spawning grounds of Cod at Faroe.
(Source: data from national laboratories.)

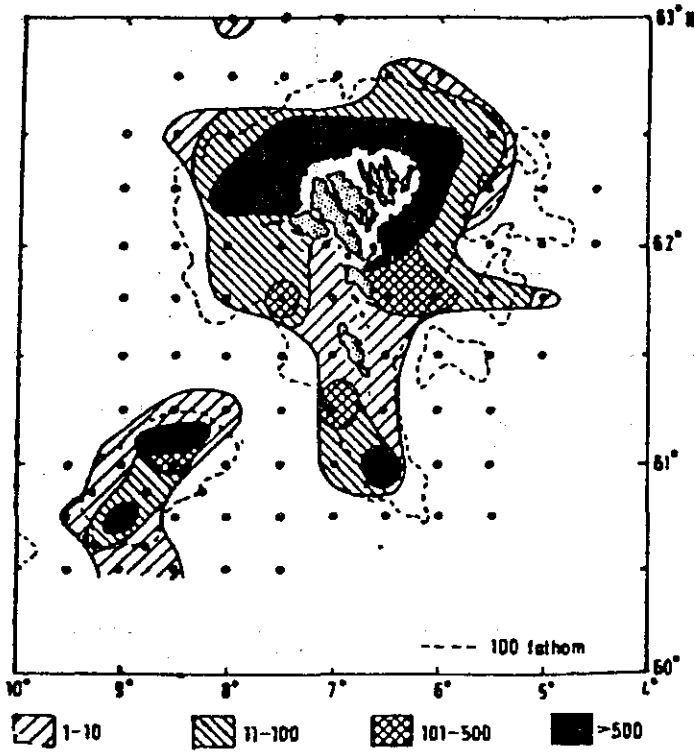
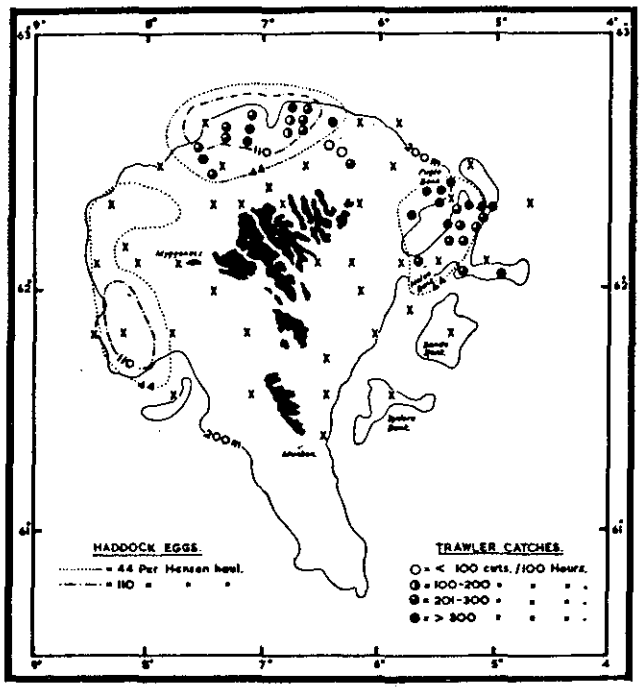
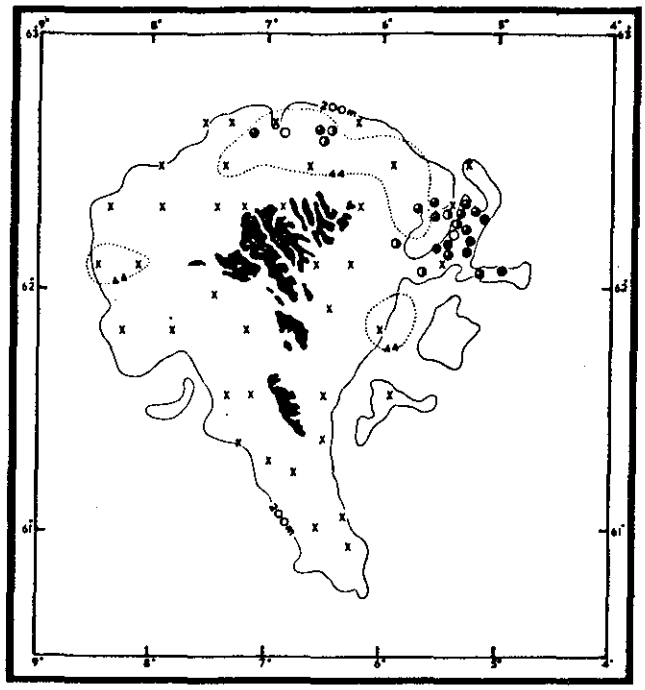


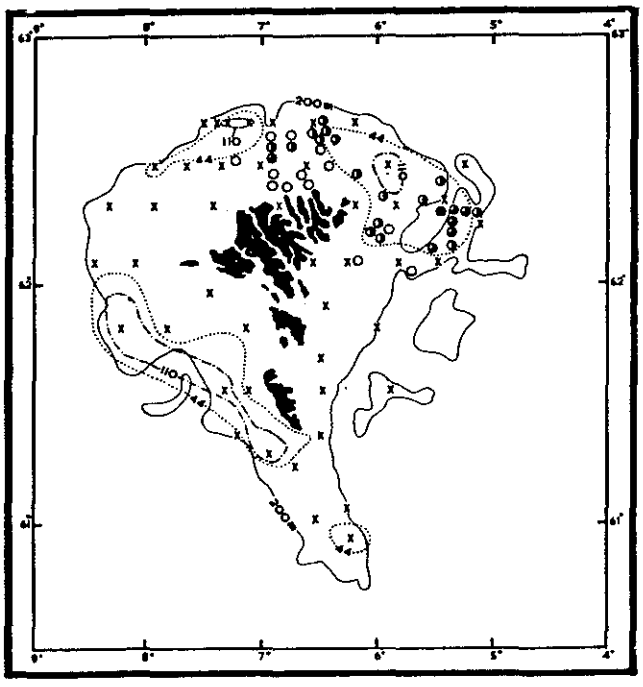
Figure 26. Distribution of 0-group Cod at Faroe. (Numbers per half-hour tow.)



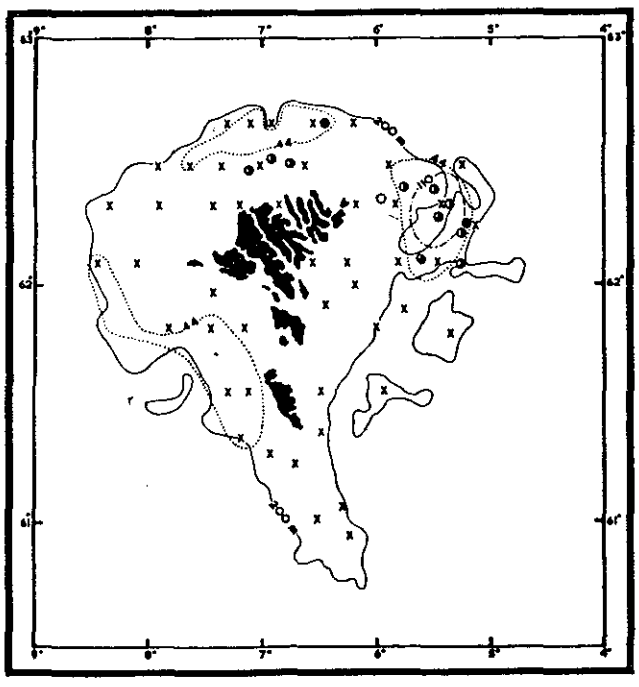
A. Distribution of haddock eggs and the catches of haddock by Aberdeen trawlers at Faroe in April 1950.



B. Distribution of haddock eggs and the catches of haddock by Aberdeen trawlers at Faroe in April 1951 (Symbols as in A).



C. Distribution of haddock eggs and the catches of haddock by Aberdeen trawlers at Faroe in April 1952 (Symbols as in A).



D. Distribution of haddock eggs and the catches of haddock by Aberdeen trawlers at Faroe in April 1953 (Symbols as in A).

Figure 27. Distribution of Haddock eggs and the catches of Haddock in April 1950, 1951, 1952, 1953. (Source: Saville, 1956)

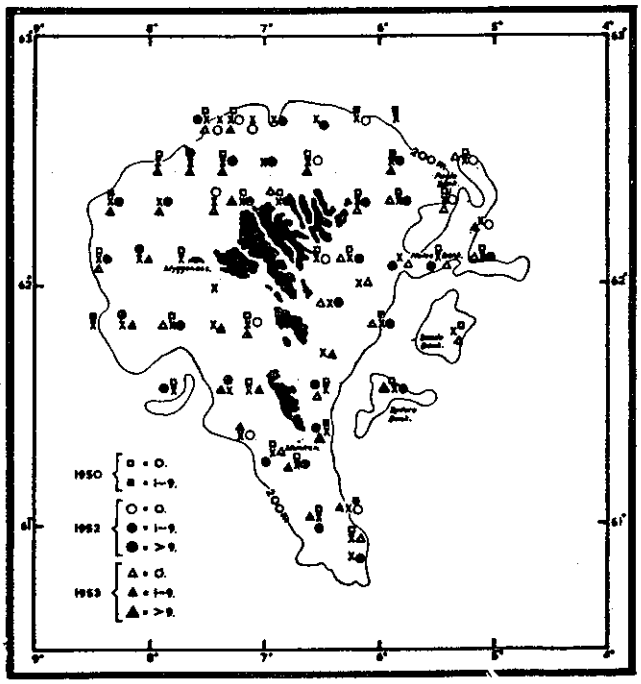


Figure 28. Distributiom of Haddock larvae at Faroe in June 1950-53. The symbols represent the catches of a 2-metre ring net hauled vertically from bottom to surface.
(Source: Saville, 1956)

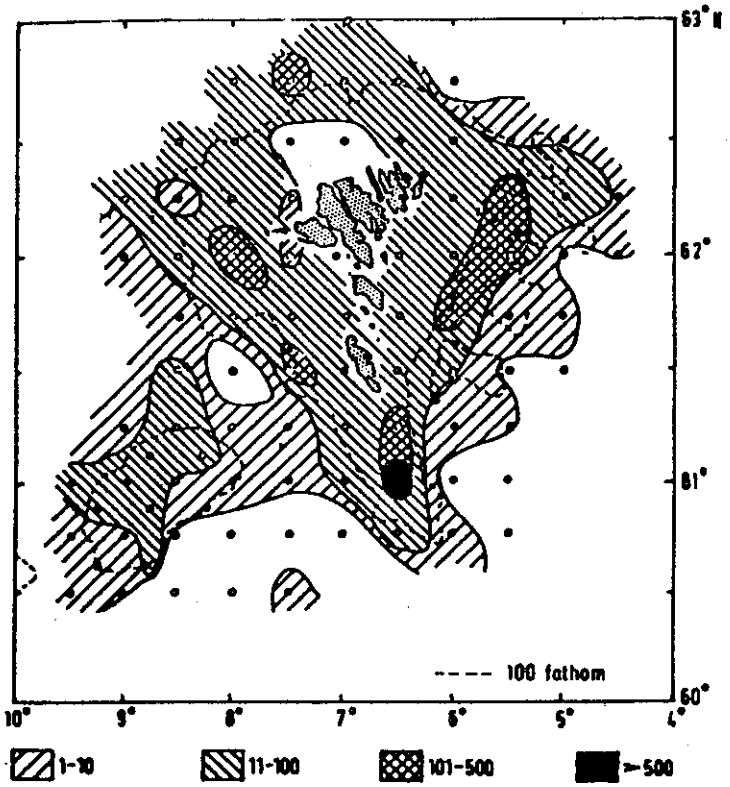


Figure 29. Distribution of 0-group Haddock (numbers per half-hour tow). ("Cirolana", 1975.)
(Source: ICES, C.M.1975/H:51.)

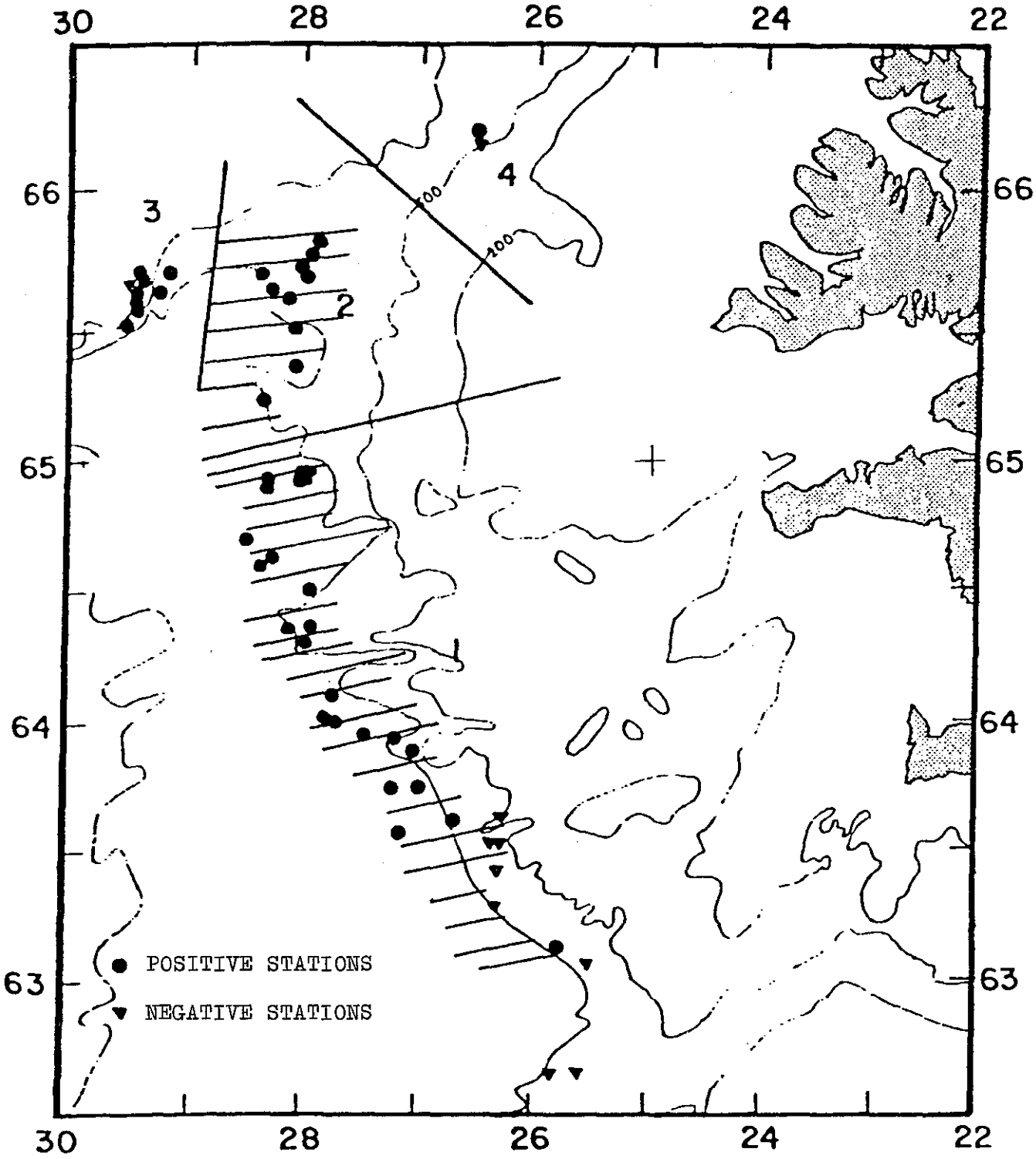


Figure 30. Distribution of Greenland Halibut in March 1977 in Sub-areas V and XIV. The area is divided into four sub-areas.

Spawning areas.

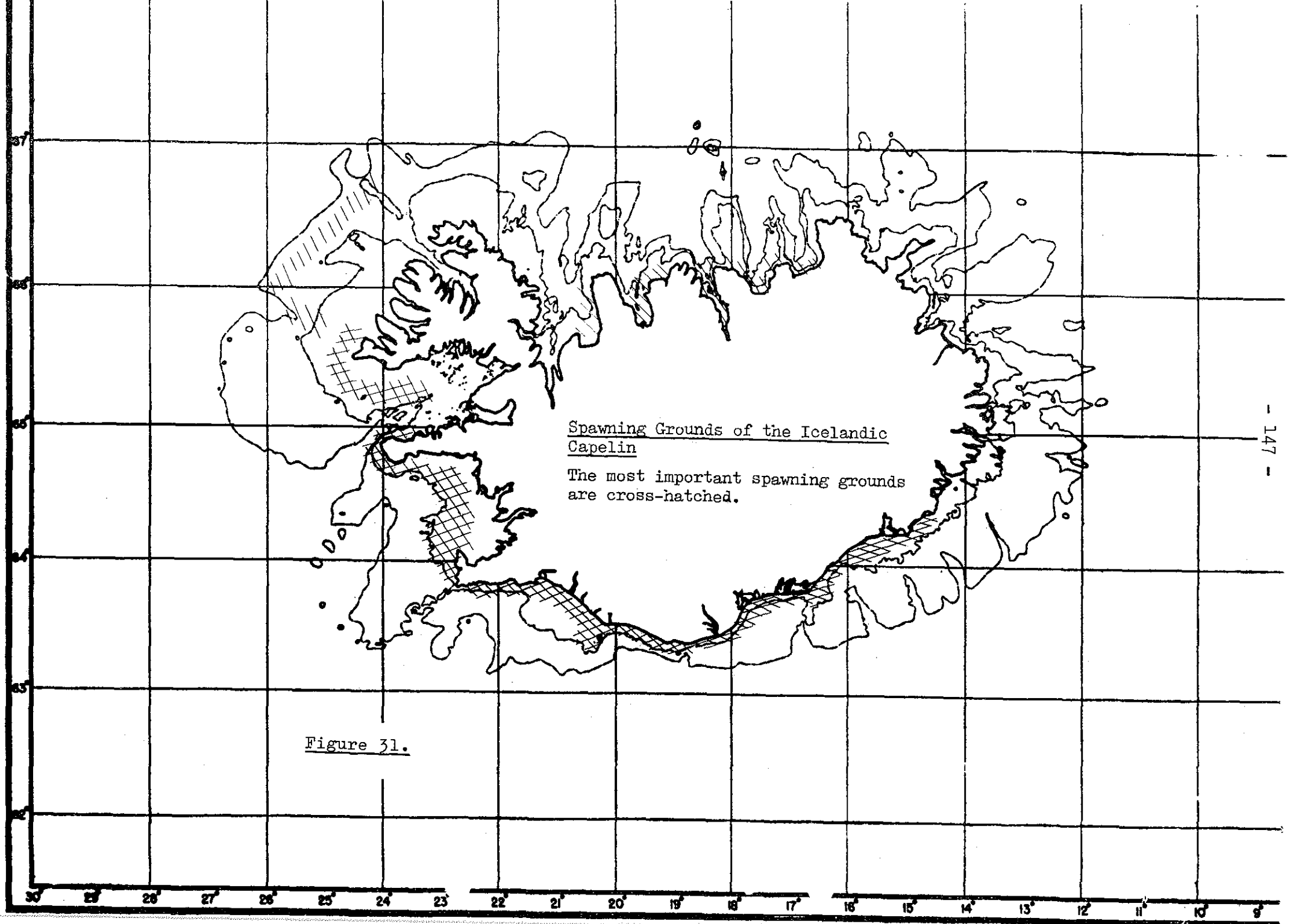

Spawning Grounds of the Icelandic Capelin
The most important spawning grounds are cross-hatched.

Figure 31.

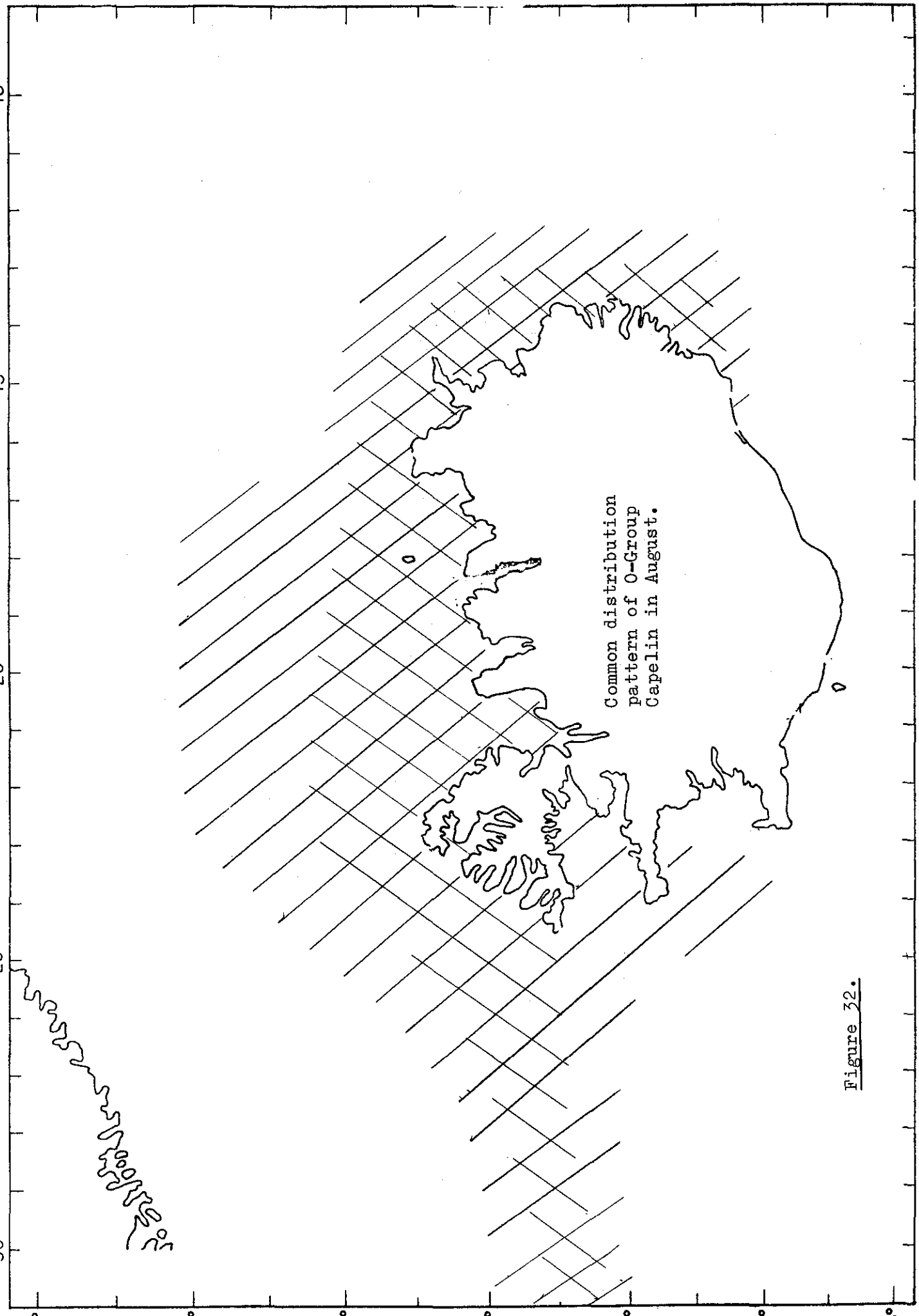

Common distribution
pattern of 0-Group
Capelin in August.
10°
15°
20°
25°
30°
69°
68°
67°
66°
65°
64°
63°

Figure 32.

