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**Distribution of Norwegian spring-spawning herring and mackerel
in the Norwegian Sea in late summer, 1991.**

by

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Abstract

A pairtrawl survey was carried out in the Norwegian Sea during July - August 1991 to map the distribution of pelagic fish. Herring were caught throughout most of the surveyed area, with the largest concentrations observed within 200 nautical miles off Vesterålen/Troms. It therefore seems that the Norwegian spring-spawning herring has resumed its oceanic feeding migration. Mackerel were observed in most parts of the surveyed area as far north as 73° N, and seemed to belong to the Western stock. It was observed a tendency for older and bigger mackerel of the same yearclasses to migrate further north than younger and smaller individuals. A similar tendency was observed for horse mackerel.

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Introduction

The Norwegian spring spawning herring stock has been feeding in coastal waters off Nordland/Troms during the period following the stock collapse in the late sixties (Dragesund et al., 1980; Hamre, 1989). Coinciding with the recruitment of the strong 1983-yearclass to the spawning stock in 1987 the feeding areas has been observed to extend westwards into the Norwegian Sea (Røttingen, 1989). Observations and catches of mackerel from the Norwegian Sea, demonstrate that also mackerel feed in this area in the summer. As a first attempt to study the distribution of herring and mackerel in the Norwegian Sea a pelagic trawl survey was carried out in July/August 1991 by the Institute of Marine Research, Norway.

Material and methods

The pelagic trawl survey in the Norwegian Sea was carried out during 23 July - 27 August, 1991. Sampling was carried out using a commercial pelagic trawl ("Boretårn"), which were hauled in the surface by two vessels (pairtrawling). The trawl was fitted with bouys attached to the wings to secure sampling in the surface. Maximum sampling depth was measured at 17 m by a Scanmar depth sensor. Based on experiments with similar trawls the wing spread was estimated to be approximately 30 m. The trawling speed was 4.0 knots, and the trawling time was 45 minutes, giving an effective trawling distance of about 3 nautical miles. During the survey 75 trawls were carried out (Fig. 1).

The catches were sorted immediately after each haul, and as much as 100 individuals of the target species were picked out by chance for analysis. The mackerel was frozen at -20°C for later examination, while the herring samples were analyzed within one hour.

Mackerel data as age, weight and length at age in the pair trawl catches have been compared with the same parameters in the commercial Norwegian mackerel catches in the third quarter 1991 from the area 62° - 65° N (southern part of ICES Division IIa), the northern part of the North Sea (ICES Division IVa), and from trawl catches taken by R/V "Johan Hjort" during a survey in the North Sea in June-July 1991. The area surveyed by the pair trawlers was divided in three parts, and the numbers of aged fish within each area are shown below.

Area	Positions	Numbers aged
A:	65° 30' - 68° 30'N	168
B:	68° 30' - 70° 30'N	170
C:	North of 70° 30'N	148

Results and discussion

Herring were caught throughout the Norwegian Sea southeast of the polarfront (Fig. 2). The largest catches however, were made in the north-eastern parts of the surveyed area, approximately delineated by 7° to 17° E and 69° to 73° N. Whether this represented the maximum geographic distribution of the feeding area in 1991 is uncertain. Røttingen (1989) reported that the 1983 year class contracted towards the overwintering area medio August in 1987, indicating that the present survey might be somewhat late to observe the maximum extent of the feeding area.

The 1983-yearclass dominated the herring stock in the feeding area, and constituted 75 % of the catches (Fig. 3). The 1988 and 1989 yearclasses constituted 7 and 12 % of the catches, respectively. This juvenile herring originates partly from the Barents Sea, and partly from the fjords of northern Norway.

The main feeding area of the herring stock in the fifties and sixties were situated between Iceland and Jan Mayen (Dragesund et al., 1980). After a period of coastal feeding from 1973 to 1987 (Hamre, 1989; Røttingen, 1989) the herring stock now resumes its oceanic feeding habits. So far, however, the feeding area are more northeasterly situated than before the stock collapse in 1970.

Dragesund et al. (1980) described a positive correlation between stock size and the area of spawning, and it is fair to assume that this also applies to the size of the feeding area. Based on the rich yearclasses of juvenile herring observed in the Barents Sea in 1991 and 1992 (Reidar Toresen, pers. comm.) a growth in the spawning stock might be expected from 1994 onwards. This may change the present migratory pattern towards the situation of the 50's and 60's.

The development of the Western and the North Sea mackerel, which might contribute to the catches in the surveyed area has changed since the 1970's. There has been observed large changes in the migratory pattern of particularly the Western stock. This stock has migrated more and more extensively into the North Sea and probably also into the Norwegian Sea during the feeding period (second half of the year) since the 1970's (Walsh and Martin, 1986; Bakken and Westgård, 1986; Iversen and Skagen, 1990 and Anon., 1990a). During this period the spawning stock in the North Sea has collapsed, with a present level of about 80 000 tonnes (Iversen et al., 1991) while the Western stock has a size of about 2 million tonnes (Anon., 1990b).

Mackerel were observed in large parts of the investigated area (Fig. 4), as far north as 73° N. The main catches were made in the area west of Lofoten - Vesterålen along the sections 68° N, 69° N and to some extent 70° N. However, the largest catch was taken as far north as 72° N (St. 52, Fig 1).

The spawning and prespawning mackerel caught in June - July 1991 by R/V "Johan Hjort" in the North Sea were considered as North Sea mackerel, and the catches were dominated by two and three years old fish. These age groups were caught in relatively smaller proportions (Fig. 5) in the Norwegian commercial mackerel fishery in the northern North Sea (ICES Division IVa) and in the Norwegian Sea between 62° - 65° N (the southern part of ICES Division IIa), and are considered as Western mackerel (Anon., 1992).

In the pair trawl survey the two and three years old mackerel (Fig. 6) were obtained mainly in the southern area (area A) while these age groups hardly were caught further north (area B and C). The catches were dominated by four years old fish in area A. This age group was also relatively well represented further north, but was not dominating the catches. In the northern areas the age groups 7, 10 and 11 were relatively stronger represented than in area A. Both the weight (Fig. 7) and the length (Fig. 8) at the same age are smaller in the North Sea stock than the fish caught further north both in the Norwegian purse seine fishery and in the pair trawl survey.

Based on this analysis the mackerel caught in the area by the pairtrawlers are most likely Western mackerel. There is a tendency for the bigger fish in the same age group to be caught furthest north. Therefore it seems that the older and bigger fish migrates more extensively to the north than the younger and smaller fish.

Two catches of horse mackerel were made at trawl stations 73 and 75 (area B) with catch rates of 86 and 7 fish respectively. The length distribution of these fish and the length distribution in the Norwegian commercial catches in the third quarter in Division IVa and in Division IIa south are given in Fig. 9. Length distributions in the commercial catches from the two Divisions were similar, but considerable larger fish were taken in area B. The main catches in the

commercial fishery were fish smaller than 34 cm, while the horse mackerel in area B were mainly larger than 34 cm. Therefore it seems that there is a tendency for the bigger horse mackerel, as for bigger mackerel, to migrate further north.

References

- Anon. 1990b. Second report of the EEC-Norwegian Joint Scientific Group on Migration and Area Distribution of mackerel (Western Stock), Brussels, 12-13 December 1989. ICES Dok. C.M.1990/H:5.
- Anon. 1990a. Report of the Mackerel/Horse mackerel egg production Workshop. ICES, C.M. Dok. 1990/H:2.
- Anon. 1991. Report of the Mackerel Working Group. ICES Dok. C.M.1991/Assess:19.
- Anon. 1992. Report of Mackerel, Horse Mackerel, Sardine and Anchovy Working Group. ICES Dok. C.M.1992/Assess:17.
- Bakken, E. and Westgård, T. 1986. Intermixture of the North Sea and Western mackerel stocks determined by analysis of Norwegian tagging data. ICES Dok. C.M.1986/H:65.
- Dragesund, O., Hamre, J. and Ulltang Ø. 1980. Biology and population dynamics of the Norwegian spring-spawning herring. Rapp. P.-v. Cons. int. Explor. Mer, 177: 43-71.
- Hamre, J. 1989. Life history and exploitation of the Norwegian spring-spawning herring. Proceedings of the fourth Soviet-Norwegian Symposium, Bergen, 12-16 June 1989, : 5-39.
- Iversen , S.A., Eltink, A., Kirkegaard, E. and Skagen, D.W. 1991. The egg production and spawning stock size of the North Sea mackerel stock in 1990. ICES, Doc. C.M.1991/H:11.

- Iversen, S.A. and Skagen, D.W. 1989. Migration of Western mackerel to the North Sea 1973-1988. ICES Dok. C.M.1989/H:20.
- Røttingen, I. 1989. The 1983 year class of Norwegian spring-spawning herring as juveniles and recruit spawners. Proceedings of the fourth Soviet-Norwegian Symposium, Bergen, 12- 16 June 1989, : 165-203.
- Walsh, M. and Martin, J.H.A. 1986. Recent changes in the distribution and migrations of the Western mackerel stock in relation to hydrographic changes. ICES, Dok. C.M./H:17.