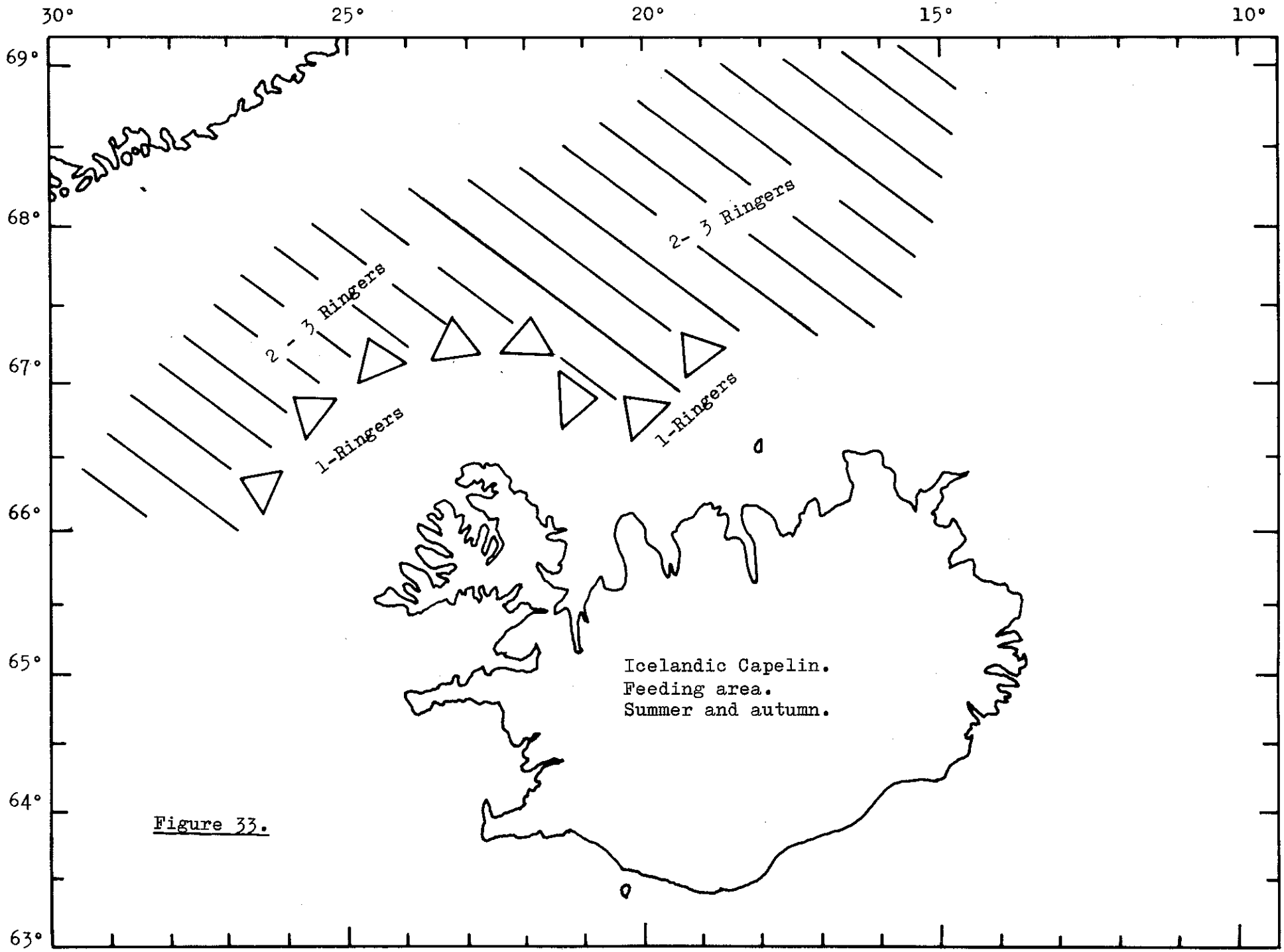

30°
25°
20°
15°
10°
69°
68°
67°
66°
65°
64°
63°
2 - 3 Ringers
2 - 3 Ringers
1-Ringers
1-Ringers
Icelandic Capelin.
Feeding area.
Summer and autumn.

Figure 33.

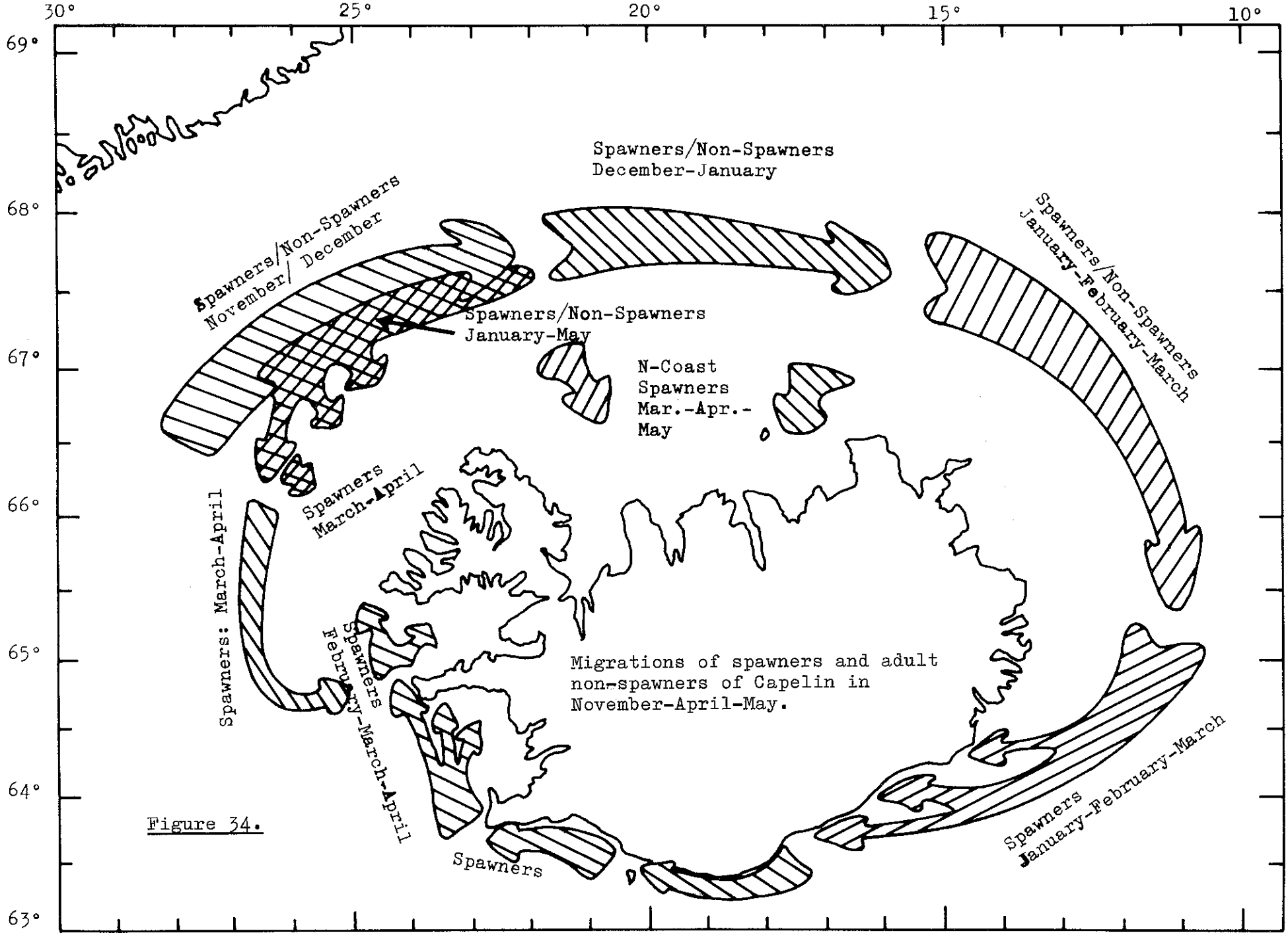

30°
25°
20°
15°
10°
69°
68°
67°
66°
65°
64°
63°
Spawners/Non-Spawners
December-January
Spawners/Non-Spawners
November/ December
Spawners/Non-Spawners
January-May
N-Coast
Spawners
Mar.-Apr.-
May
Spawners/Non-Spawners
January-February-March
Spawners
March-April
Spawners: March-April
Spawners
February-March-April
Migrations of spawners and adult
non-spawners of Capelin in
November-April-May.
Spawners
Spawners
January-February-March

Figure 34.

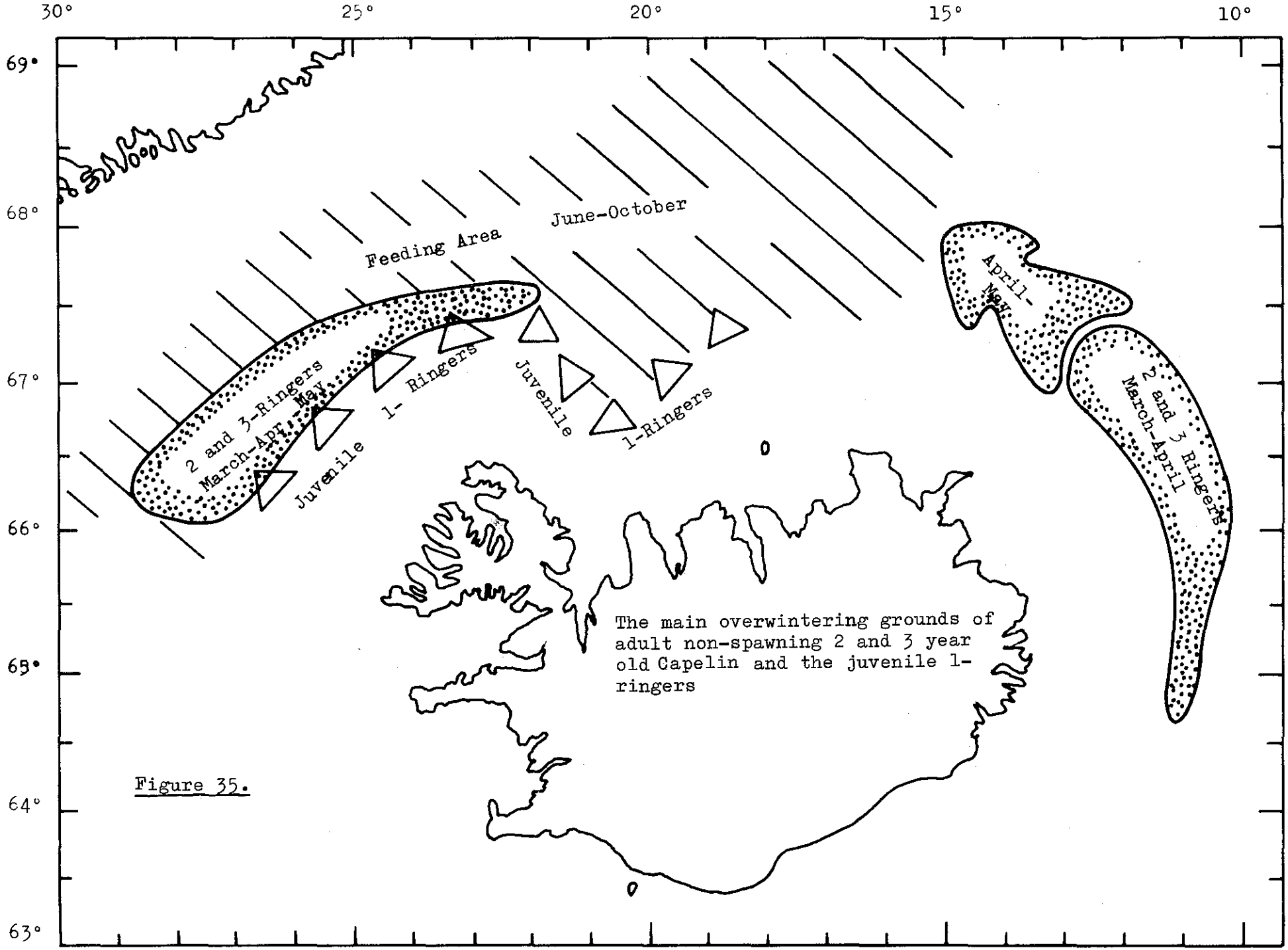

30°
25°
20°
15°
10°
69°
68°
67°
66°
65°
64°
63°
Feeding Area
June-October
2 and 3-Ringers
March-April-May
1- Ringers
Juvenile
Juvenile
1-Ringers
April-May
2 and 3 Ringers
March-April
The main overwintering grounds of adult non-spawning 2 and 3 year old Capelin and the juvenile 1-ringers

Figure 35.

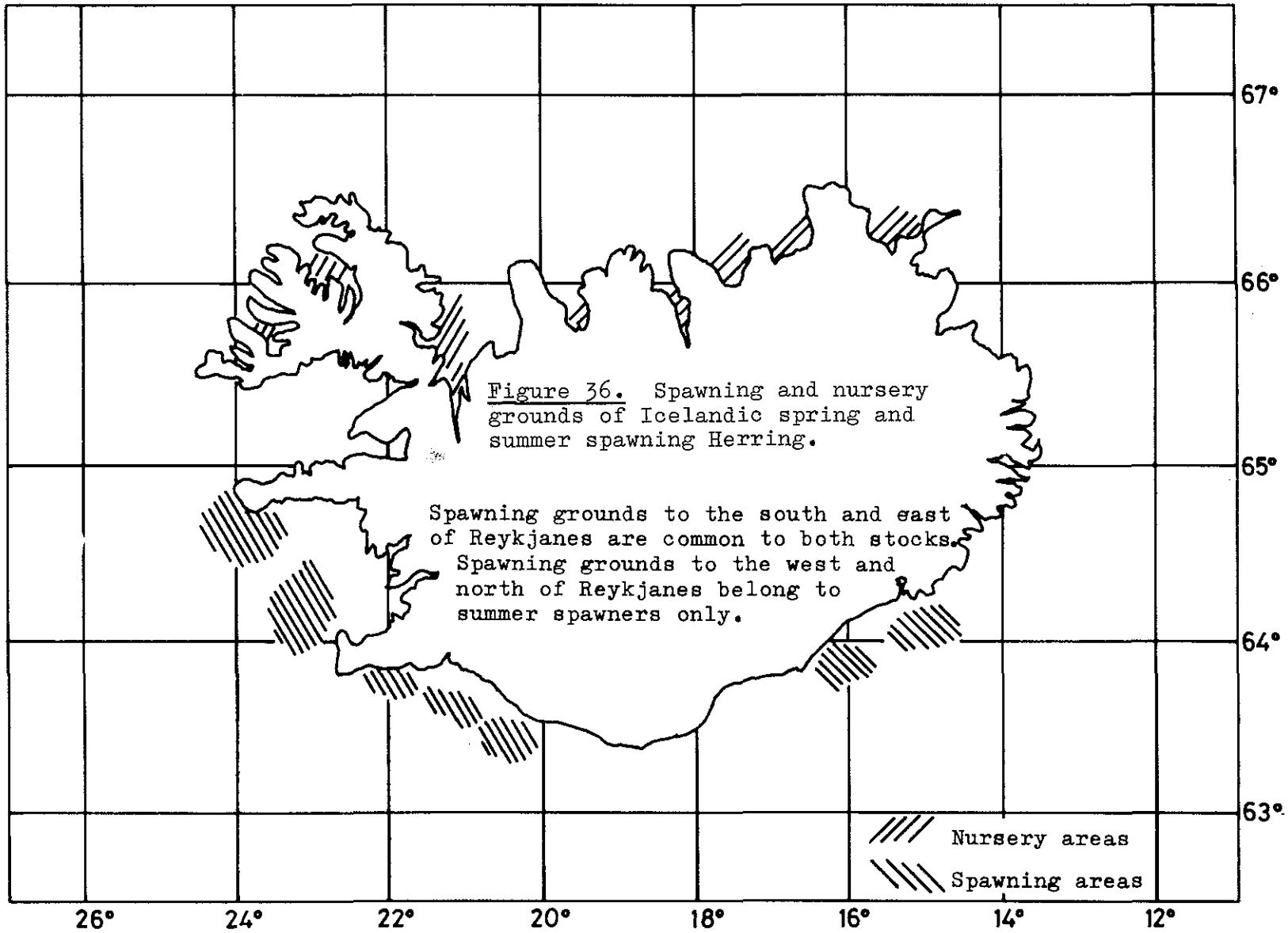


Figure 36. Spawning and nursery grounds of Icelandic spring and summer spawning Herring.

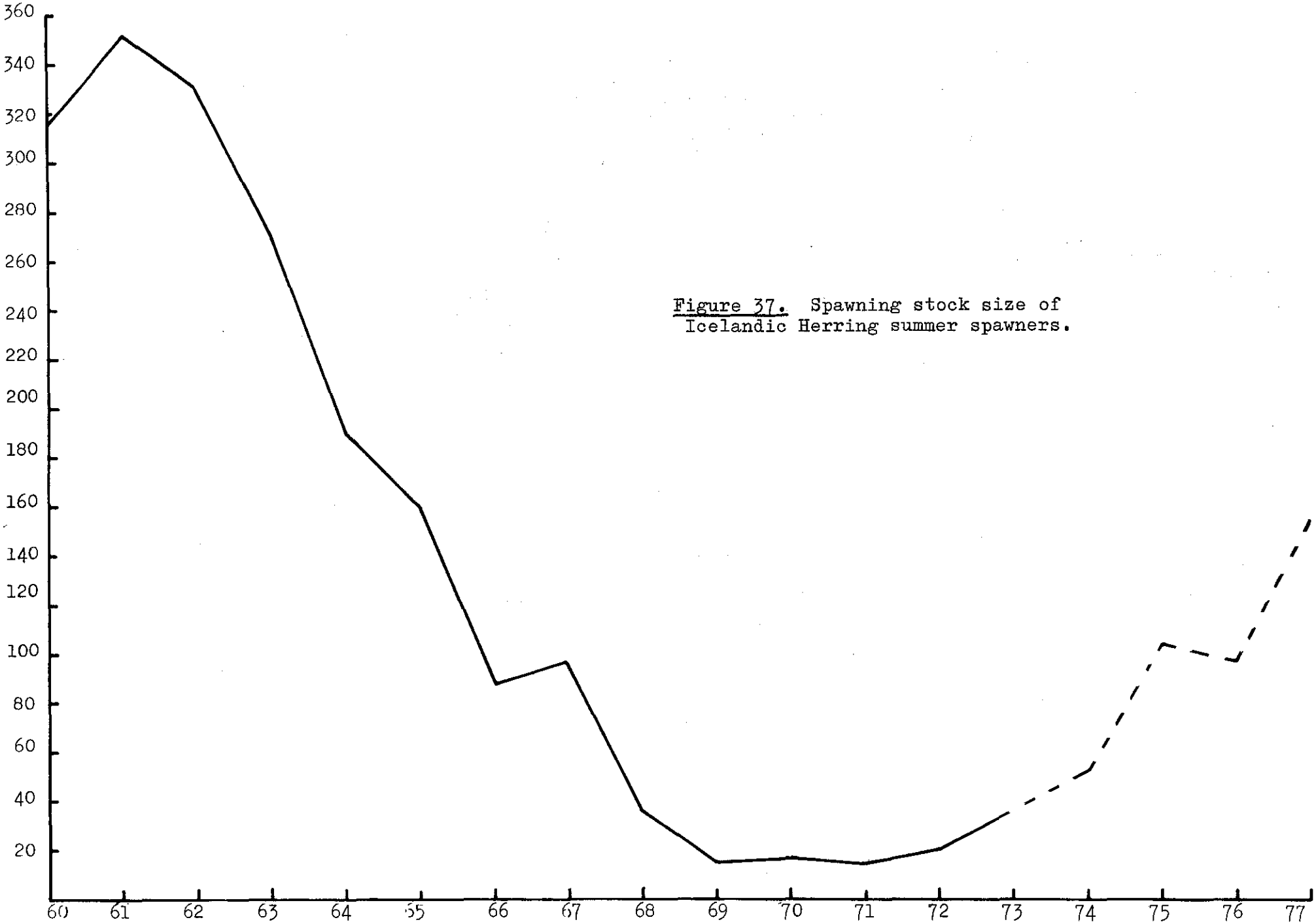


Figure 37. Spawning stock size of Icelandic Herring summer spawners.

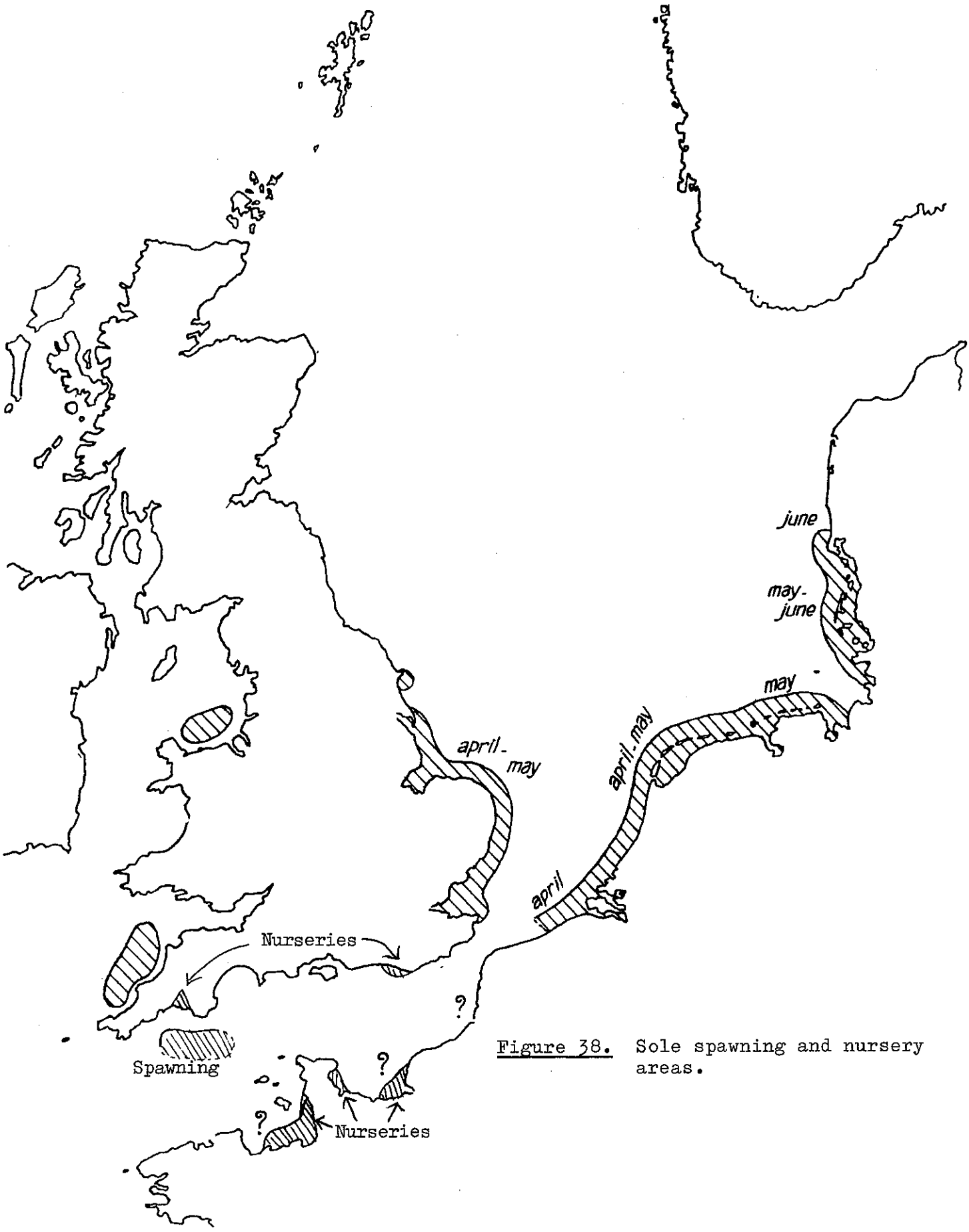


Figure 38. Sole spawning and nursery areas.