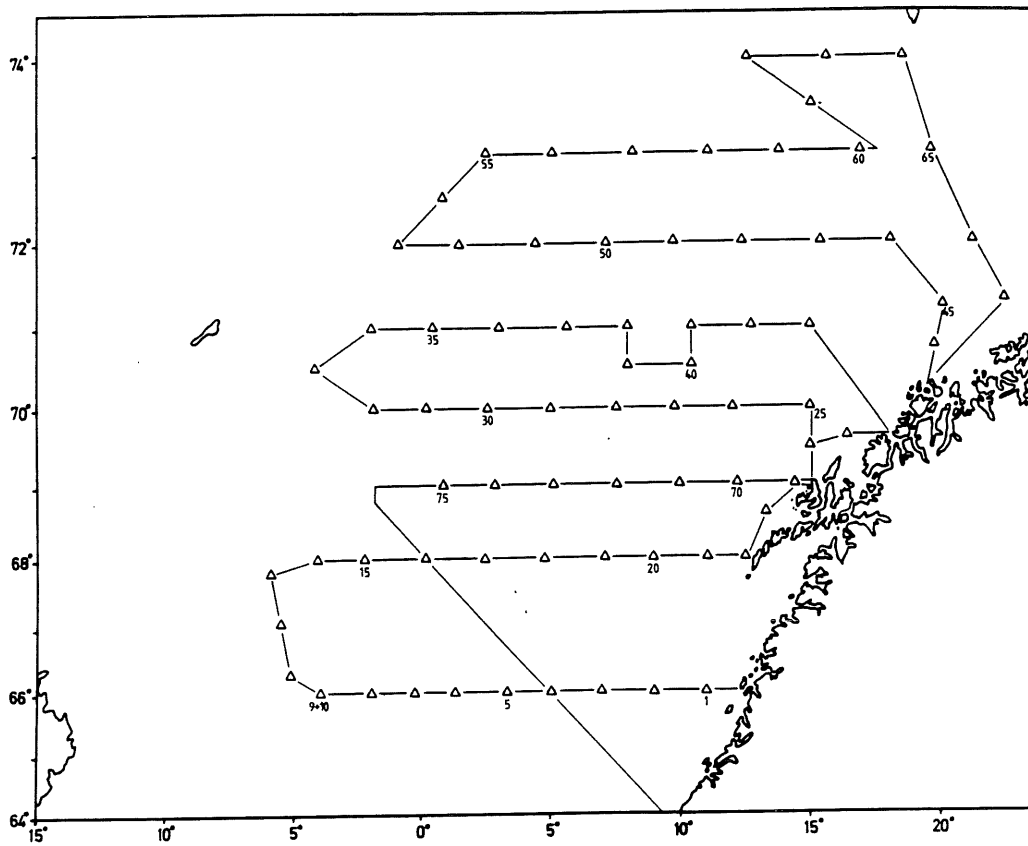


Fig. 1 Survey grid and trawl stations for a pairtrawl survey July - August 1991.