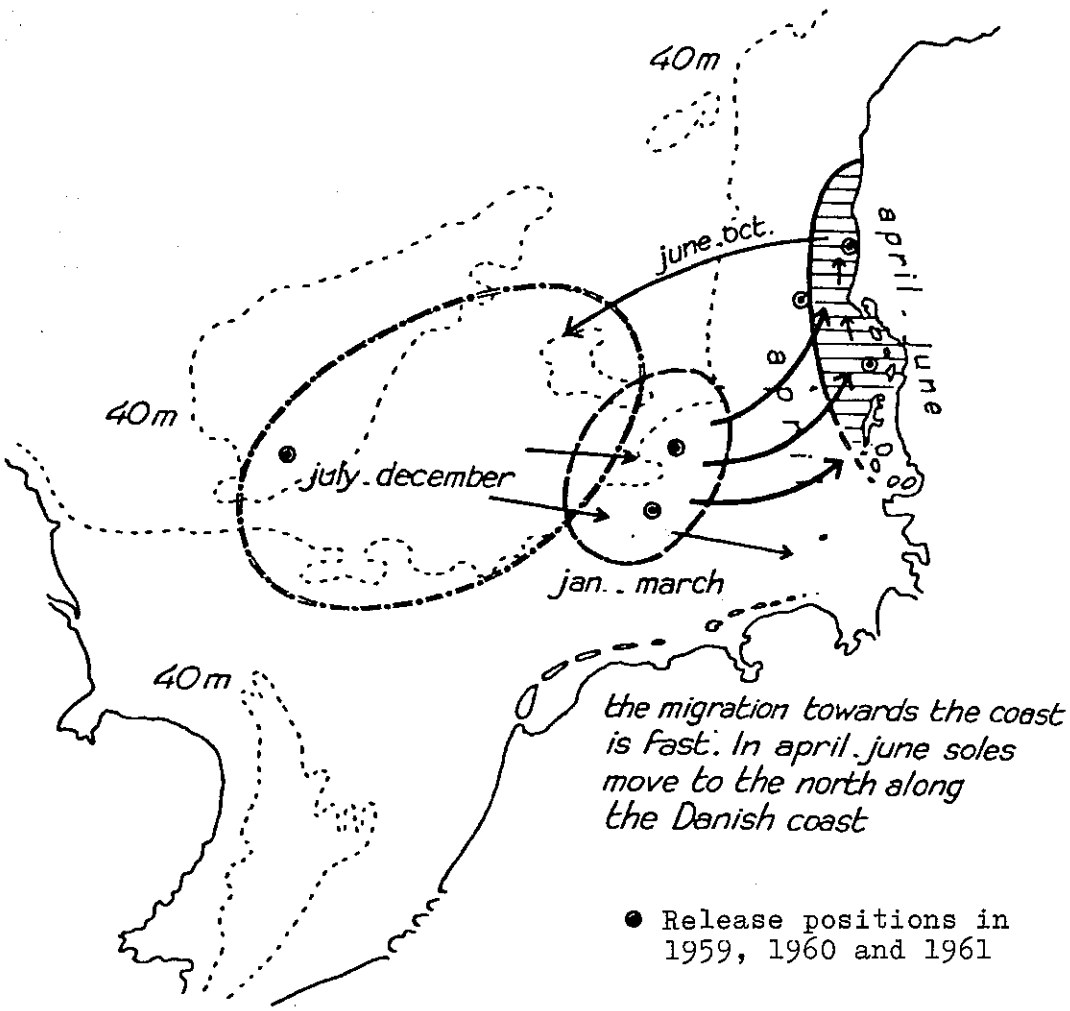


Figure 39. Migration of the Sole spawning near the Danish west coast.

Figure 40. Migration of the Sole spawning east of Heligoland.

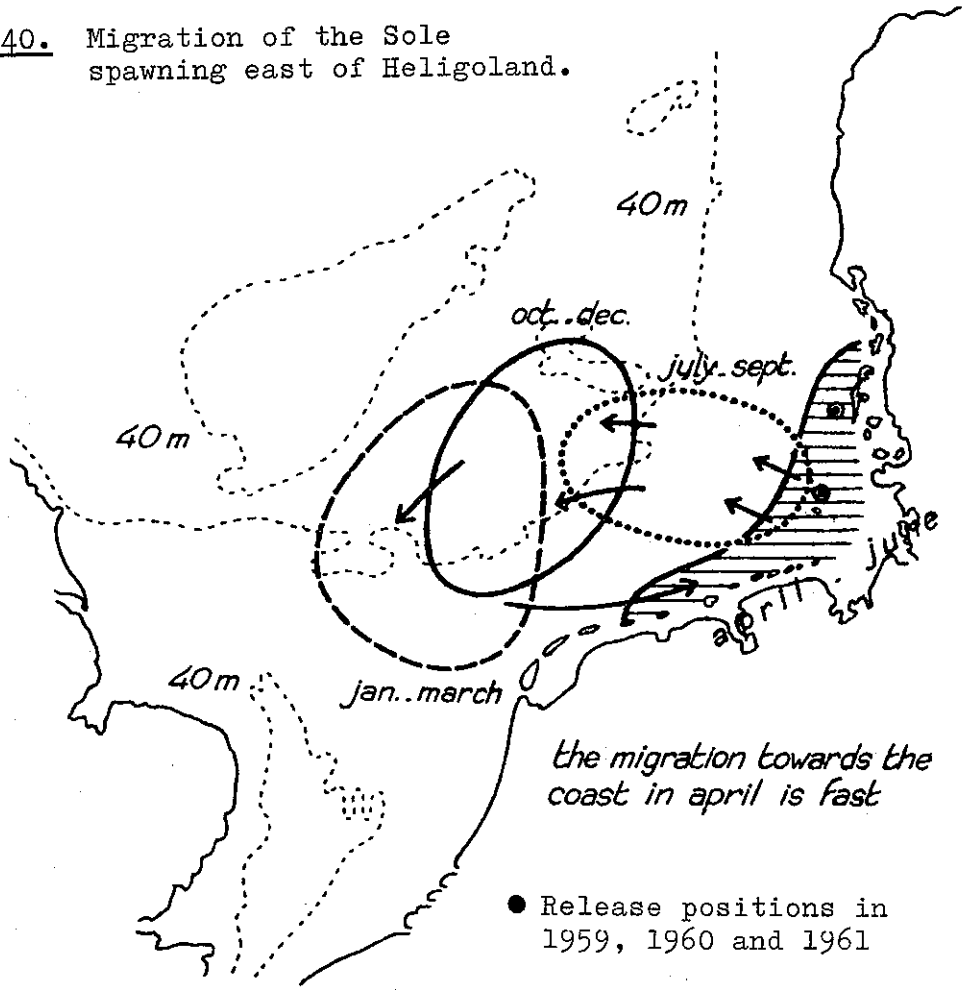


Figure 41. Migration of the Sole near the German and Dutch coasts.

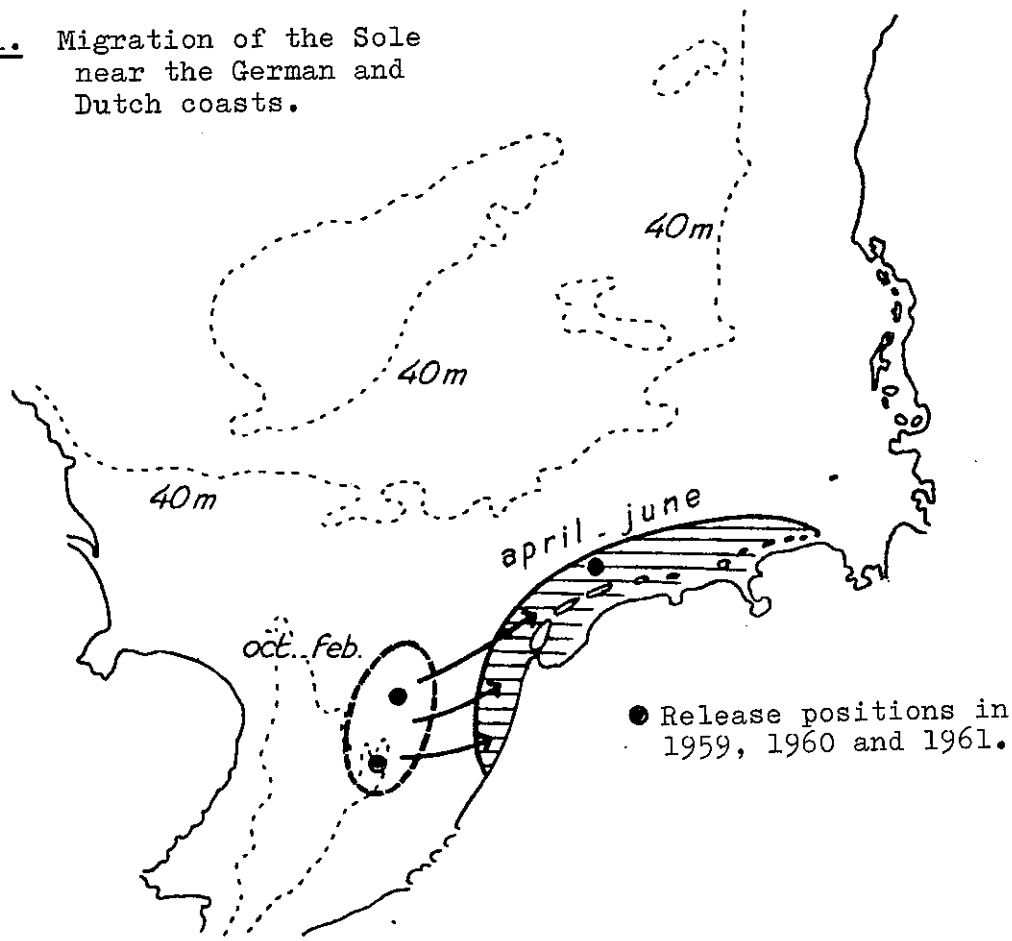


Figure 42. Migration of the Sole near the Dutch coast.

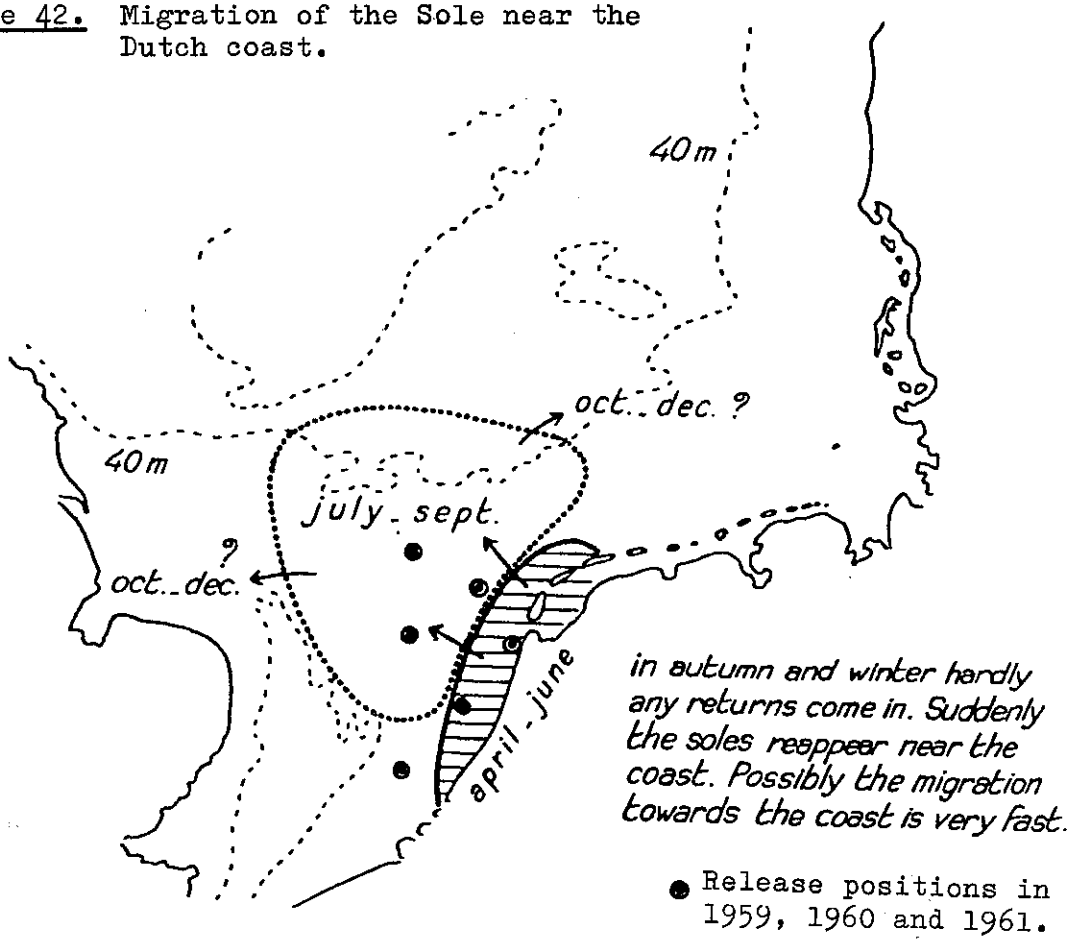


Figure 43. Migration of the Sole near the Belgian coast.

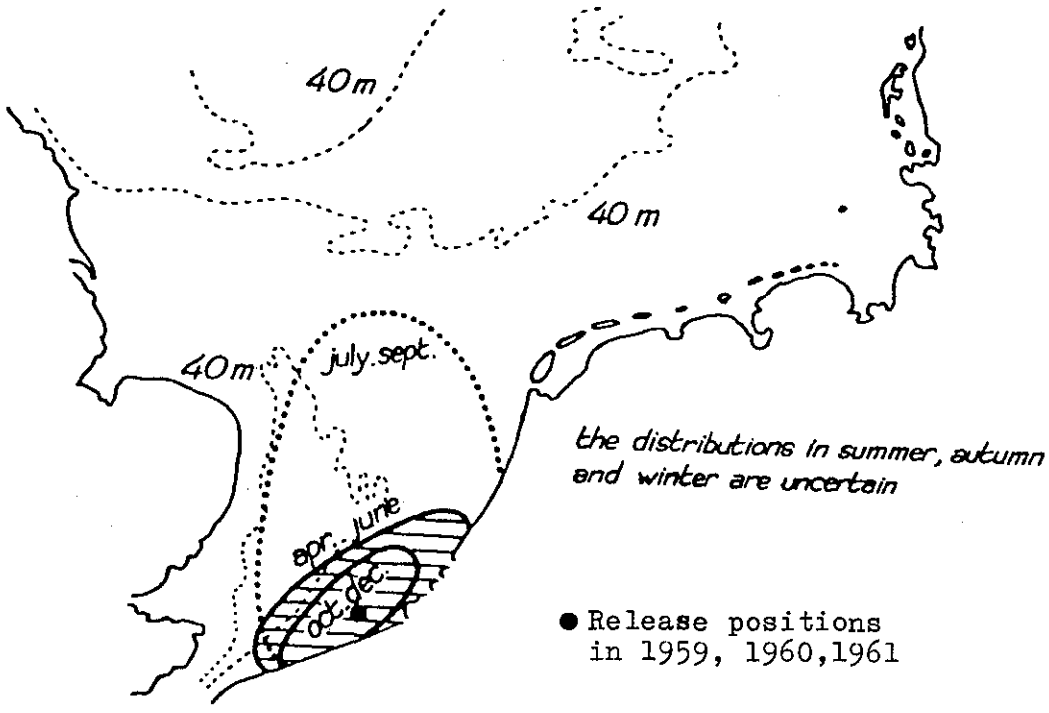


Figure 44. Annual average catches (1972-75) per statistical rectangle for the Dutch Sole fisheries. The surface of the circles is equivalent to the total catch.

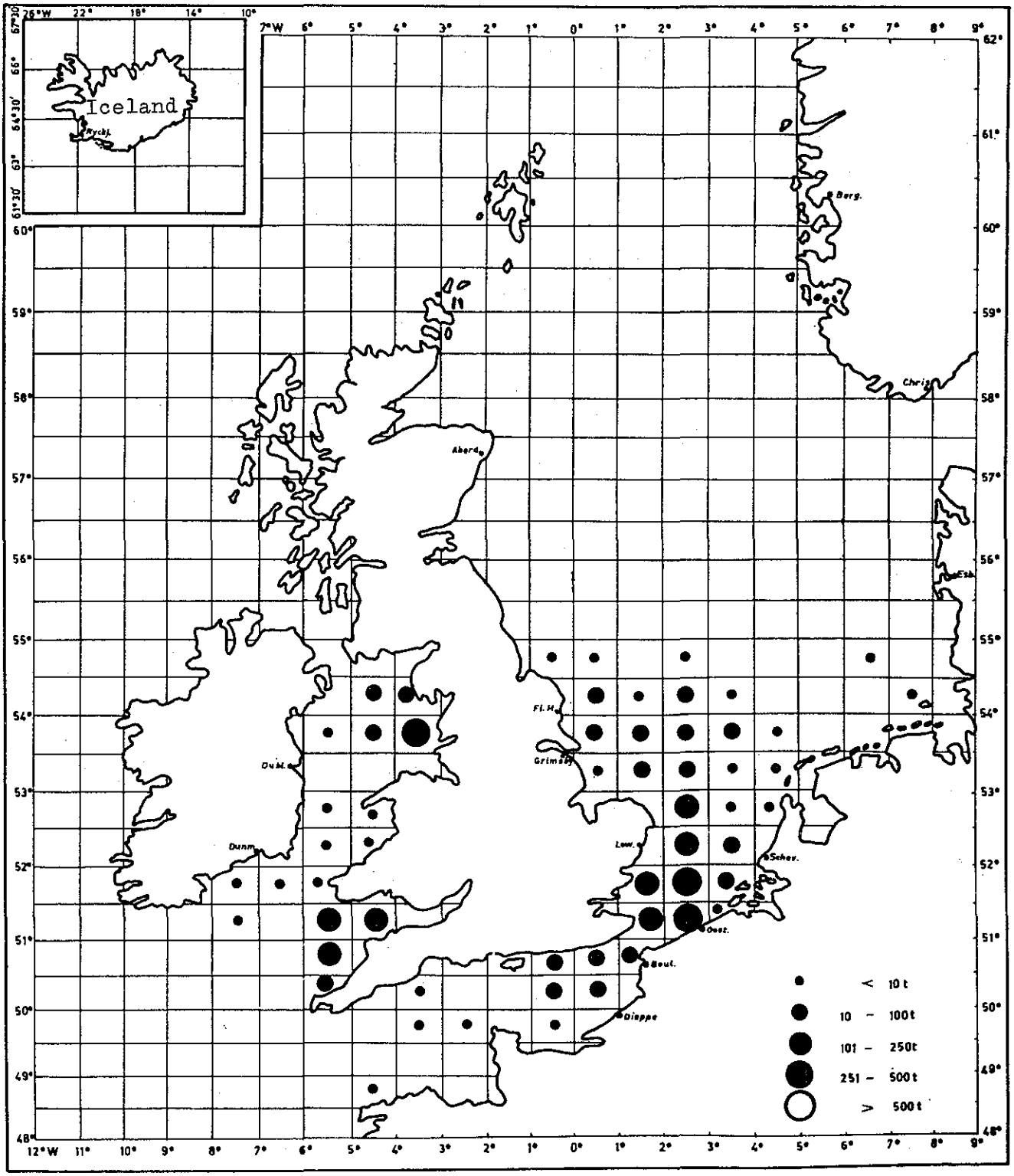


Figure 45. Distribution of Belgian Sole catches in 1972.

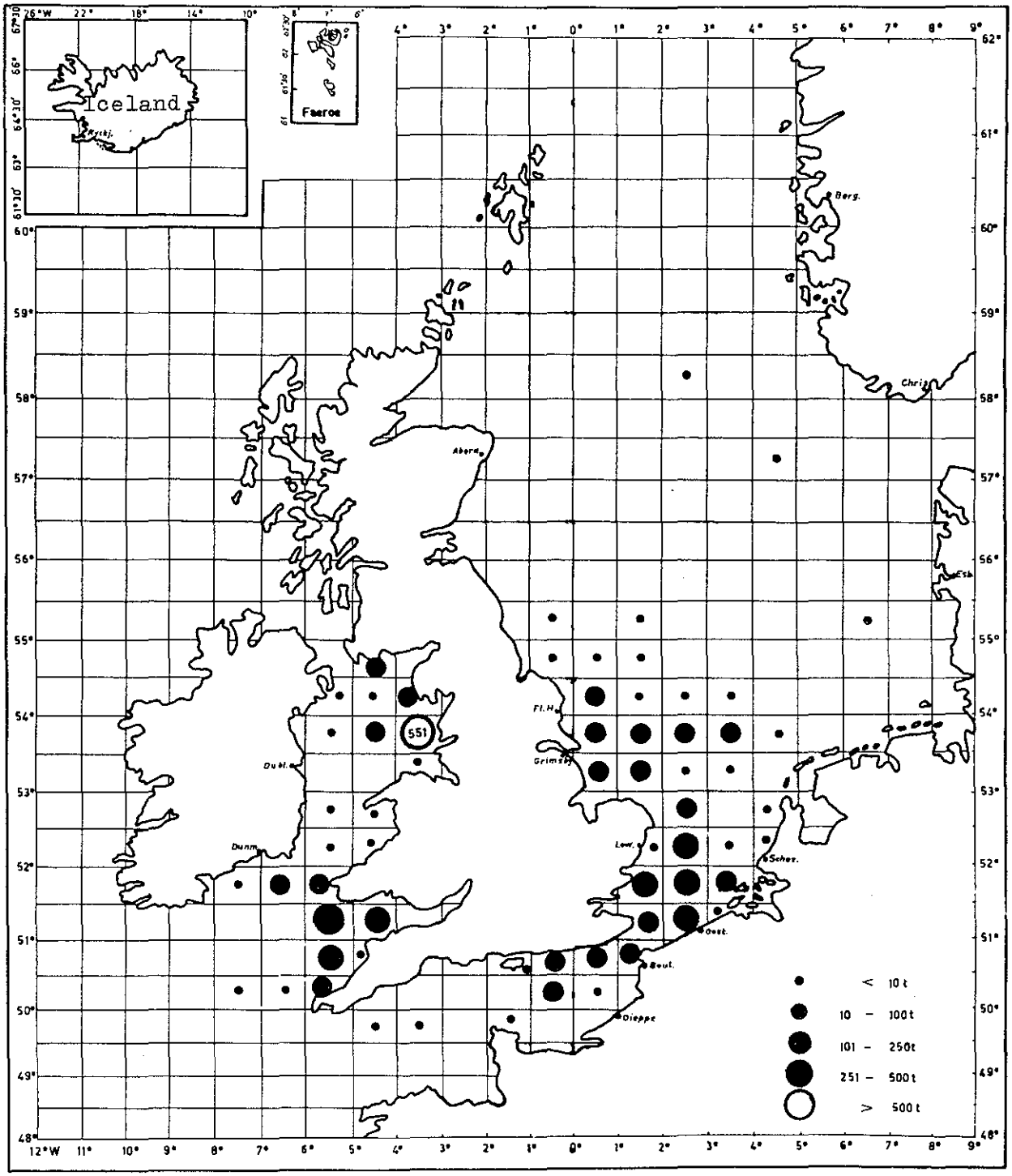


Figure 46. Distribution of Belgian Sole catches in 1973.

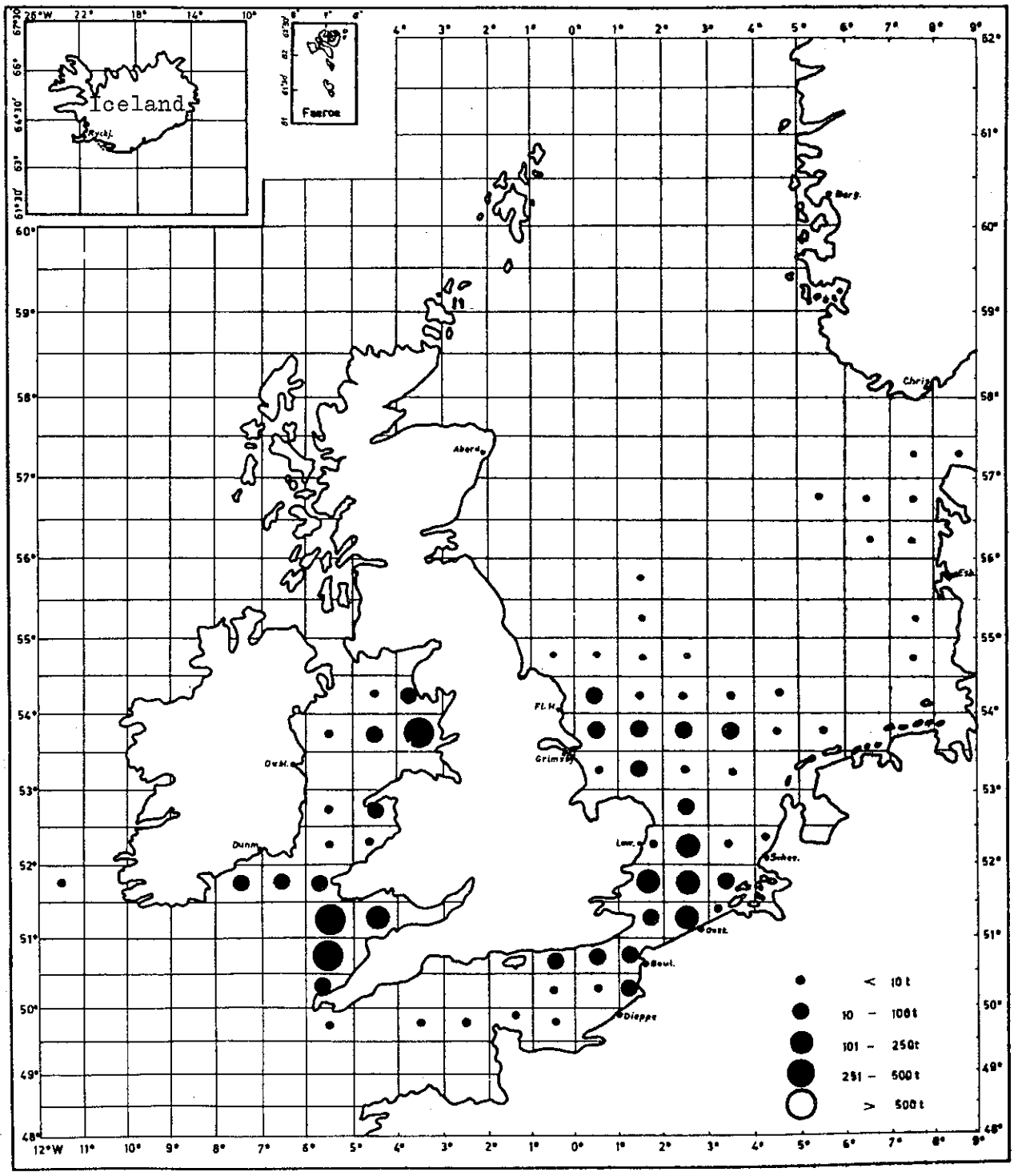


Figure 47. Distribution of Belgian Sole catches in 1974.

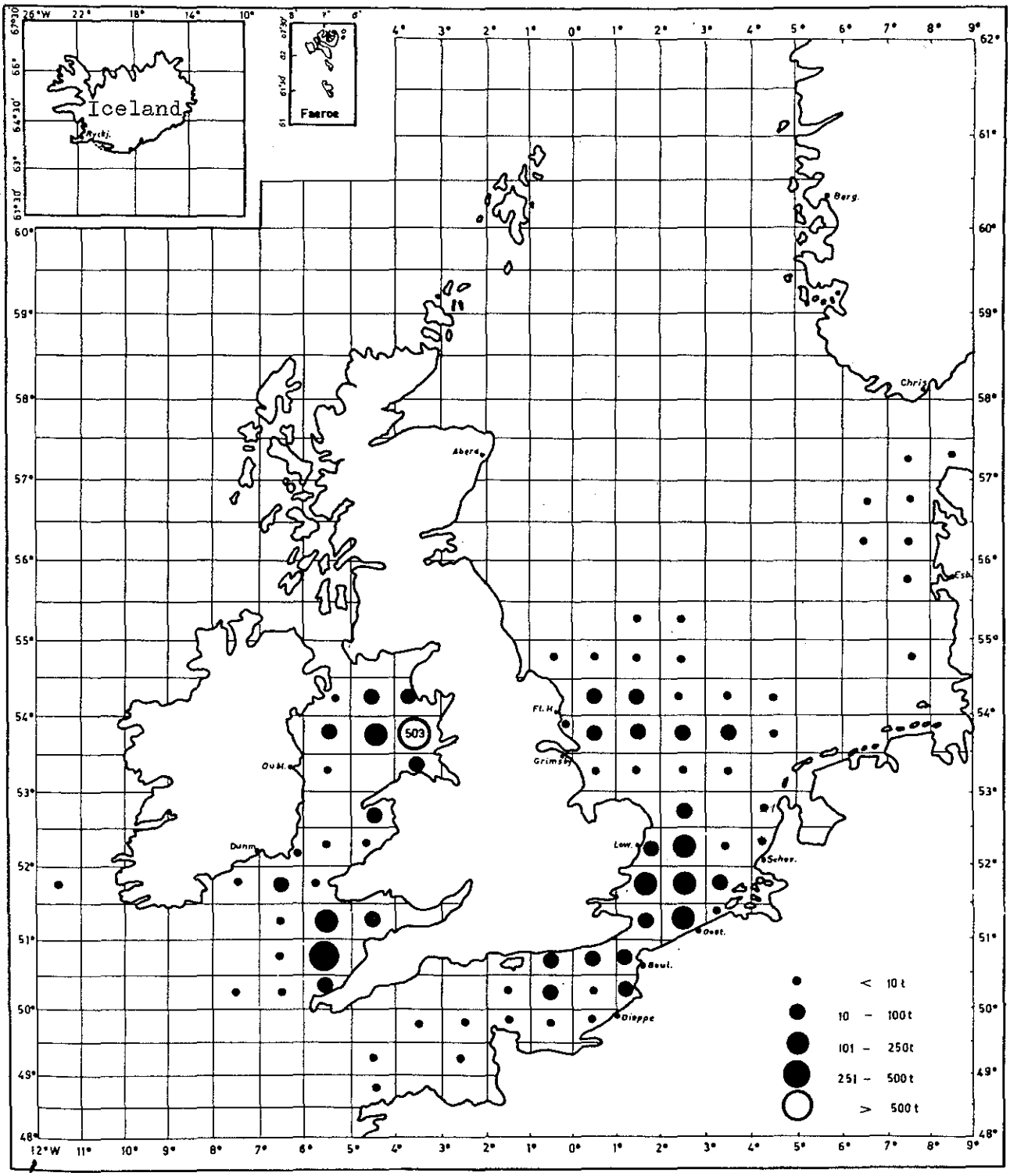


Figure 48. Distribution of Belgian Sole catches in 1975.

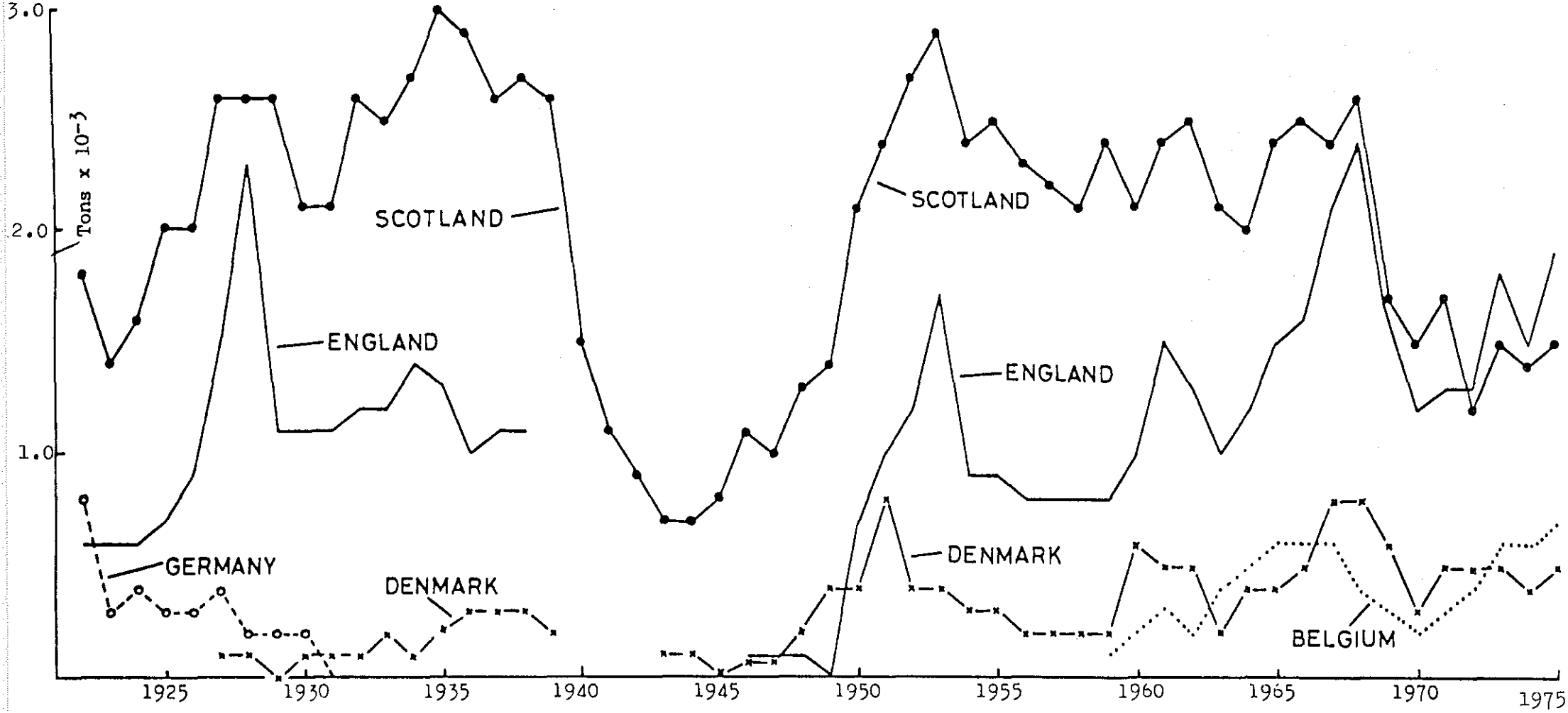


Figure 49. Lemon Sole. Landings 1922-75. North Sea (Sub-area IV).

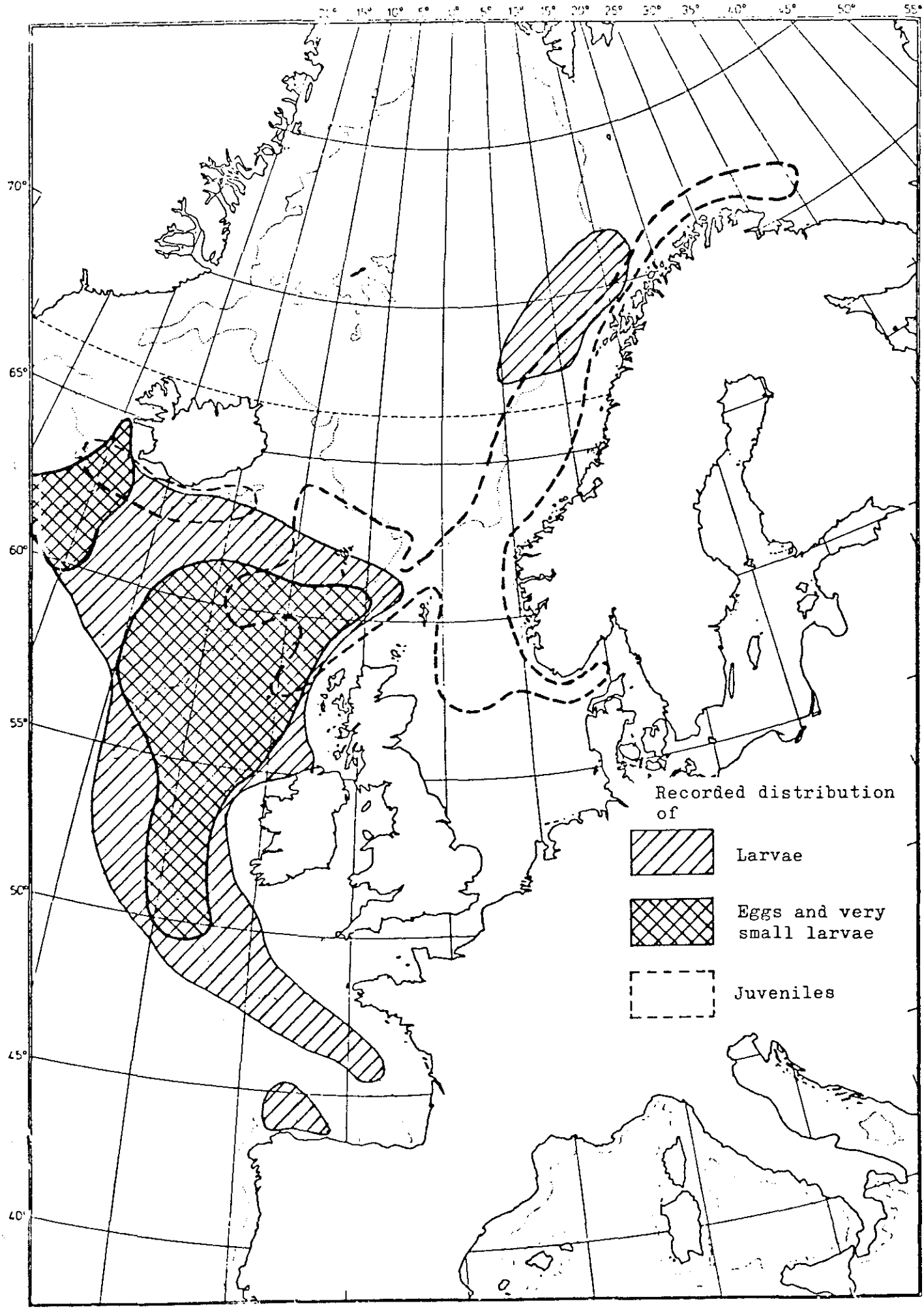


Figure 50. Blue Whiting. Spawning and nursery areas.

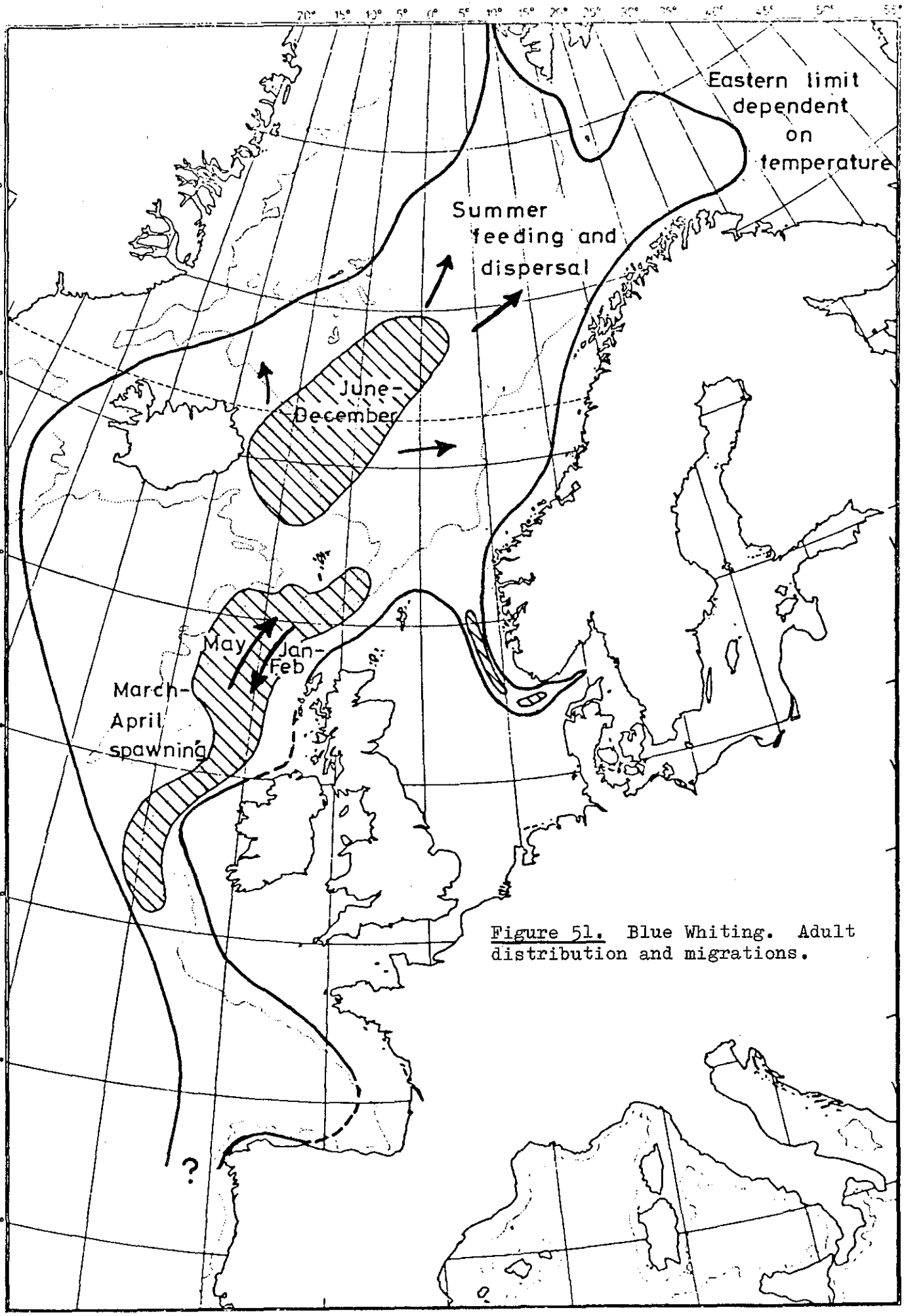


Figure 51. Blue Whiting. Adult distribution and migrations.

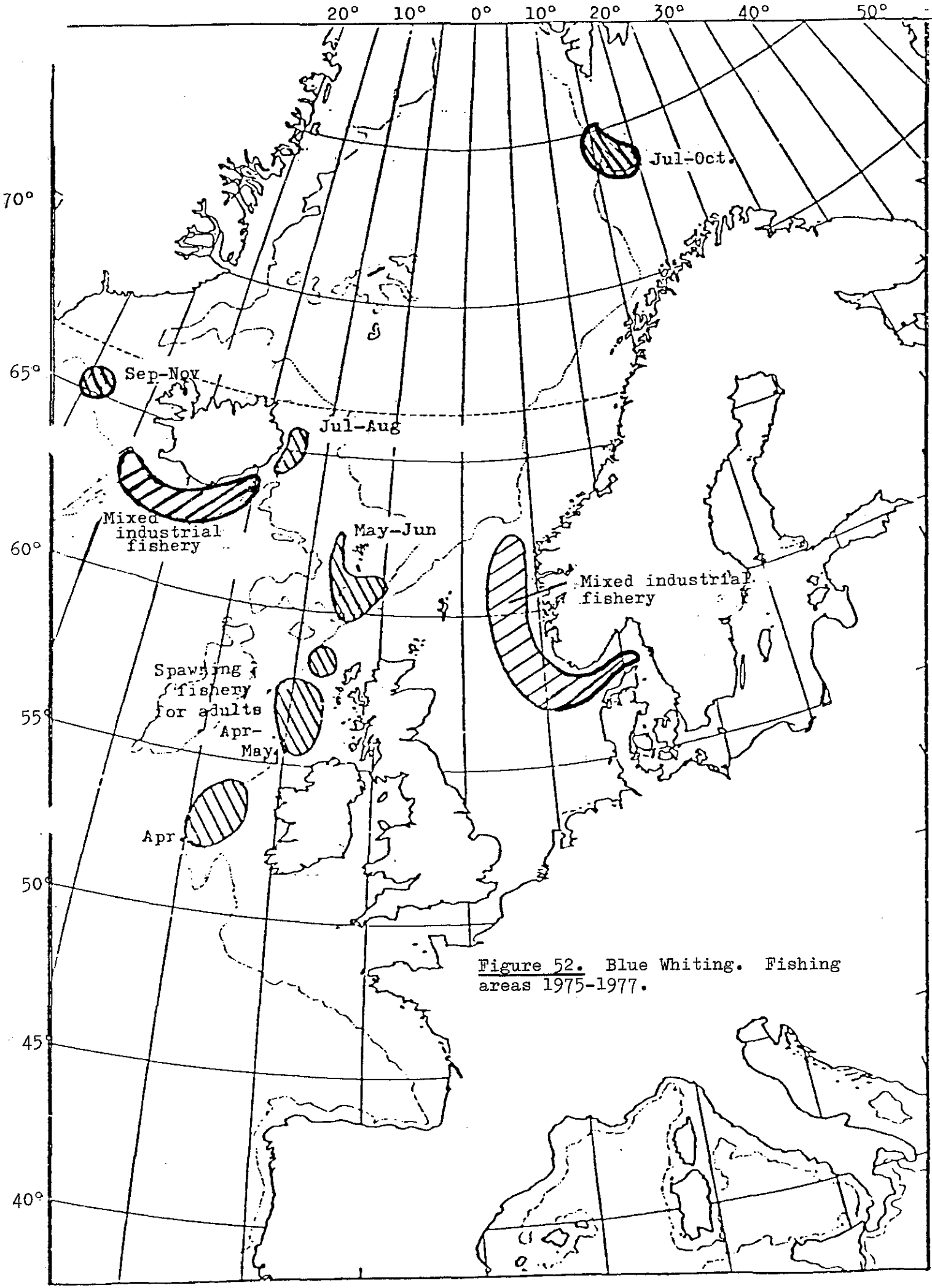


Figure 52. Blue Whiting. Fishing areas 1975-1977.