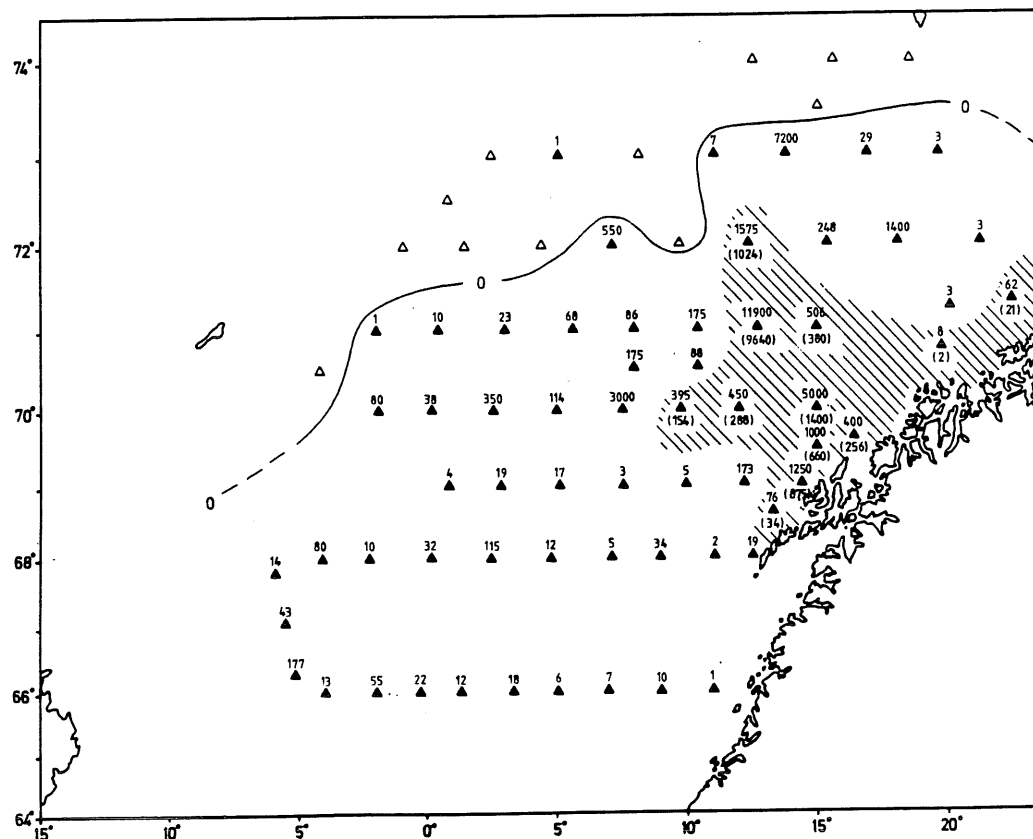


Fig. 2 Distribution of herring (numbers per trawl haul).
 Number above triangle: adult herring (> 30 cm).
 Number below triangle: juvenile herring (< 30 cm).
 Hatched area: distribution of juvenile herring.

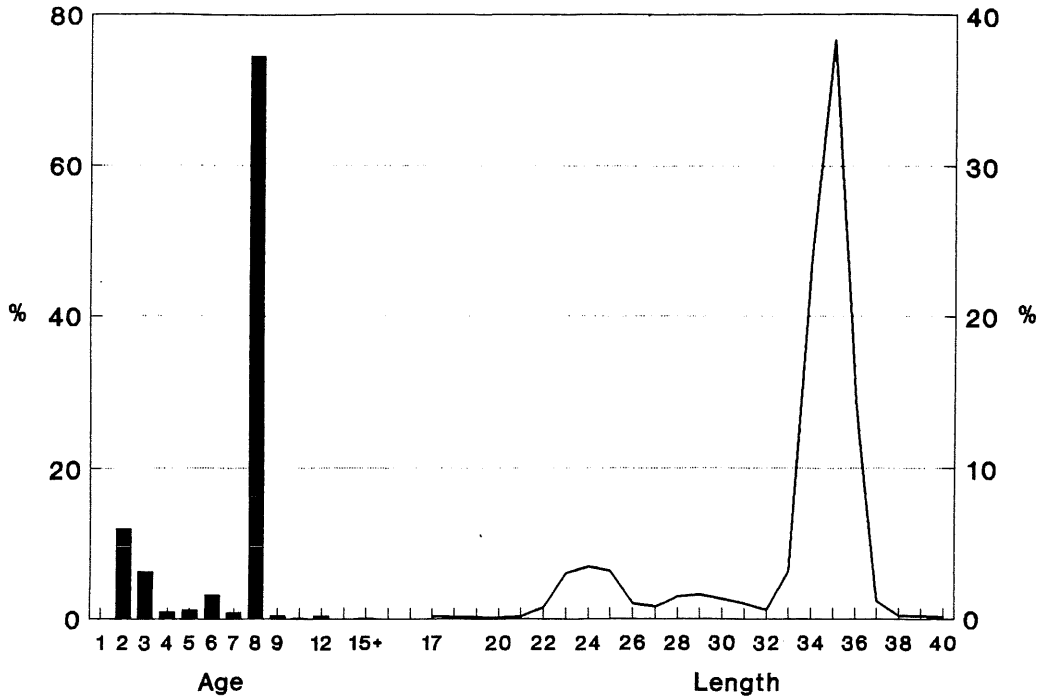


Fig. 3 Age and size distribution of herring caught in the Norwegian Sea during July - August 1991.