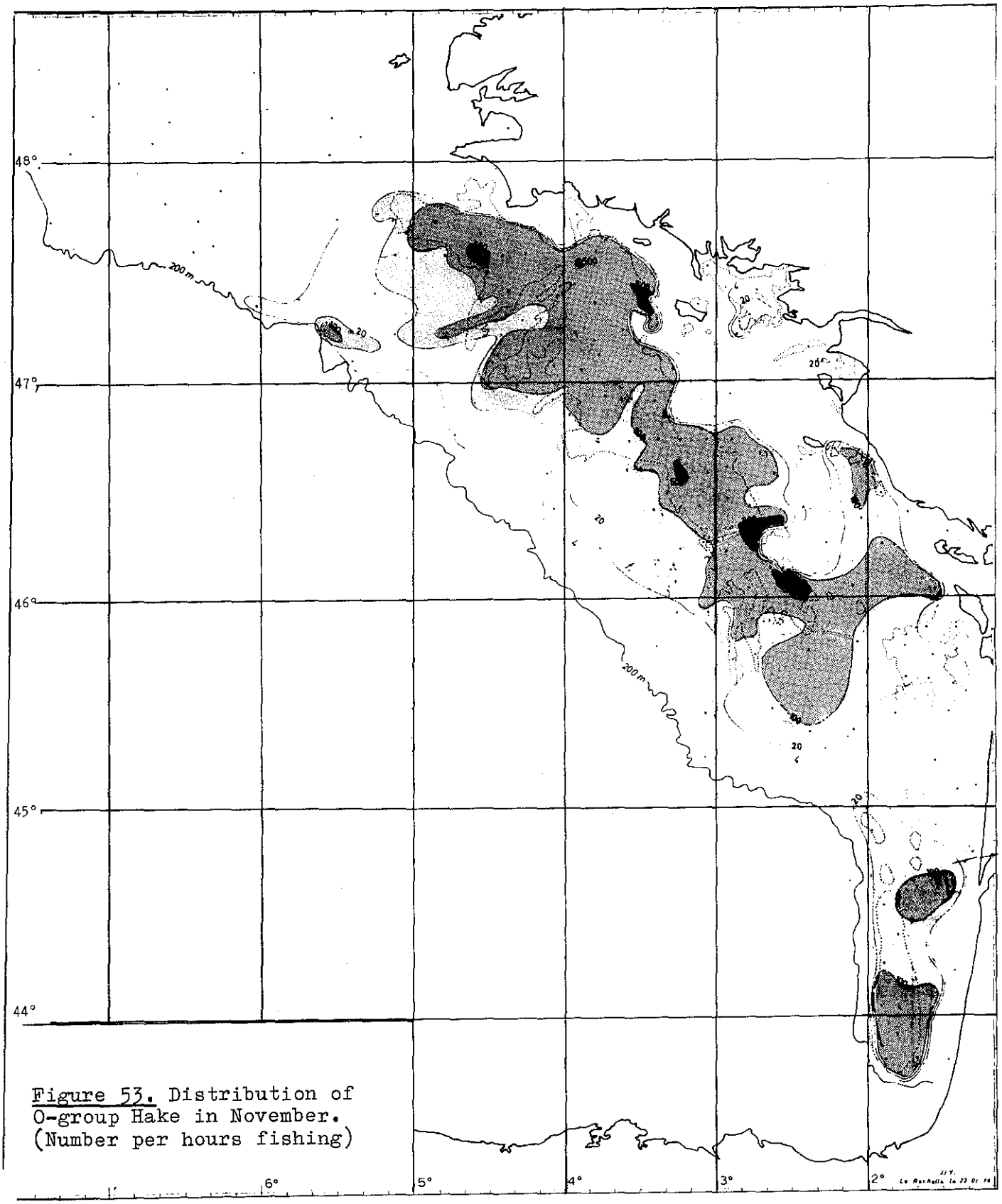


Figure 53. Distribution of O-group Hake in November. (Number per hours fishing)

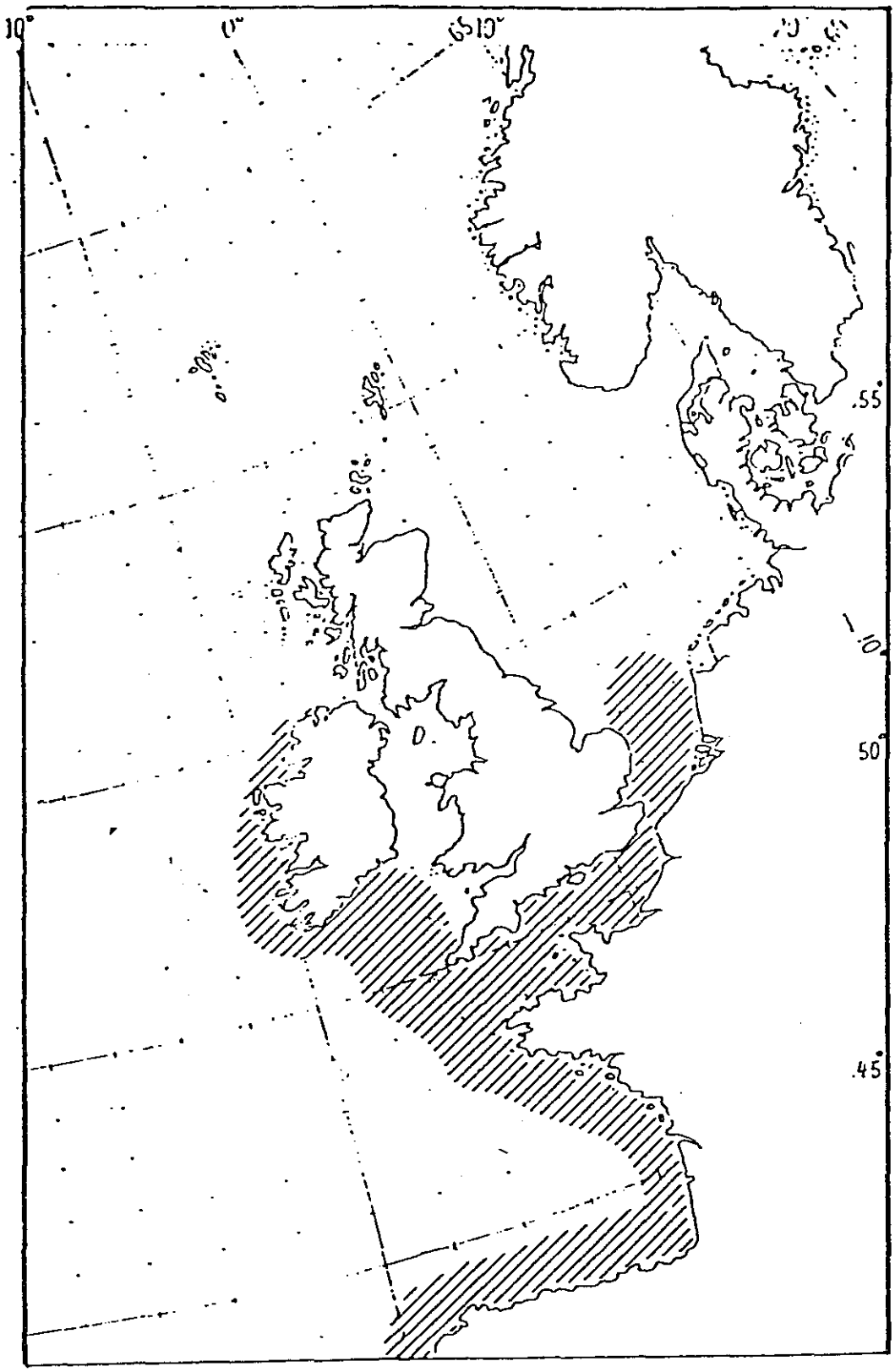


Figure 54. Distribution of adult Pilchard.

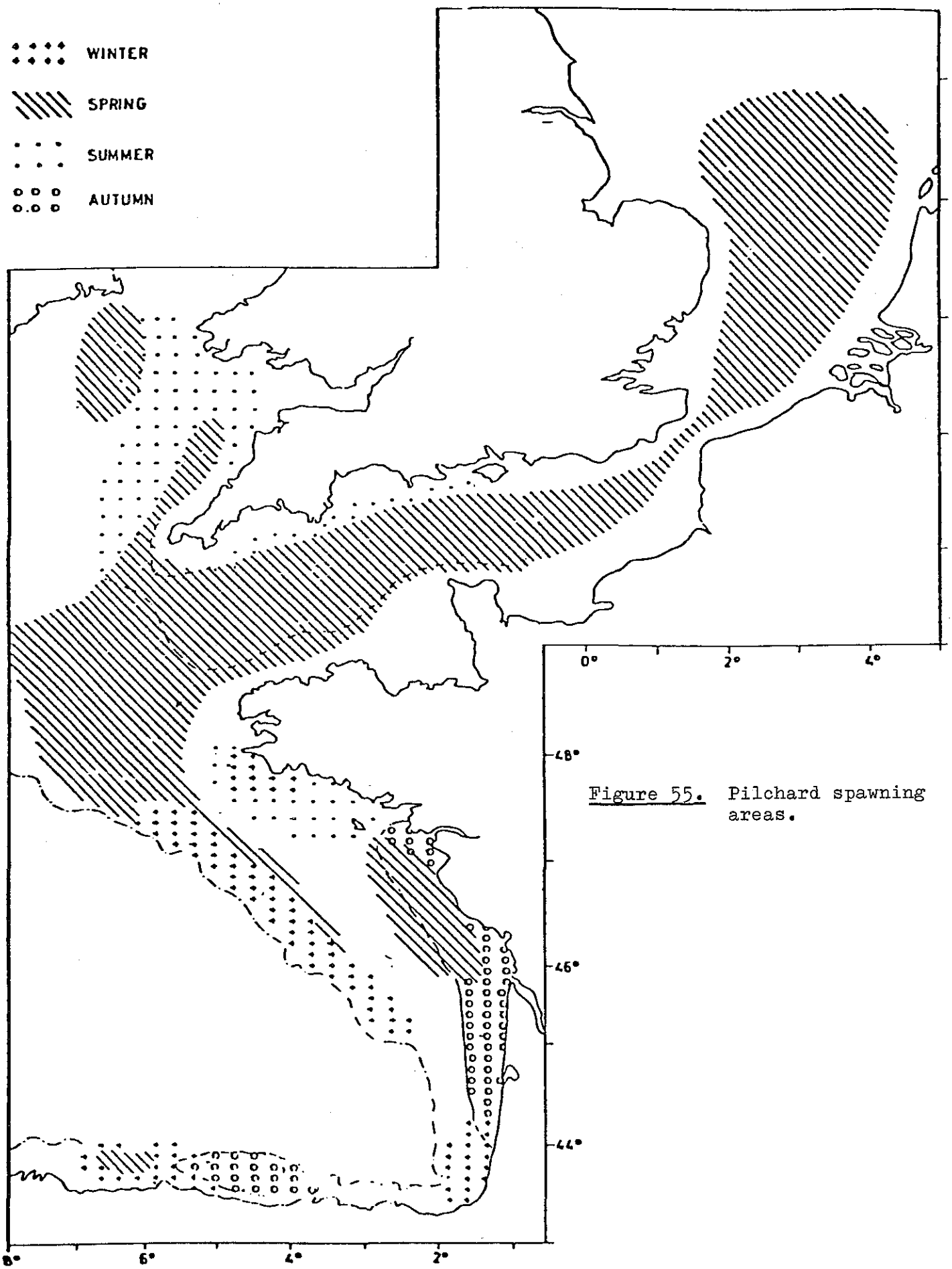


Figure 55. Pilchard spawning areas.

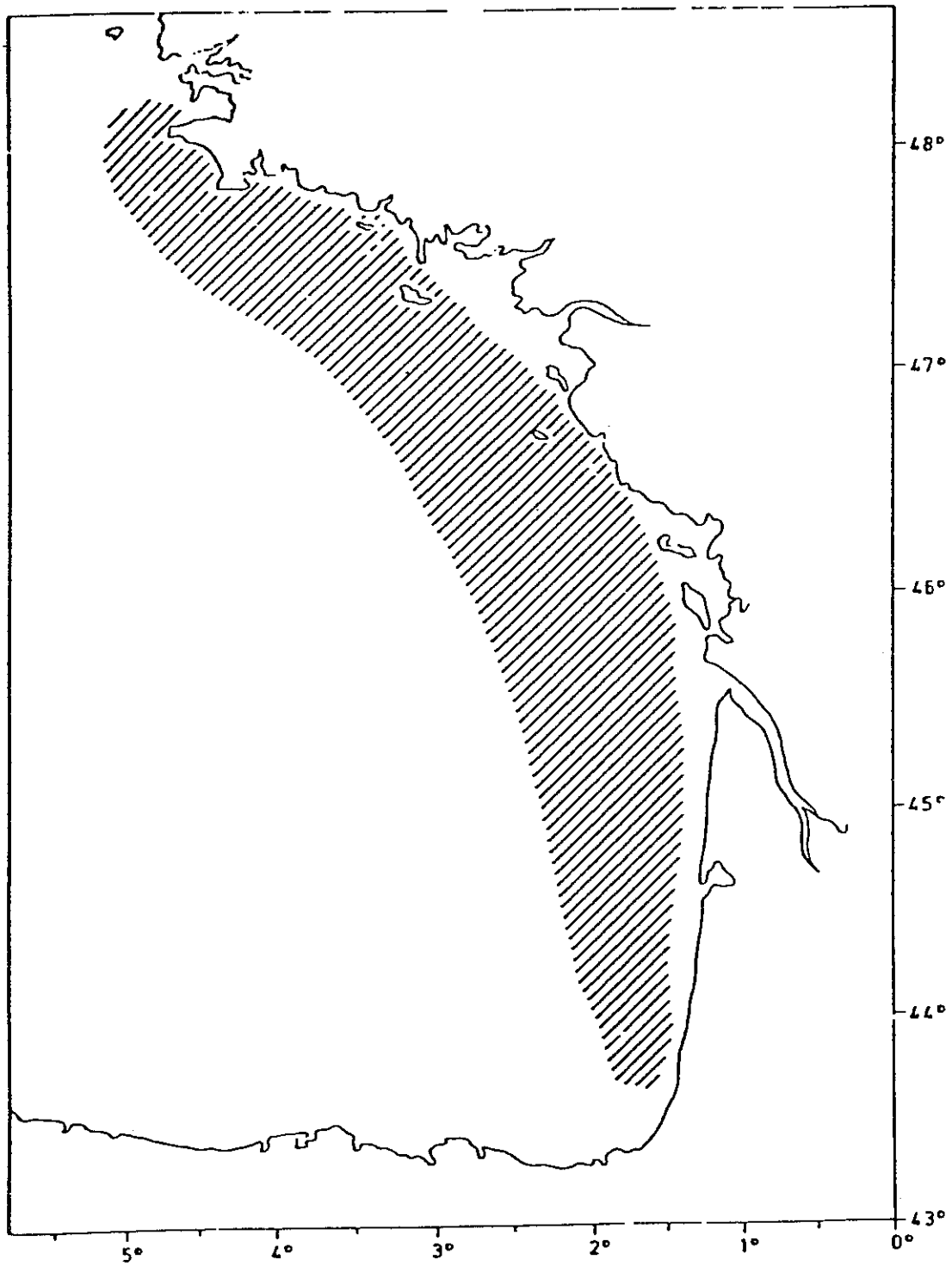


Figure 56. Pilchard. Southern population component. Distribution of 0- and I-group.

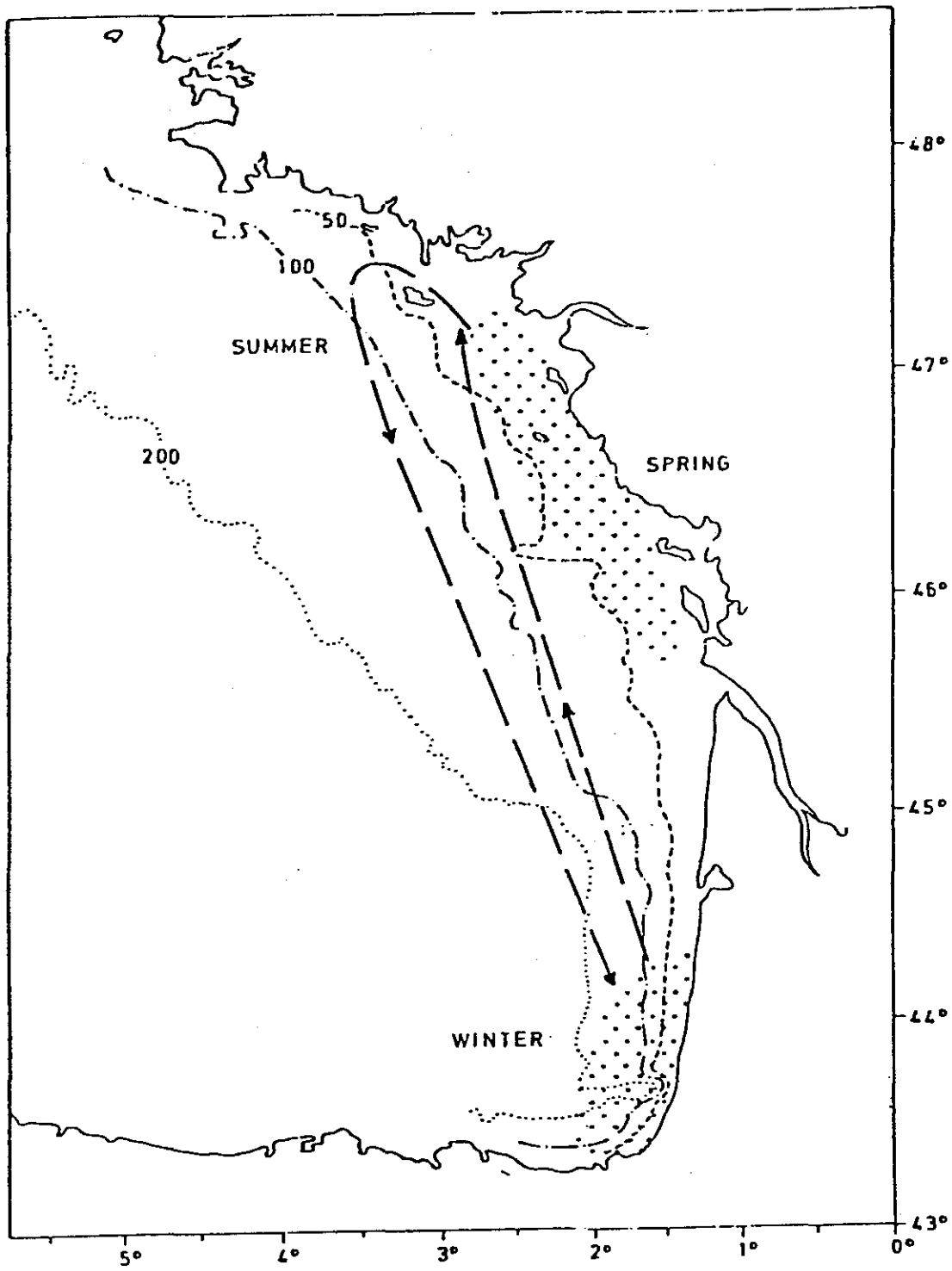


Figure 57. Pilchard. Southern population component. Migration pattern of adults (arrows) and spawning areas (dots).

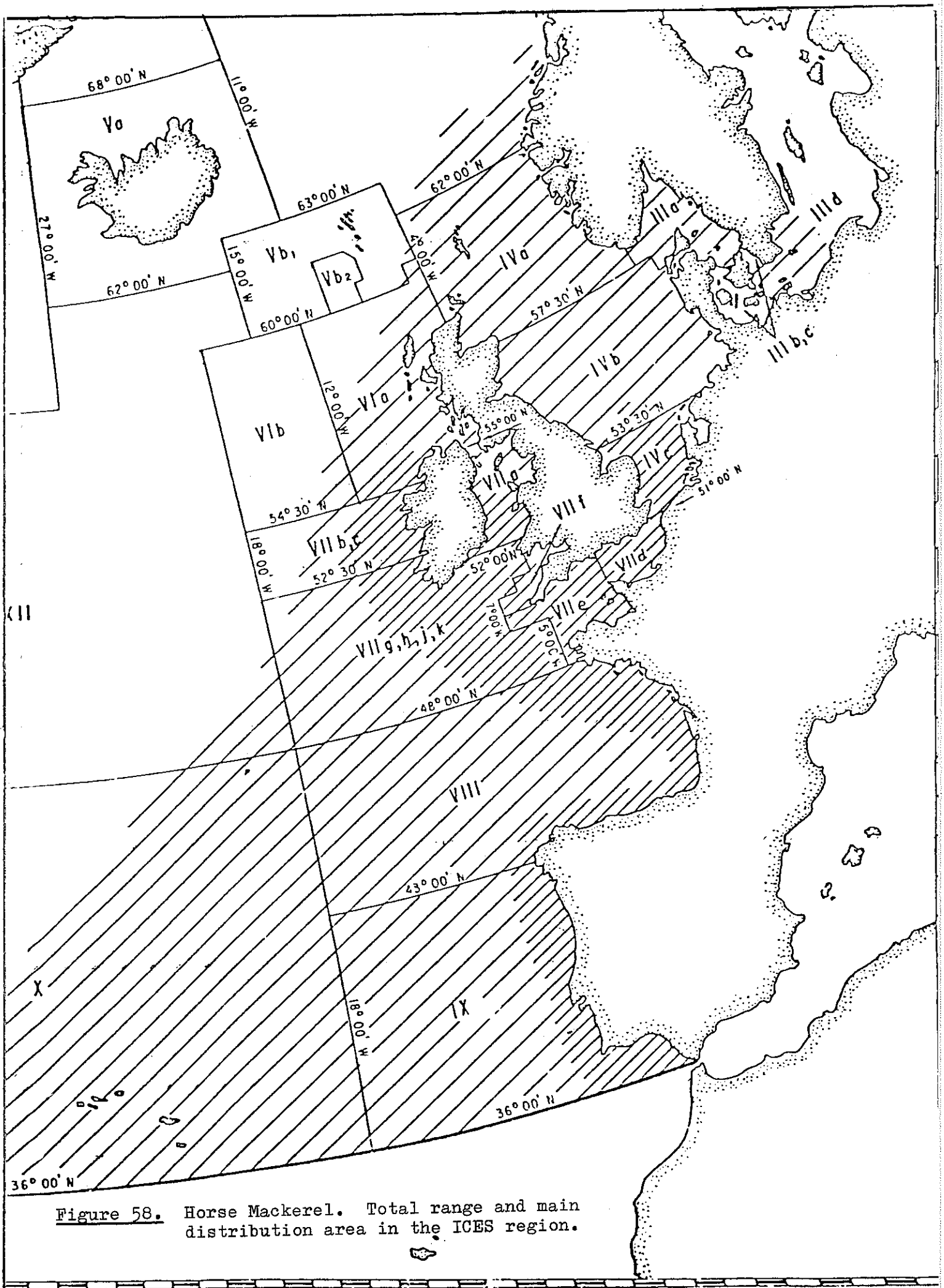


Figure 58. Horse Mackerel. Total range and main distribution area in the ICES region.

II. THE BALTIC AREA

1. COD

1.1 General distribution

In the Baltic (the sea area covered by the Baltic Fishery Convention) there are two main stocks of cod: the Baltic cod (Gadus morhua callarias L.) which is commonly found east of 14°30'E (west of Bornholm) with a distribution extending northwards to the northern part of the Gulf of Bothnia; and the Atlantic cod (Gadus morhua morhua L.) with its main distribution to the west of 14°30'E. Due to fluctuations in the relative proportions of the stocks and to differing hydrographical situations the boundary between the two stocks is not a very distinct one.

1.2 Spawning

The main spawning areas are found in the deeper part of the main basin of the Baltic as shown in Figure 59. To the east of Bornholm the most important spawning areas are the Bornholm Basin, the southern Gotland Basin, the Gdańsk Deep and the Słupsk Furrow. In the Belts, Kiel Bay, and Mecklenburg Bay spawning takes place in depths of 20-40 m, in the Arkona Basin in 40-50 m (temporarily at least).

As a minimum salinity of 10‰ is necessary for the eggs to float and thus for their successful development, spawning in the Bornholm Deep generally takes place in depths of more than 60 m, in the Gdańsk and Gotland Deep at 70 m or even deeper, if the oxygen conditions permit.

The highest density of eggs east of Bornholm is found in the Bornholm Basin, the eggs in the Gotland Basin are, however, distributed over a much larger area. A conservative estimate, based on the mean densities of eggs in the period 1954-70 and on the size of the areas, indicates that the total number of eggs in the Gotland and Gdańsk Basins is about twice that in the Bornholm Basin. On the other hand, the survival of eggs is higher in the Bornholm area. The main spawning time is March in the Belts, Kiel Bay, and Mecklenburg Bay, and in April in the Arkona Basin. The spawning season east of Bornholm is very prolonged beginning in March in the Bornholm and Gdańsk Deeps, in April in the Gotland Deep, and ending in August. The most intensive spawning period is usually May-June. It varies from year to year, however, depending on temperature, salinity and oxygen conditions.

1.3 Nursery and feeding areas

The young cod, in age groups 0 to II are found along the coasts in shallow water and most frequently in the deeper waters (40-70 m) close to the main spawning areas. North, east, and south of Bornholm young cod are abundant. High abundance has also been observed along the Polish and the Soviet coasts from Oder Bank to Ventspils, as well as off the east coast of Gotland and on the southern part of the Swedish east coast, at the Rönne Bank, the Midsea Banks and Słupsk Bank. Part of the cod larvae and the very young cod presumably drift slowly eastwards and northwards with the current, later an active migration may take place. This may explain the occasional abundant occurrence of I and II group cod in the Åland Sea, where no cod eggs and larvae are found and 0-group cod only occasionally. The long migrations performed by the

Åland Sea cod, and the frequent migrations from east to west in the southern Baltic are a consequence of this dispersal.

In the southern and to some extent in the central Baltic proper recruitment to the fishable stock is primarily dependent on the local spawning and the young fish grown up there and in the neighbouring coastal areas. In addition these areas receive a varying, but important, contribution of recruits which have grown up in the northern area of the Baltic, in the Åland Sea and even farther north, where no effective spawning is possible. This immigration is an important source of bias when making catch predictions.

1.4 Migrations

The main migration routes of maturing cod in the Baltic are shown in Figure 59. Cod from the northern areas and the Åland Sea mainly pass east of Gotland, to the Gdańsk Bay or to the Bornholm Basin. Cod in the area between Gotland and the Swedish east coast south of the Åland Sea usually keep to the western part of the area, migrating mainly to the Bornholm Basin, but to some extent also into the outer Gdańsk Bay. Migrations southwards occur, e.g. from the east coast of Gotland in all seasons, the most important period being late autumn and early winter. Reasons other than maturation for the migration may be involved, for example unfavourable oxygen content in the deep water and the search for food. In the southern Baltic, east of Bornholm, migrations from Słupsk Furrow, Gdańsk, and southern Gotland region westwards (to Bornholm Basin) predominate, varying from year to year possibly due to different oxygen and salinity conditions. The cod in the Bornholm area seem rather stationary and only a very small percentage of cod from any part of the Baltic east of Bornholm migrate to the west of that island.

In the area west of Bornholm cod from shallow water migrate to the deeper parts of the Arkona Basin to spawn. Migrations to the Bornholm Basin and to the Belts may be even more important. The Arkona Basin, however, is a very important feeding area, particularly for young cod. In the area to the west of Gedser-Dars mature cod during winter migrate northwards through the Great Belt to the Kattegat. In the Sound a similar migration is observed to the Kattegat, but also southwards to the Arkona Basin.

Cod in all regions feed throughout the year except for a short period before spawning, and in very severe winters.

1.5 The fishery

From 1967-77 the catches were as follows (in 000's tons):

Sub-divisions	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977[1)]
22	29	33	29	31	32	33	38	31	32	33	30[x)]
24	15	19	13	13	15	16	16	15	13	16[x)]	17[x)]
25-32	152	164	170	154	118	144	143	148	195	203	160
Total	196	216	212	198	165	193	197	194	240	252	207

1) Preliminary.

x) Including Sub-division 23.

In the catches age groups 2, 3 and 4 dominate by weight. Recruitment to the fishery starts at age 2 in Sub-divisions 22 and 24 and at age 3 in Sub-divisions 25-32. 3 year old cod are mature but only a small proportion of the 2 year olds. At present, the 1972 and 1976 year classes are both very large and important to the fishery. The former still yields a major part of the catch whilst the latter is recruiting to the fishable stock.

The fishery is almost exclusively carried out by otter trawl. In periods with a deficit of oxygen in the Bornholm Basin midwater trawls are used. The most important fishing period for this type of fishery is winter and spring. Some fishing with lines and nets is also carried out off the coasts of the southern and Central Baltic. The greatest catch is taken in Sub-division 25, but the yield in Sub-divisions 26 and 28 has increased in recent years. North of Gotland a fishery is carried on only at a low level, e.g. in the Åland Sea; and to a very small extent in the Gulf of Bothnia with lines and nets.

1.6 Management

Due to differences in exploitation rates and the pattern of migration the mortality rates vary considerably, being highest in the western Baltic:

Mortalities of 3 year old and older cod in 1973-75

	Sub-divisions		
	22	24	25-32
M (assumed val.)	0.2	0.2	0.3
F (from VPA) ≥ age 3	1.20	1.10	0.49
Z	1.40	1.30	0.79

The first recommendation for international management of the Baltic cod, to avoid overexploitation of the stock, was made by ICES in 1974 (Coop.Res.Rep., No.44). In 1975 a TAC was first proposed, for the year 1976, for Baltic cod of 150 000 tons in Sub-divisions 25-32 and of 41 000 tons in Sub-divisions 22 and 24. Due to differences in stocks and their vital parameters management is now carried out in 3 units in Sub-division 22, Sub-division 24, and Sub-divisions 25-32.

The Baltic cod fishery is regulated by an internationally agreed minimum mesh size, a minimum landing size and by quotas.

2. FLOUNDER

2.1 General distribution

Flounders are uniformly distributed in all parts of the Baltic except the deepest area around Gotland, the easternmost part of the Gulf of Finland and the Bothnian Bay where they are rarely found. In the Bothnian Sea the abundance is low. The flounder shows a wide tolerance to changes in salinity and may sometimes enter fresh water.

2.2 Spawning

In order to float eggs of flounder must be in water of a salinity not less than 10‰. This means that flounder are able to spawn in all the deeper parts of the Baltic, but the success of the spawning depends on the oxygen content. Values of about 1 mg O_2 per litre and less are critical. In the central and northern areas of the Baltic proper special populations of flounder have developed which are able to spawn in shallow waters. These populations are called Bank Flounders. Their eggs are deposited on the bottom in depths of 6-20 m and are able to develop at a salinity of about 6‰ (Oder Bank, SW Finland).

In the Arkona Basin flounders spawn in March-April, in the Bornholm Deep from March to May, and in the Gdańsk and Gotland area from March to June (Figure 60).

The flounder of the Swedish east coast, including Öland and Gotland, spawn mainly in May. At the southwest coast of Finland the spawning period lasts from May to July. The eggs hatch in 5-6 days at 10°C, and in 10 days at 5°C.

2.3 Nursery grounds and recruitment

On hatching the larvae are about 3 mm long and live a pelagic life until 7-10 mm long. They then seek the bottom in shallow coastal waters before metamorphosis. At the end of their first year of life flounder off Bornholm and to the east of it are about 4-5 cm long, further west they are larger; in the Belts and the Sound 11-12 cm. The next year is mainly spent in intermediate water depth. Recruitment to the fishable stock begins in the Baltic proper in the third year of life. In the southern Baltic only a small number of flounder survive beyond an age of 8-9 years. Growth is slower in the eastern and northern areas.

2.4 Migrations

Tagging experiments have shown that there is a rather distinct boundary between the stocks of mature flounder in the southern and in the central parts of the Baltic. The border line may be drawn from the southern point of Öland to Rozewie in Poland. Mature flounder to the north of this boundary seem to be confined to the coastal area and perform only short migrations from shallow to deeper water, and along the coasts. The deep water areas, around Gotland, with a very low oxygen content act as barriers which are only to a small extent breached by the fish swimming over them.

In the southern Baltic, to the south and west of the boundary mentioned above, flounders are distributed all over the area, except in the Bornholm Deep during summer and autumn when the oxygen content is low. There are distinct spawning migrations, in winter, from shallow water along the coasts to the spawning grounds in depths of 40-80 m in the Bornholm Basin, the Słupsk Furrow and the Gdańsk Deep. From the Arkona Basin a great many pass eastwards to the Bornholm Basin. After spawning the fish migrate to very shallow water of 0.5-10 m depth. The females leave the spawning grounds first.

Tagging experiments have shown that migrations of mature flounder are rather short and that a large number of local populations exist. A few migrations from the Baltic, east of Bornholm, and from the Arkona Basin to Kiel Bay, the Sound and the southern Kattegat have been observed. Very few flounders go from the Belts and the Sound to the Baltic.

In the northern areas, for example the Bothnian Sea, the densest concentrations of adult fish keep fairly close to the coasts during summer. In the autumn a great part of the stock there is found in the areas around the open sea grounds, especially at the Finngrund Banks. In the Bothnian Bay, in the far north, the waters in and close to the archipelagos are the main feeding areas but scattered occurrence is noted all over the sea. There is also some immigration of herring from the Bothnian Sea to the Swedish side for feeding.

3.4 Migrations

Herring make spawning, feeding and wintering migrations between the open sea and the coasts. Some populations have developed more distinct and longer migrations. This is true for instance for the herring spawning in spring at the Swedish coast northwards up to the Åland Sea, and for herring of the Rügen-type spawning in spring at the German and the western part of the Polish coast. The former, representing one of the richest stocks of the Baltic, makes wide ranging feeding migrations from the end of May to July to the water areas east and southeast of Bornholm, returning northwards in late autumn and winter.

From the northernmost Baltic proper and the Åland Sea the herring frequently pass east of Gotland on their way south to Gdańsk Bay and the Bornholm area. Fish from these waters very rarely pass westwards of Bornholm. The Rügen-herring migrates through the Belts and the Sound to the Kattegat and sometimes as far as the Skagerrak, after spawning. These results from tagging refer mainly to mature fish; the younger ones are probably more stationary.

In the Bothnian Sea herring migrations are usually more bound to the coasts. Important movements have been noted in this area, and in the Gulf of Finland, however, as indicated by the arrows in Figures 61 and 62.

The feeding migrations mentioned above result in extensive mixing of herring of different origin, particularly in the Bornholm Basin. As a result there are difficulties in identifying the constituents of catches and allocating them to stocks. This results in a certain level of imprecision in stock assessments. Tagging experiments reveal also great changes from time to time both in the frequency and range of migrations.

In addition to these longer migrations there are also inshore and offshore movements. Heavy concentrations of herring are sometimes noted during winter in the Swedish archipelagos. These fish disperse later over wide areas for spawning.

3.5 Fishery

The herring fishery in the Baltic has shown a rapid development during recent decades. The total catch amounted in 1960 to 168 thousand tons, in 1970 to 322 thousand tons and has increased since then almost uninterruptedly to 435 thousand tons in 1977 (Table 82). The large increase since the 1950s is due to a major increase in fishing effort due to the change from a coastal fishery to an open sea fishery with new fleets using bottom and pelagic trawls. The highest annual catch is taken in Sub-division 25, the Bornholm Basin, but herring fishing grounds, of somewhat lesser importance, are situated all over the coastal slopes of the Baltic Sea area to a depth of 100-120 m. Large catches are taken also with trap nets and set nets on spawning grounds in shallow waters.

3.6 Management

Due to differences in ecological conditions and in exploitation rates, the mortality rates vary considerably between stocks as shown in the text table below. The main predators on herring are cod and salmon. As the abundance of cod is higher in the southern and western Baltic, the natural mortality rate is estimated to be higher in these areas.

Mortality coefficients in various parts of the Baltic Sea in 1974-76 for 3 year old and older herring

	Sub-divisions					
	22-24	25-26	27-29	Gulf of Riga	30-31 and 29 north of 59°30'N	32
M (assumed value)	0.30	0.20	0.20	0.15	0.15	0.15
F (from VPA)	0.71	0.29	0.31	0.91	0.19	0.41

In waters where both herring and sprat occur they mix on the feeding and overwintering localities; especially young herring and sprat. Therefore the fisheries for both species are often mixed ones. This is an additional complicating factor in optimal management of these fish resources.

The first recommendation for international management of Baltic herring was made by ICES in 1974. Due to differences in the vital parameters observed in the various herring stocks of the Baltic Sea, the assessment of them was carried out in four different units:

Management unit 1 - Sub-divisions 22-26
Management unit 2 - Sub-divisions 27, 28 and 29 south of 59°30'N
Management unit 3 - Sub-divisions 29 north of 59°30'N, 30 and 31
Management unit 4 - Sub-division 32

(A chart of the Baltic Sub-divisions is attached to the end of this report).

The Liaison Committee of ICES recommended the first TAC for Baltic herring of 400 000 tons in 1976, sub-divided into 175 000 tons in Unit 1, 119 000 tons in Unit 2, 54 000 tons in Unit 3 and 52 000 tons in Unit 4.

International regulation of the Baltic herring fisheries is carried out by minimum mesh sizes and by quotas.

4. SPRAT

4.1 General distribution

Sprats are found all over the Baltic except in the Bothnian Bay. The main concentrations are found in Sub-divisions 25, 26, 28 and 29.

Sprats in different parts of the Baltic differ in their growth rates and other population parameters. It is therefore not possible, for assessment purposes, to treat all Baltic sprats as a single stock. On the basis of growth and mortality rates one can sub-divide sprat in the Baltic into three groups: one in Sub-divisions 22, 24 and 25, a second in 26 and 28 and a third in 27, 29 and 32.

The abundance of sprat is very variable. In the southern Baltic there were few sprats between 1937 and the early fifties; after this period the stock abundance increased to a very high level.

4.2 Spawning

Spawning begins in February/March in deep water layers of the basins. In the end of April or in May the sprat move for spawning into the upper water layer and simultaneously spread over the whole central and southern Baltic and to some extent over the northern areas, too. Nevertheless there are some spawning areas of more importance than others. Such areas are Kiel Bay, the southernmost part of Sub-division 24, the Bornholm Basin, the Gdańsk Basin and the southern part of the Gotland Basin (Figure 63).

Although the peak time of spawning does vary, it is mainly in June. Spawning ends during August. Little is known about larval drift. There is, however, a larval drift from southwestern areas in a north-easterly direction.

4.3 Nursery and feeding areas

The nursery areas for the Baltic sprat are the shallow waters, down to 50 m. Extremely abundant year classes are also distributed, as 0-group and I-group, in the open Baltic Sea. Their abundance and pattern of distribution vary considerably from year to year.

Figure 64 illustrates the main distribution of adult fish during the feeding season and Figure 65 shows the main overwintering concentrations.

4.4 Migrations

There are migrations during spawning time as well as during the feeding season. The migrations, and distribution, of adult sprat changes to some extent from year to year, influenced by environmental factors and stock size. Whereas adult sprat, during winter and during spawning are found in the open sea, feeding sprat shoals are distributed closer to the coasts. There has been observed an age-dependent distribution in the open Baltic Sea. The older sprat, beginning with age group 3, move into the open sea and form there the 'pool of seniors'. This is especially observed in the Gdańsk-Gotland area.

4.5 Fishery

Sprat in the Baltic Sea has been exploited, on a small scale for a long time. In the period up to 1962 the catch did not exceed about 50 000 tons. A rather large increase in exploitation started in 1963 and culminated in 1974 with a catch of about 217 000 tons. The catch statistics show a reduction in yield since then, to a level of about 182 000 tons in 1977 (Table 83).

4.6 Management

The increase in catches during the sixties was due partly to increased fishing effort and partly to increasing biomass. The first attempt to assess Baltic Sea sprat was made by the ICES Working Group on Assessment of Pelagic Stocks in the Baltic in February/March 1974. A preliminary TAC of 240 000 tons for 1976 was recommended by the Liaison Committee in 1975. The subsequent figure of recommended TACs are given in the following text table.

ICES recommended TACs for sprat by Sub-division and years (in tons)

Year	22 + 24 + 25	26 + 28	27 + 29 + 32	Total
1977				240 000
1978	33 600*	94 700	80 000	210 000
1979	34 000	80 000	41 000	155 000

* For Sub-divisions 24 and 25.

For assessments, the following estimates of mortality have been applied:

Mortality estimates, 2 year old and older sprat, ICES - Sub-division

	22	24	25	26	27	28	29	32
M (assumed value)	0.400	0.400	0.400	0.500	0.200	0.500	0.200	0.200
F	0.173	0.173	0.173	0.274	0.277	0.274	0.277	0.277

It is a well known fact that sprat is an important food component for predatory fish. Interrelations between sprat stocks and the stocks of cod and salmon have to be taken into consideration for future assessment work.

5. SALMON

5.1 Distribution and migration

Baltic salmon is confined to the Baltic drainage area, mainly east of longitude 13°E and, in the present situation, to a reduced number of rivers flowing into the Baltic (Figure 66). Its occurrence in the western Baltic is sporadic, and the number leaving the Baltic through the Danish seas is thought to be insignificant.

Sweden contributes about 70% of the total natural reproduction, maintained by 13 rivers, chiefly flowing into the Gulf of Bothnia. Spawning occurs in a few other streams occasionally. Apart from the Finnish-Swedish boundary river Torne älv, the salmon run in Finland is limited to 2 medium-sized rivers, both in the Bothnian area. The natural production of Baltic salmon in the USSR is mainly concentrated in two major rivers running into the Gulf of Riga. In addition, spawning occurs in a few other rivers flowing into the Gulf of Riga, to the Gulf of Finland and to the main basin of the Baltic. In Poland, there is only one river now supporting a salmon run regularly, and that only to a very minor extent.

The main basin of the Baltic is the principal feeding area of adults from most of the Baltic rivers. A proportion of the population from the Gulf of Bothnia remains in that area during their entire marine phase and are joined by feeding migrants originating in other parts of the Baltic area. Relative to salmon feeding in the main basin, those staying in the Gulf of Bothnia have a considerably lower growth rate. The stock in the Gulf of Finland originates almost exclusively from the USSR.

The Gulf of Riga is mainly a transition area for local migrants heading for feeding places in the main basin, in the Gulf of Finland, and in the Gulf of Bothnia, and for returning spawners.

Migration of young salmon which leave the rivers of the Gulf of Bothnia in late spring seems to follow the main current, an anti-clockwise surface circulation in the Gulf of Bothnia and in the main basin. The majority migrate into the main basin more or less directly, joining the post-smolts from the southern and eastern rivers.

The spawning migration in the main basin is predominantly a rapid northward movement to home rivers, starting in late March or in April. In Sweden and Finland, grilse, i.e. salmon which have spent two summers in the sea, do not enter their home river before July. The salmon which have spent two winters or longer in the sea start the run upstream somewhat earlier. The first salmon making a return migration to rivers in the Gulf of Riga appear there in late May or early June and enter the rivers in August. The peak of the grilse run occurs in September.

Apart from these large-scale migrations of fish returning to spawn, salmon, during the marine phase, do not seem to exhibit a distinct migration pattern. Catch per unit effort data from the offshore fishery, however, suggest some sort of seasonal regularity in the movement of the main body of feeding salmon. In autumn the greatest abundance is found in Sub-divisions 29 and 30 and in the northern parts of the Sub-divisions 27 and 28. In winter, the main distribution is usually somewhat more southerly and in spring the greatest concentration occurs in Sub-divisions 25 and 26.

5.2 Recruitment

It is estimated that the establishment of power plants, pollution, and various human activities have reduced the run of natural smolts to the sea to a quarter of the original production at the beginning of this century of about 8 million.

These losses have been partly compensated by the release of hatchery-reared smolts, chiefly by Sweden. In Sweden, 24 rivers, with a drainage area of more than 1 000 km^2, contribute to the reproduction, naturally and artificially. At present, the total number of reared smolts reaching the sea is thought to exceed the natural smolt run as shown in the text table below.

Estimated annual smolt recruitment to the Baltic

Countries	Natural production about 1900	Natural production in 1970	Number of released reared smolts in 1977[b)]
Denmark	-	-	120 000
Finland	2 540 000	350 000[a)]	101 000
Germany, (F.Rep.of)	-	-	17 000
Poland	10 000	1 000	?
Sweden	4 000 000	1 400 000	2 014 000
USSR	700 000	204 000	670 000
Total	7 250 000	1 955 000	2 828 000

a) A further decrease has occurred in the 1970s.

b) USSR, mainly yearlings and one year old fish, other countries' smolts of an age of two years.

According to recent observations, the number of spawners in Swedish and Finnish rivers is too small to utilise the available spawning sites. The small number of spawners in rivers has even endangered the salmon smolt rearing. In 1976, the density of parr in the river Tornionjoki- the most productive of the remaining Baltic salmon rivers - was very low, and in the rapids of the upper tributaries, 0-group parr were totally lacking. In 1977, the same phenomenon was observed in the rivers Simojoki and Kalix älv. The reason for this insufficient reproduction is thought to be the change in efficiency and intensity of the fishery; but disease may also be a factor.

5.3 Fishery

The original salmon fishery was mainly based on catching ascending spawners in the rivers, until the end of the 19th century. At present less than 5% of the total yield of Baltic salmon is taken by the river fishery. Until the late 1940s the sea fishery was mainly a coastal fishery with fixed gear of spawning migrants similar to the river fishery. Now the coastal fishery contributes about 15% of the total catch. Although drift nets were operated at least from the middle of the 19th century, a proper offshore fishery of feeding salmon was first developed in 1947 as a consequence of the introduction of drifting long lines.

Replacement of hemp with synthetic fibres in the first half of the 1960s made drift netting the primary salmon gear. Nowadays about 80% of the total catch is taken offshore by drifting gear.

While total catches of Baltic salmon before 1945 probably did not exceed 2 000 tons annually they have since fluctuated between 2 000 tons and 4 000 tons. In recent years the annual yield has amounted to about 3 000 tons.

Table 84 shows the nominal catches of Baltic salmon, in the period 1967-77, distributed between the main basin, the Gulf of Bothnia and the Gulf of Finland. A more detailed distribution in Sub-divisions and statistical rectangles is possible for catches by Denmark, Finland and the Federal Republic of Germany, but only for recent years.

Commercial fishing within rivers is carried out in Finland, Sweden and USSR. Angling is of minor importance.

The catches in the main basin consist almost entirely of feeding salmon caught offshore by drift nets. About 50% of the Swedish and 16% of the Finnish catches in the Gulf of Bothnia are caught in Sub-division 31, and almost entirely by fixed coastal gears. Most of the catch in Sub-division 30 is taken offshore by drift nets. In the Gulf of Finland (Sub-division 32), the Finnish catch is obtained by drift gear, mainly long lines, while the USSR catch is exclusively coastal. The major part of the USSR catch is taken in the Gulf of Riga by fixed gear in the estuaries and river mouths; only 6-10% enter the river fishery proper.

Danish catch per unit effort data suggest that the total effort of the offshore fishery in the main Baltic has been significantly lower in the 1970s than in the 1960s.

5.4 Management

Apart from stocking, management of Baltic salmon comprises international regulations of the sea fishery by minimum landing size, minimum mesh and hook size, and closed seasons (Fishery Rule 14 of the IBSFC). No limitation of total catches or of the efficiency and number of fishing units has so far been introduced.

6. SEA TROUT

6.1 Distribution and migration

Sea trout is an anadromous form of the species Salmo trutta, which like salmon, spawns and spends its juvenile phase in fresh water and its growth phase in the sea. Two varieties of sea trout occur in the Baltic area. Stocks of trout with a migration pattern and growth comparable to salmon are established only in the southern Baltic and mainly in Polish rivers. The ordinary, more stationary, form is distributed in both the northern and southern Baltic rivers. Stocks of both forms may occur together in the same river system as well as in rivers occupied by salmon.

Sea trout prefer smaller streams, and tributaries of the larger river systems, as reproductive areas and as habitats for the juveniles. This is in contrast to salmon which occupy the main courses of rivers. Consequently sea trout streams, compared to

salmon rivers, are more numerous and widespread, especially in the southern Baltic drainage area where suitable natural conditions are met with. Human interference has inevitably limited the number of sea trout rivers recently, but not to the same extent as for salmon rivers. During the marine phase sea trout are abundant in most coastal areas and archipelagos of the Baltic, but are less abundant offshore.

About 80 small sea trout streams drain the Danish mainland and islands into the western Baltic and main basin. These stocks are rather stationary; about 80% seem to stay within 15 km of their native river. There is little evidence of individuals crossing the open sea. At present 15 rivers or streams from the Federal Republic of Germany to the western Baltic support sea trout runs. At least three of the numerous sea trout stocks of southern Sweden belong to the widely migrating type namely those of R. Verkeån, R. Mörrumsån and R. Emån. A relatively large proportion are recorded far offshore from the native rivers and in almost all Sub-divisions of the Baltic.

The Swedish sea trout rivers and streams running into the Gulf of Bothnia are not enumerated, but amount to several hundreds. Large-scale tagging experiments show that sea trout from the Swedish rivers flowing into both the northern and southern Bothnian region disperse passively over rather large distances inshore without preference for any particular direction. No recaptures are recorded from the open sea, and those recorded from the Finnish side of the Gulf have obviously migrated along the coast or by means of the central archipelago and the Åland Islands. Of the five sea trout rivers left in Finland, three run in to the Gulf of Bothnia and two to the Gulf of Finland. Apart from the still very productive Finnish-Swedish boundary river Tornionjoki, the populations in the other rivers are thought to be depleted.

In contrast to the migration pattern of sea trout originating from Sweden to the Gulf of Bothnia, the Finnish stocks in the Gulf seem to prefer to disperse northwards along the coasts. Recaptures of those recorded from the opposite side of the Gulf suggest that they have used the same routes as Swedish migrants, i.e. avoiding open sea crossing. Apart from staying inshore the migration of the Finnish sea trout to the Gulf of Finland does not show any definite trend as to direction into or out of the Gulf. In northern Poland populations of sea trout occur in 14 rivers and 10 larger tributaries. Sea trout of the Pomeranian rivers, and the tributaries to the lower R. Vistula, belong to the widely migrating variety occurring all over the Baltic, but probably most abundant in the southern and eastern parts. After the descent of smolts into the sea the feeding migration is mainly directed east- and northwards to the eastern part of the main basin, and further along the coast of Finland and Sweden and even to the Western Baltic. Ascent into rivers other than the native one seems to be less frequent than with other stocks of sea trout. In winter-spring feeding sea trout stay on the inshore grounds gradually moving offshore with rising water temperature. The spawning run in Pomeranian rivers starts in June-July with a peak in October-November shortly before the spawning time. The river Vistula is entered by spawning migrants throughout the year.

6.2 The fishery

As a consequence of their generally more stationary behaviour and inshore occurrence sea trout to a far greater extent than salmon are exploited by the coastal and river fisheries of their home

country. Apart from the purely commercial catches, quite important quantities of sea trout are landed by anglers and part-time fishermen. This would imply that the catch statistics are incomplete and the catches are significantly higher than reflected in Table 85.

In addition to being exploited by the home water coastal fishery the widely migrating type of sea trout are taken by the offshore pelagic salmon fishery as a valuable by-catch. On an average about 3% of the catch figures of the Danish salmon statistics, and on average 7% of the salmon catches referred to the Federal Republic of Germany, are in fact sea trout. In Table 85 annual mean catches by these two countries have been estimated. Judged by the distribution of the catches taken in the sea, those of Denmark and the Federal Republic of Germany being mainly obtained in Sub-divisions 25, 26 and 28, their origin is primarily from Polish rivers. The salmon catches of Finland before 1973 and those of USSR also contain sea trout at annual average rates of 9% and 10%, respectively.

The coastal and offshore fisheries take 2/3 and 1/3 respectively of the total sea catches of Polish sea trout. Less than 5% of the offshore catches are landed by Polish vessels; the remainder being taken as by-catches in the salmon fisheries of the other nations mentioned above.

6.3 Management

As in the case of the intensive stocking of Baltic rivers with salmon smolts, the sea trout populations are also maintained by release of hatchery-reared trout. In addition to smolts fry, 0-group and one-, two- and three-summer old parr are used as stocking material as shown in the text table below. In addition captured breeding fish are released as kelts after stripping. In Polish rivers and coast areas the non-indigenous species, rainbow trout, is also used for stocking. Apart from stocking, sea trout are protected only by national regulations.

Stocking of reared trout in the Baltic area in 1977

Stocking material (no.)	Smolt	Parr	Fry
Denmark	37 000	238 000	405 000
Finland	210 000	415 000*	-
Germany, Fed. Rep. of	-	-	-
Poland	324 000	-	3 745 000
Sweden	596 000	55 000	1 957 000
USSR	?	?	?

* Large 2 and 3 summer old parr of smolt size.

REFERENCE

ICES, 1974. Report of the Liaison Committee of ICES to the International Baltic Sea Fishery Commission. Coop.Res.Rep., No.44, pp.57-65.

Table 81. Total catch of Flounder in the Baltic (in tons).

Year	Denmark	Finland	German Dem.Rep.	Fed. Rep. of Germany	Poland	Sweden	USSR	Total
1965	2 356	?	1 641	413	1 797	586	5 580	12 373
1966	2 596	?	1 964	303	2 886	632	5 660	14 041
1967	3 165	?	2 169	363	2 036	642	4 060	12 435
1968	2 965	?	2 581	366	3 058	616	3 240	12 134
1969	2 961	?	2 512	334	2 987	559	3 300	12 104
1970	3 159	?	2 113	305	3 464	484	3 680	12 568
1971	3 364	?	2 280	318	2 409	444	4 080	11 793
1972	3 753	?	2 971	315	4 171	466	3 930	14 248
1973	2 770	?	3 323	353	4 278	502	2 610	13 836
1974	1 807	?	2 301	308	4 668	470	2 510	12 064
1975	1 621	181	2 038	460	5 139	400	3 238	13 077
1976	2 114	193	2 630	396	4 400	400	3 010	13 143
1977*	2 258	206	3 260	393	4 870	416	2 030	13 433

* Preliminary.

Table 82. Herring catches in the Baltic by Sub-division (in tons)[1)]

Year \ Area	22	23	24 + 25	26	27	28	29	30	31		22 - 31
1970	27 279	-	99 288	24 898	8 300	61 109	68 620	27 875	4 915		322 284
1971	29 505	-	96 066	40 148	8 300	64 854	69 318	29 384	6 963		344 538
1972	24 199	-	96 223	47 996	17 300	71 016	63 216	29 772	4 320		354 041
1973	26 460	-	105 774	55 484	42 839	65 350	90 542	26 971	3 879		418 859
	22	23	24 + 25	26	27	28	29	30	31	32	22 - 32
1974	14 152	375	49 089+ 75 451	59 027	37 053	56 138	44 198	25 767	6 874	48 636	422 245
1975	22 507	499	150 036	59 988	33 847	47 367	53 643	21 676	5 978	39 412	434 753
1976	13 619	217	150 556	55 284	22 973	49 343	48 295	28 019	9 144	50 652	428 174
1977*	11 911	1 092	155 245	59 056	34 884	41 411	46 786	24 610	9 250	50 745	434 990

* Preliminary.

1) These figures are rather different from the official landing statistics given in Bulletin Statistique. This has arisen from the re-allocation of herring, caught as a by-catch in the sprat fisheries, to the herring catch; and of any sprat taken as a by-catch in the herring fisheries to the sprat catch. The figures given above and in Table 83 are therefore a truer reflection of the actual catches of herring and sprat taken.

Table 83. Sprat catches by Sub-divisions (in tons)[1)]

Year	22	23	24 + 25	26	27 + 28	29	30	31	32	22-31
1970	1 341	-	162 + 7 507	21 734	55 111	62 265	-	-		148 120
1971	1 407	-	476 + 10 690	31 669	65 984	68 018	-	-		178 234
1972	1 973	-	690 + 16 285	31 216	82 670	68 507	-	-		201 341
1973	868	-	2 132 + 14 381	36 993	17 831 + 54 490	72 964	-	-		195 439

	22	23	24 + 25	26	27	28	29	30	31	32	22-32
1974	1 395	-	75 283		18 557	57 998	72 346				217 079
1975	8 857	-	22 694	60 694	6 507	22 726	33 269	14	-	27 691	182 452
1976	5 936	-	28 120	42 898	2 318	21 708	25 901	2	-	38 351	165 234
1977*	2 854	-	33 450	58 056	1 605	26 999	26 266	-	-	32 860	182 090

* Preliminary

1) See footnote to Table 82.

Table 84. Annual nominal catches in metric tons of Baltic Salmon.

Sub-division Nation Method+)	Baltic Main Masin 24 - 29						Gulf of Bothnia 30 - 31				G. of Finland 32	Total
	Denmark O.	Finland O.	Fed. Rep. of Germany O.	Poland O.	Sweden O.(99%)/C.	USSR O. C.(94%)	Denmark O.	Finland C.(65%)/O.	Sweden C.(85%)/O.	R.	Finland O.(99%)/C.	
1967	1 754	143	187	8	364	- 126	4	168	133	99	114	3 100
68	1 868	197	213	8	339	- 148	1	151	120	97	118	3 260
69	1 469	169	134	30	366	- 135	0	197	94	69	140	2 803
70	1 298	121	130	11	341	- 101	11	193	111	45	136	2 498
71	993	138	106	11	285	- 95	52	82	109	50	124	2 045
72	1 034	122	117	13	277	- 107	11	143	135	65	138	2 162
73	1 107	192	107	17	407	- 122	12	191	179	134	135	2 603
74	1 224	282	52	20	403	21 155	0	310	195	155	111	2 928
75	1 112	237	67	10	352	43 194	98	258	305	127	158	2 961
76	1 372	181	58	7	332	? ?	38	426	251	80	81	2 826

+)
O. - Offshore fishery; pelagic gear (drift nets and long lines), yield: feeding salmon.
C. - Coastal catches; fixed gear (fyke nets, bag nets etc.), yield: mainly maturing salmon on spawning migration.
R. - River catches, mainly fixed gear, yield: maturing salmon on spawning migration.

Table 85. Nominal catch of Sea Trout in the Baltic Sea.

Year	Denmark	Finland	German Democratic Republic	Federal Republic of Germany	Poland	Sweden	USSR
	b)	c)	a)	b)	c)	d)	a)
1967	about 40 tons	-	-	10-12 tons	54	-	-
68		-	-		133	-	-
69		-	-		58	-	-
70		-	-		56	84	-
71		-	-		41	66	-
72		-	-		75	64	-
73		-	18		83	89	141
74		92	29	4-5 tons	101	119	123
75		96	25		79	101	60
76		103	-		97	86	54

a) Bulletin Statistique
b) Estimated proportion of salmon catch
c) Personal communication
d) Fiskeristatistisk årsbok.

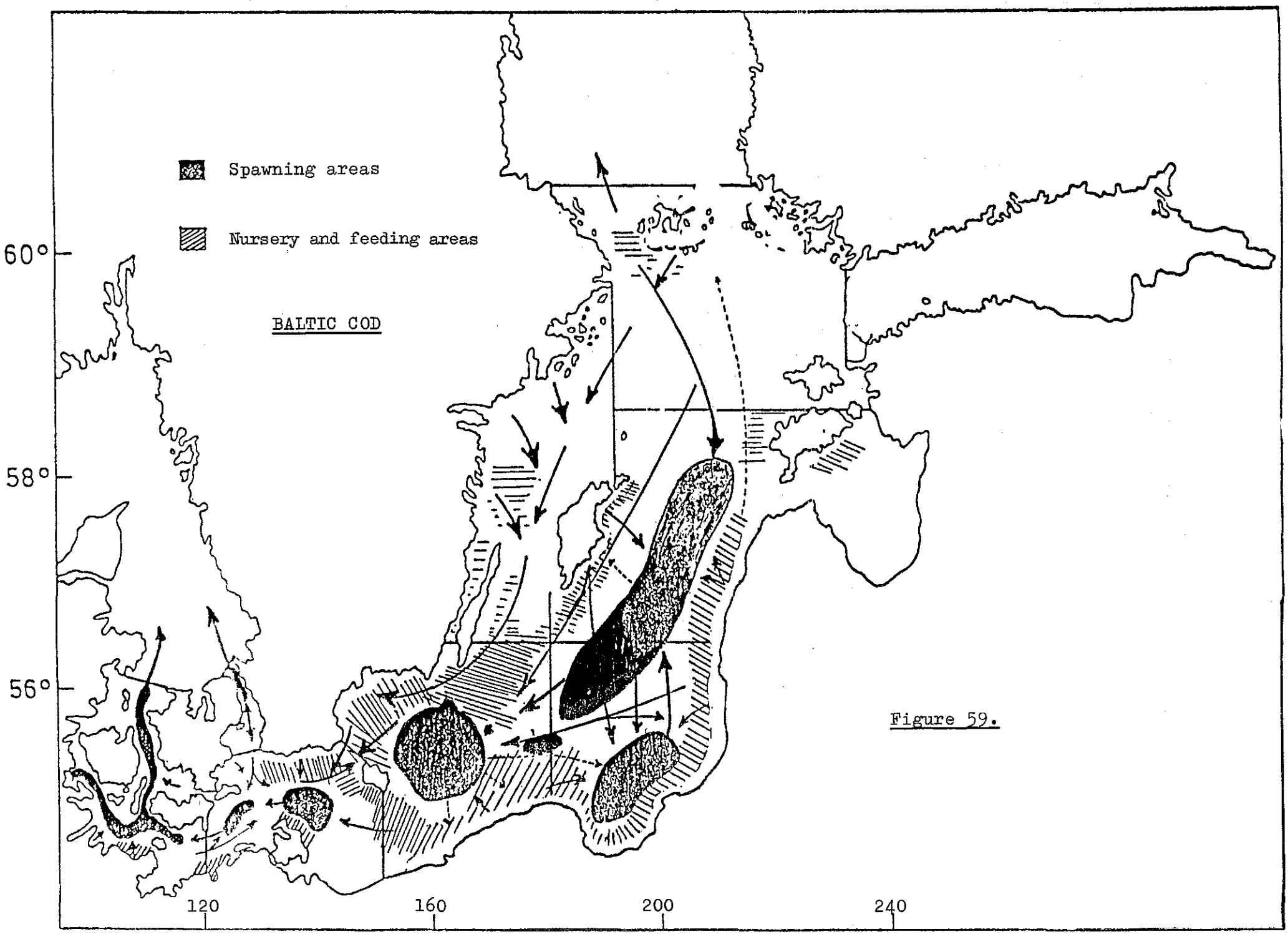

Spawning areas
Nursery and feeding areas
BALTIC COD
60°
58°
56°
120
160
200
240

Figure 59.

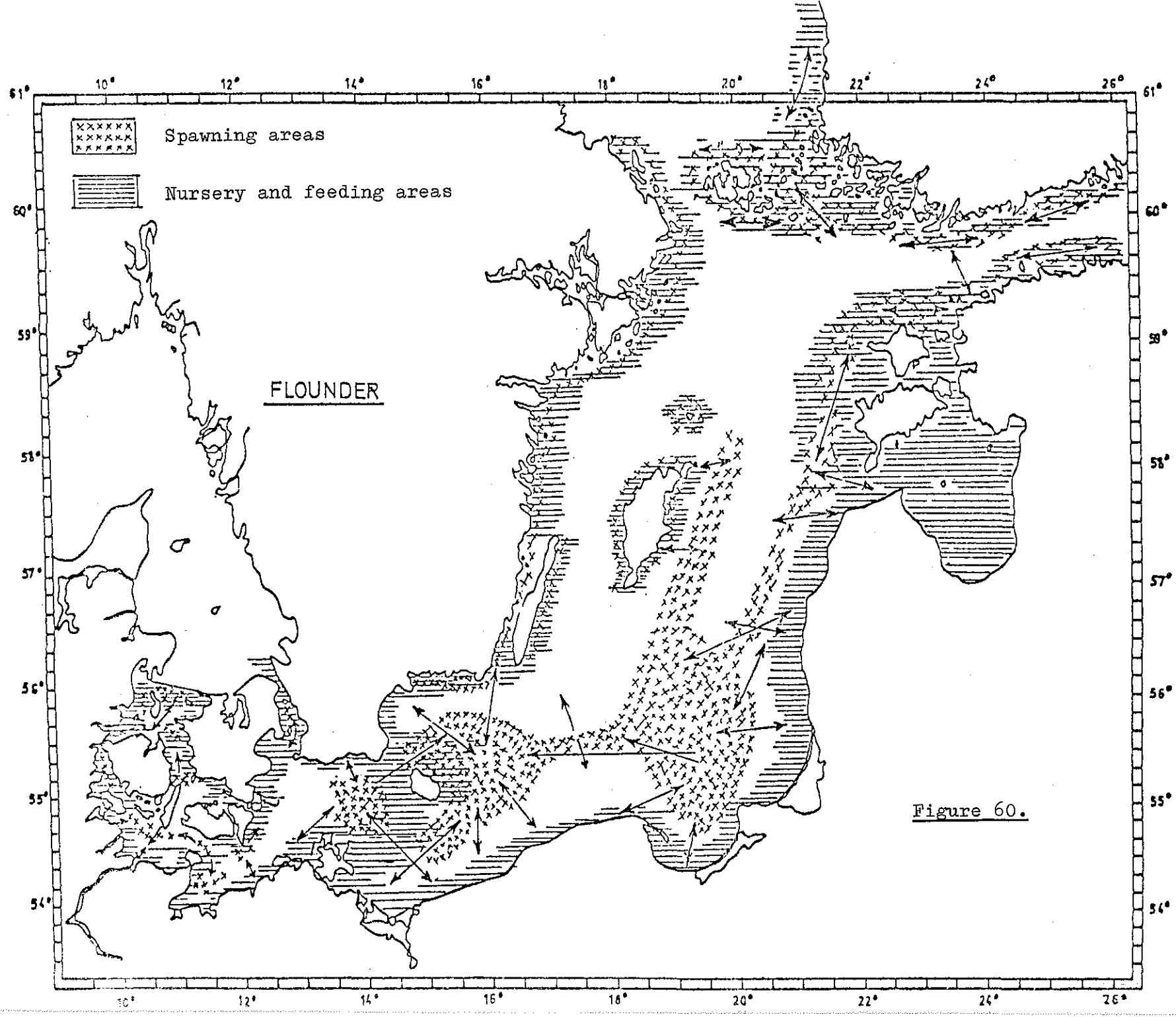

Spawning areas
Nursery and feeding areas
FLOUNDER
10°
12°
14°
16°
18°
20°
22°
24°
26°
61°
60°
59°
58°
57°
56°
55°
54°

Figure 60.

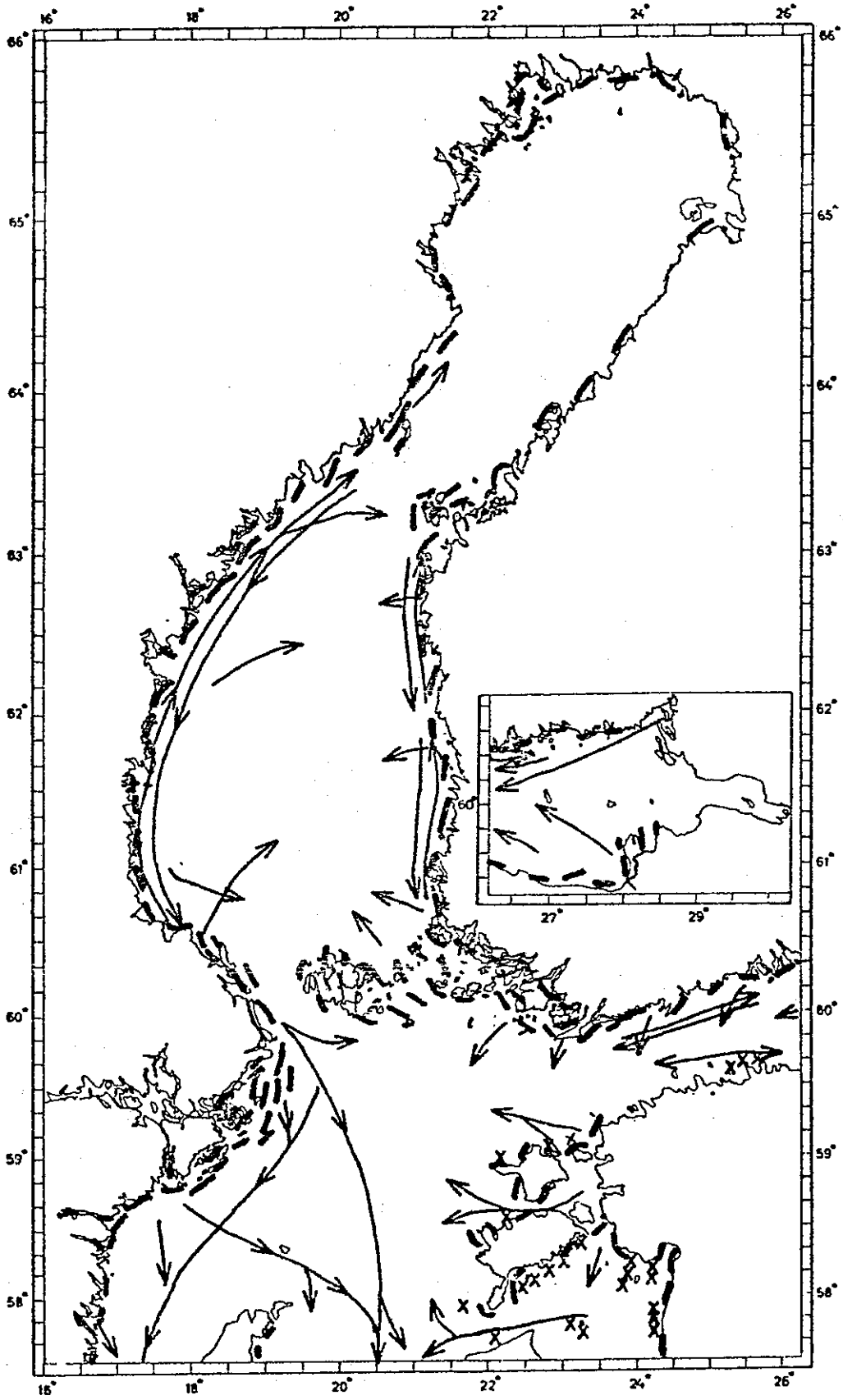


Figure 61. Spawning areas and feeding migrations of Baltic Herring. – – – spring spawners, XXX autumn spawners. Migrations indicated by arrows. The long migrations in N-S direction in the Baltic proper may be more coastal bound than indicated on the figure.

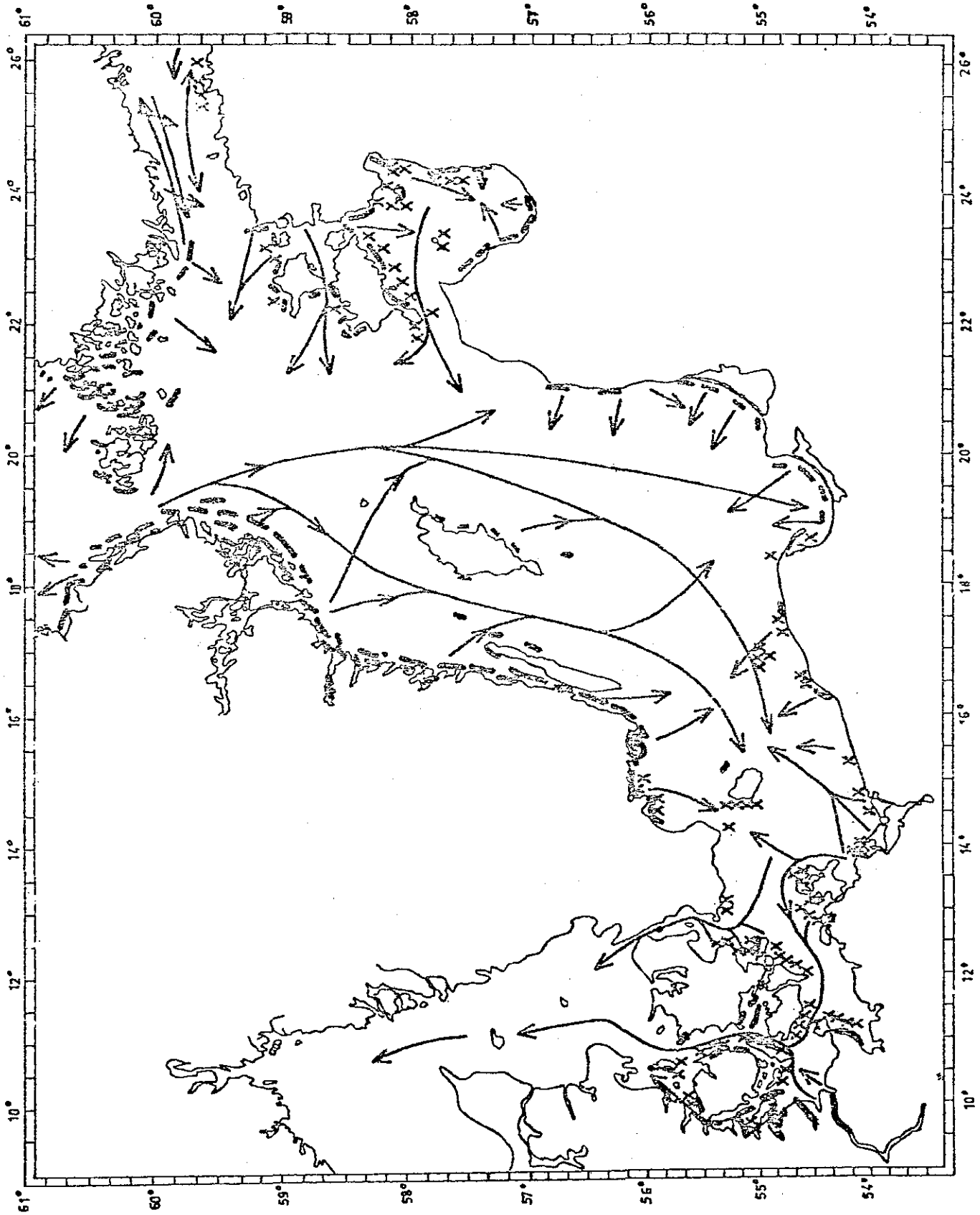


Figure 62. Spawning areas and feeding migrations of Baltic Herring. --- spring spawners, XXX autumn spawners. Migrations indicated by arrows. The long migrations in N-S direction in the Baltic proper may be more coastal bound than indicated on the figure.

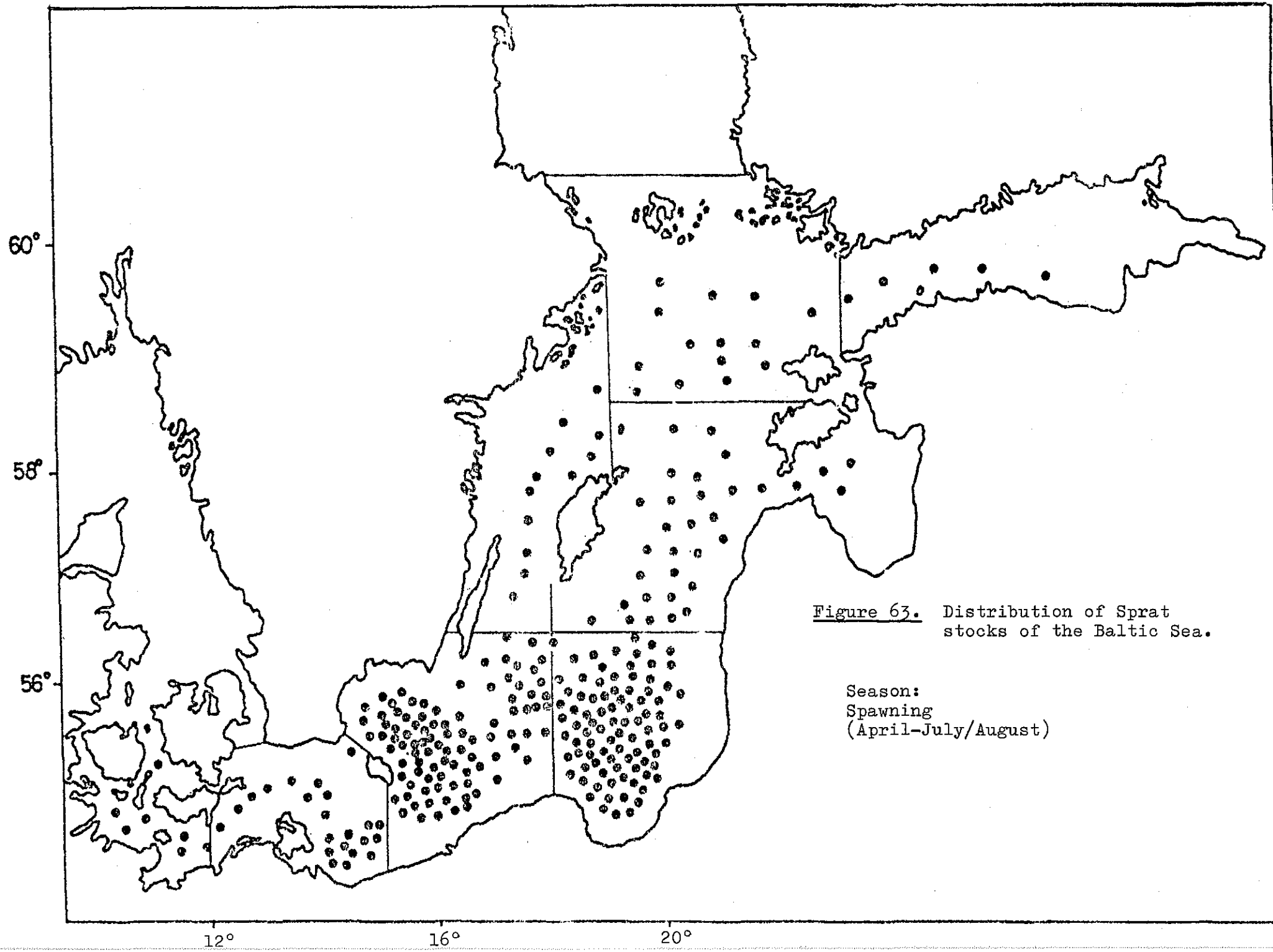


Figure 63. Distribution of Sprat stocks of the Baltic Sea.

Season:
Spawning
(April-July/August)

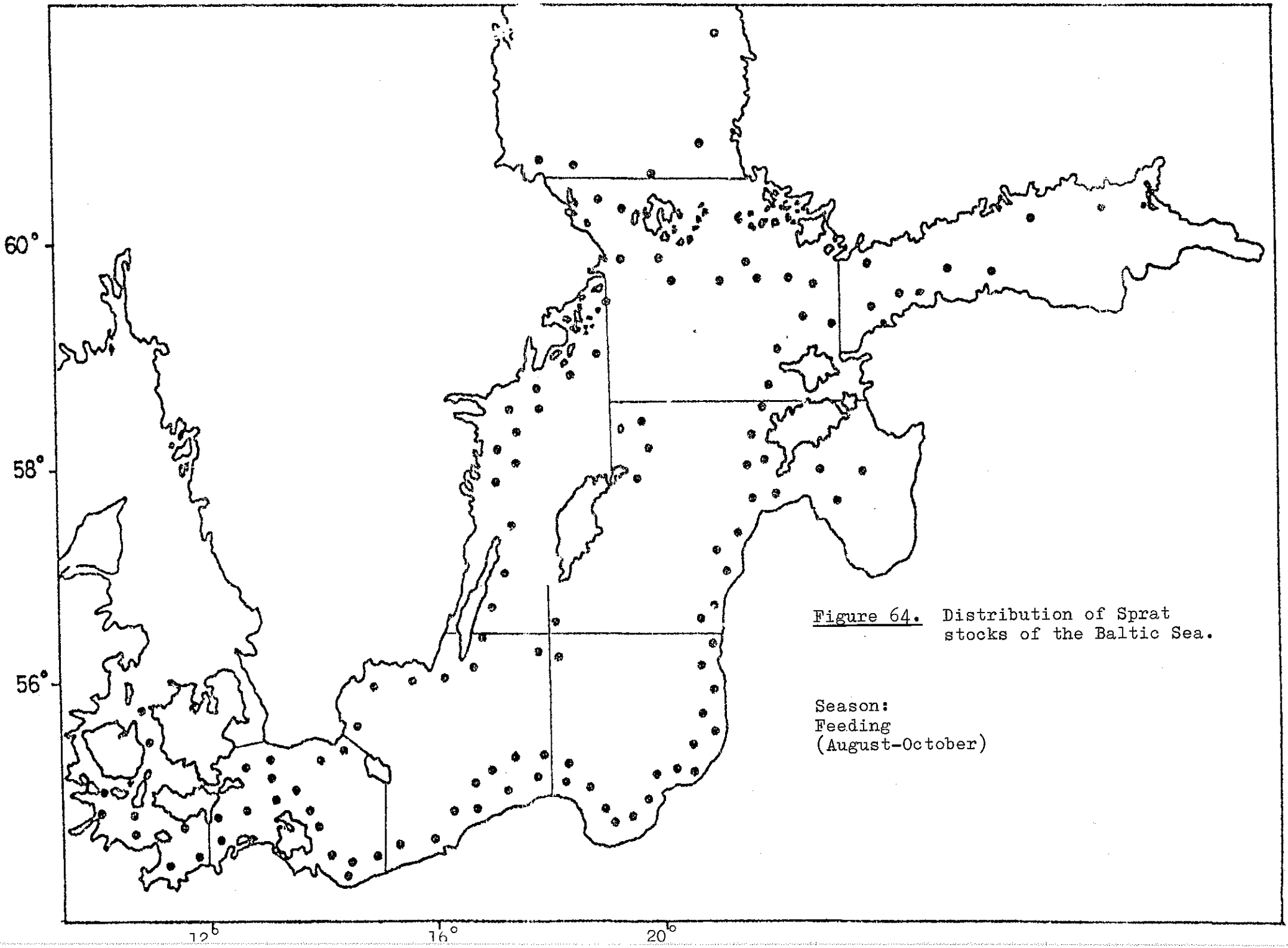


Figure 64. Distribution of Sprat stocks of the Baltic Sea.

Season:
Feeding
(August-October)

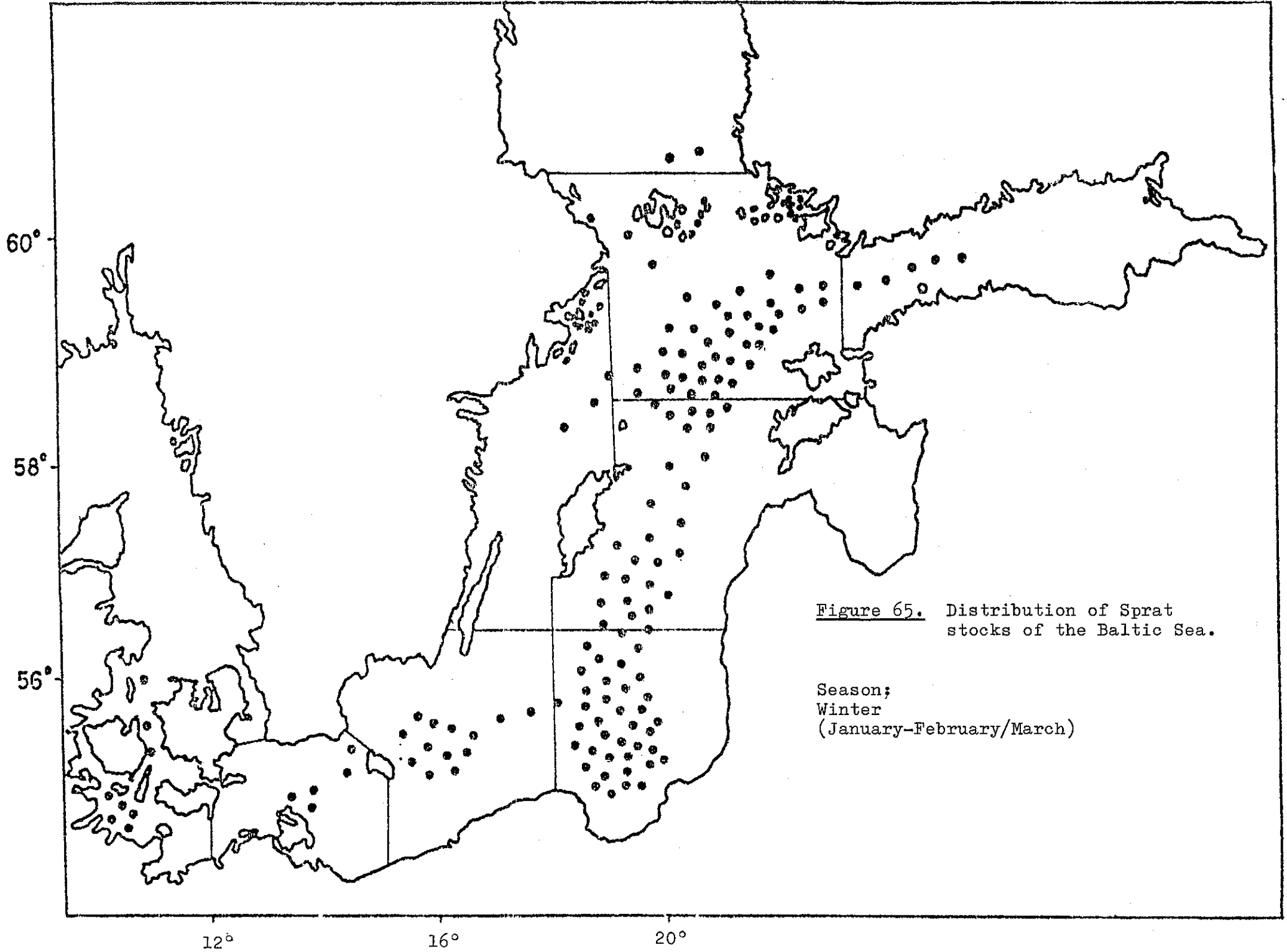


Figure 65. Distribution of Sprat stocks of the Baltic Sea.

Season;
Winter
(January-February/March)

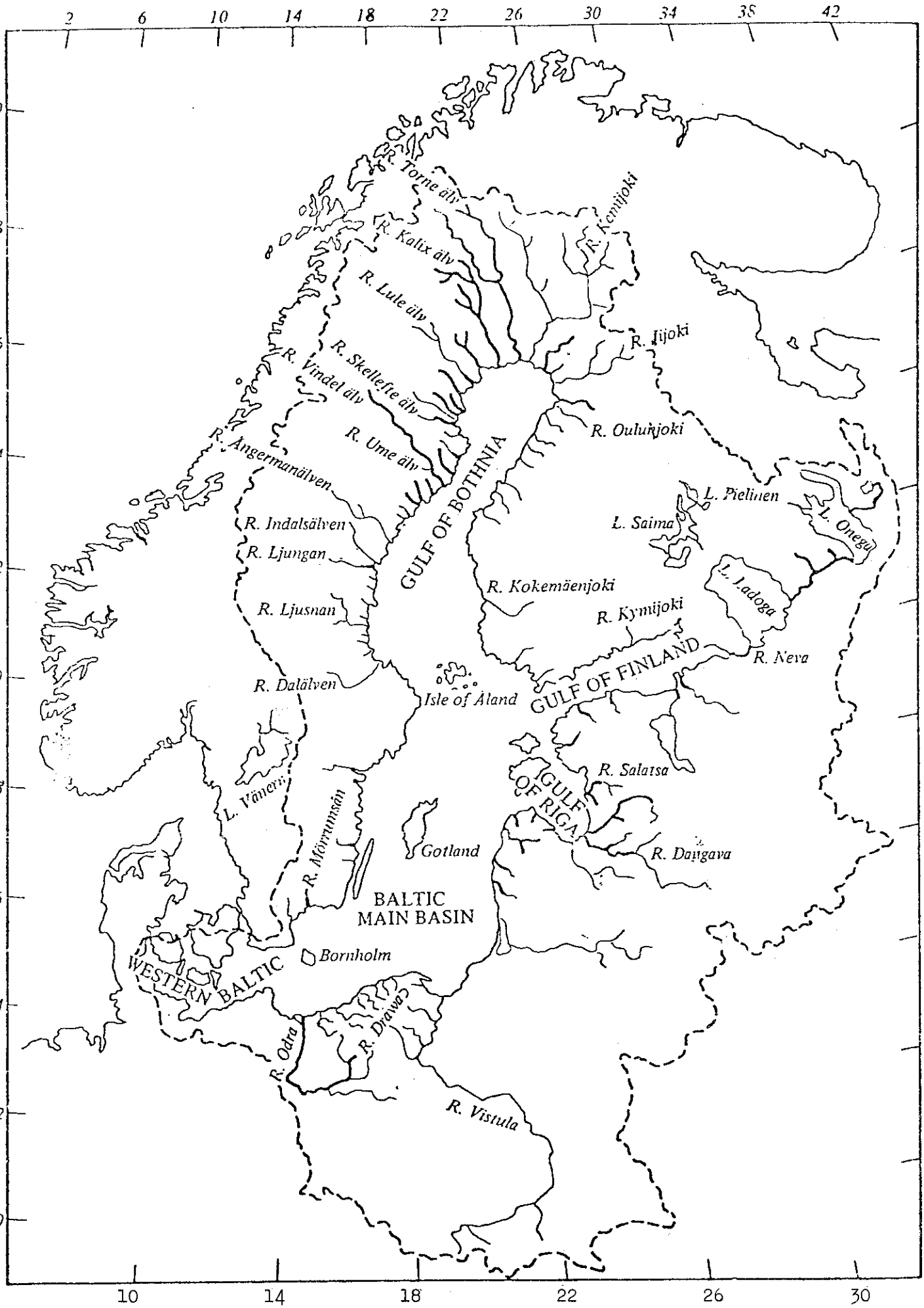
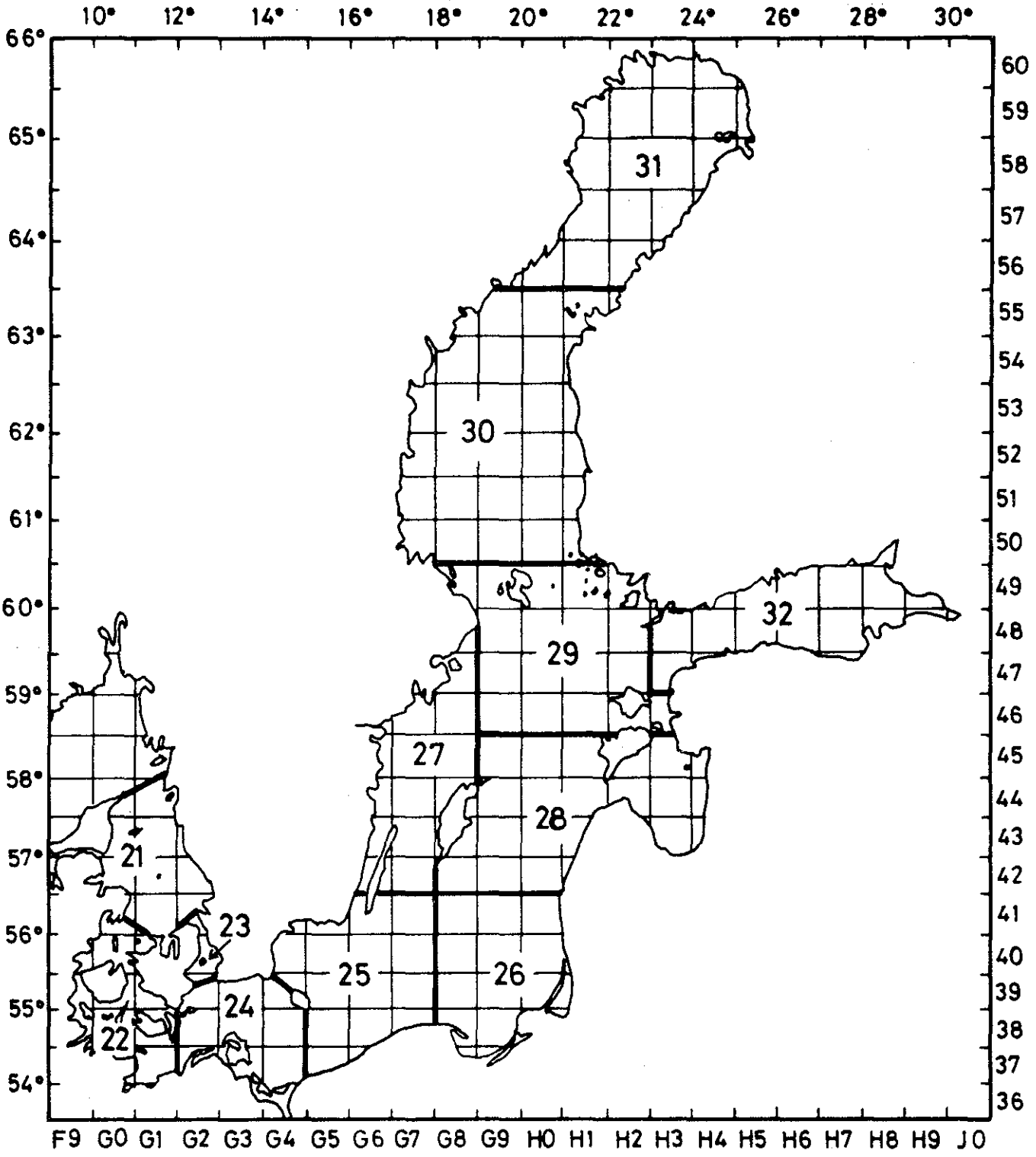


Figure 66. Baltic drainage area.
River and reaches of rivers supporting salmon run in former time (thin line) and at present (thick line).



BALTIC FISHING AREAS

APPENDIX

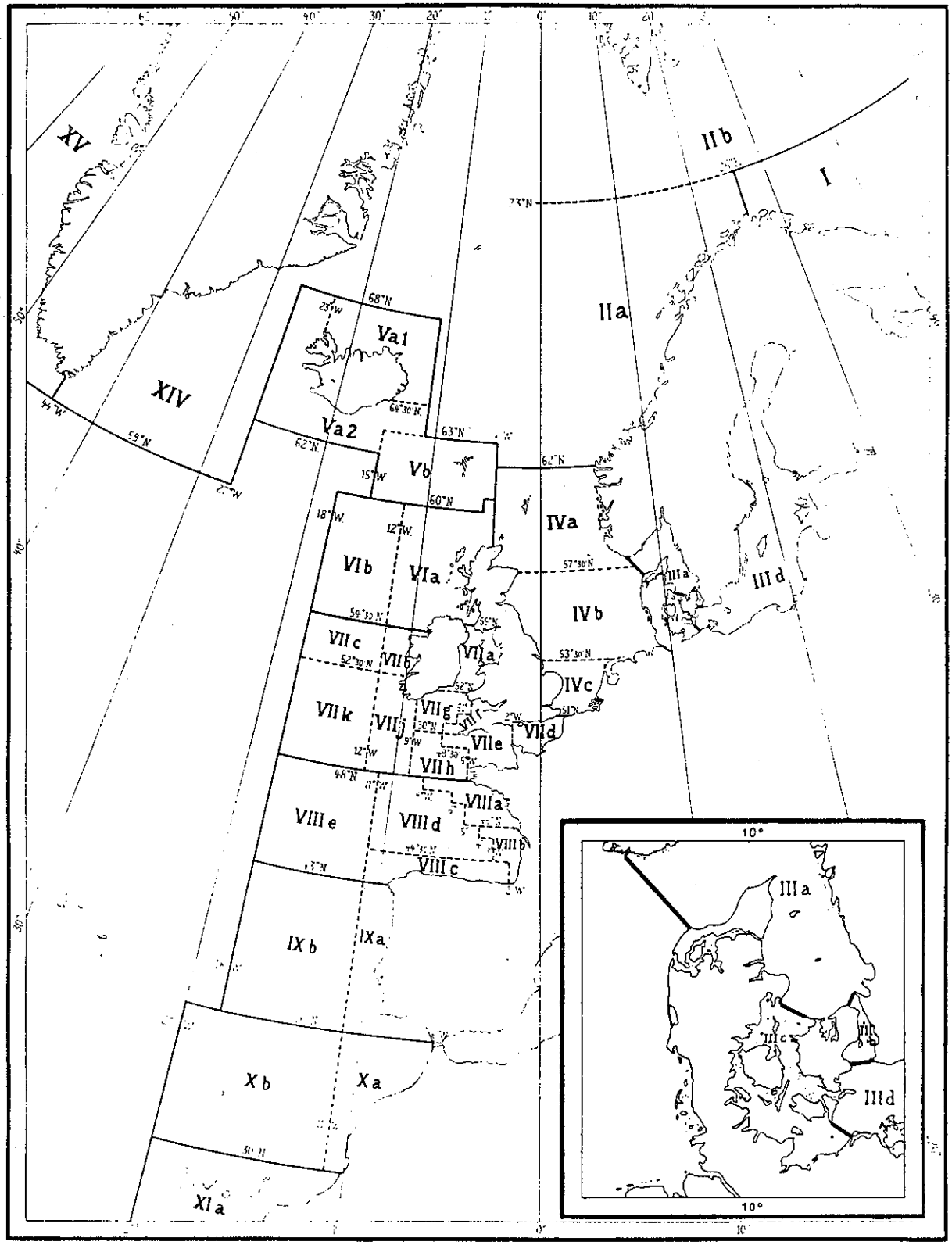


Chart of former statistical divisions referred to in the section on hake.

(Bulletin Statistique, Vol.38,1953)

INDICATION OF SPINE COLOURS

Reports of the Advisory Committee on Fishery Management	Red
Reports of the Advisory Committee on Marine Pollution	Yellow
Fish Assessment Reports	Grey
Pollution Studies	Green
Others	Black

-o-o-o-