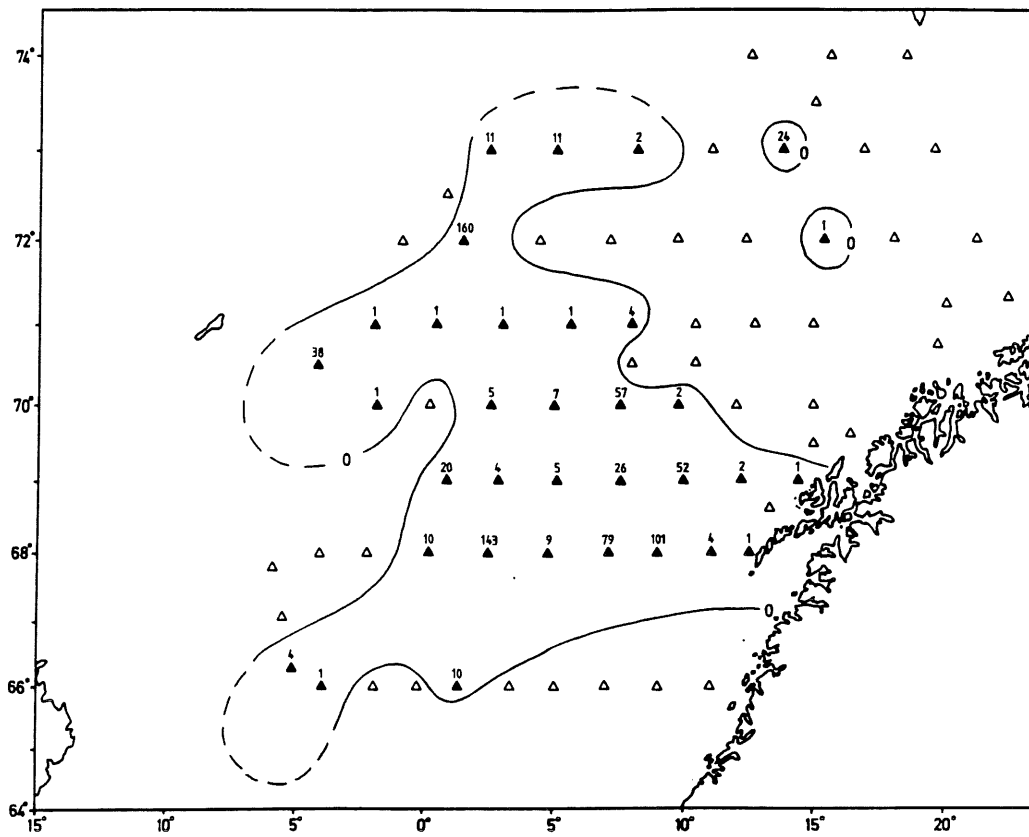


Fig. 4 Distribution of mackerel (numbers per trawl haul) July - August 1991.

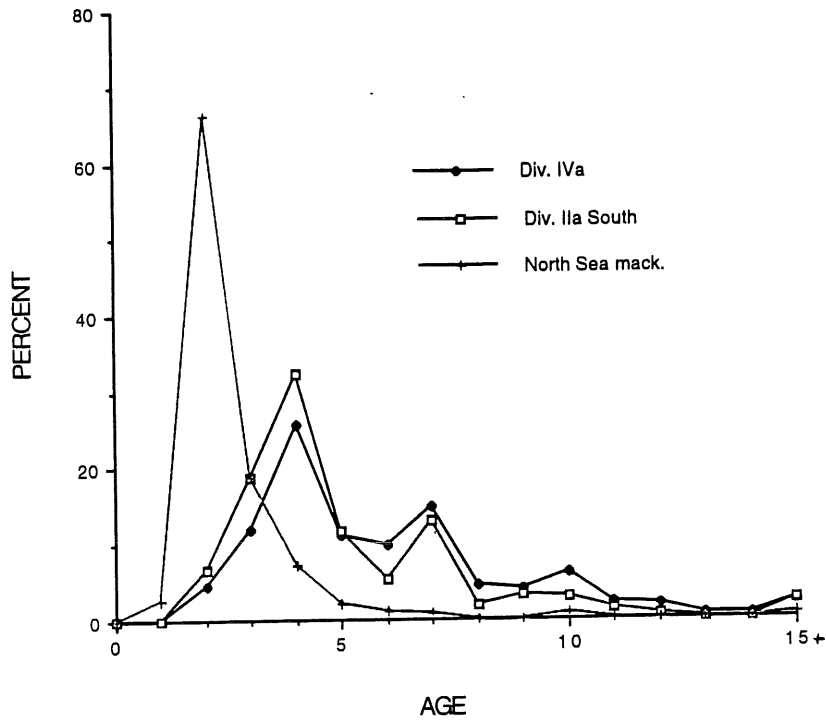


Fig. 5 Age distribution of mackerel in the commercial Norwegian fishery and in research vessel catches from the North Sea.

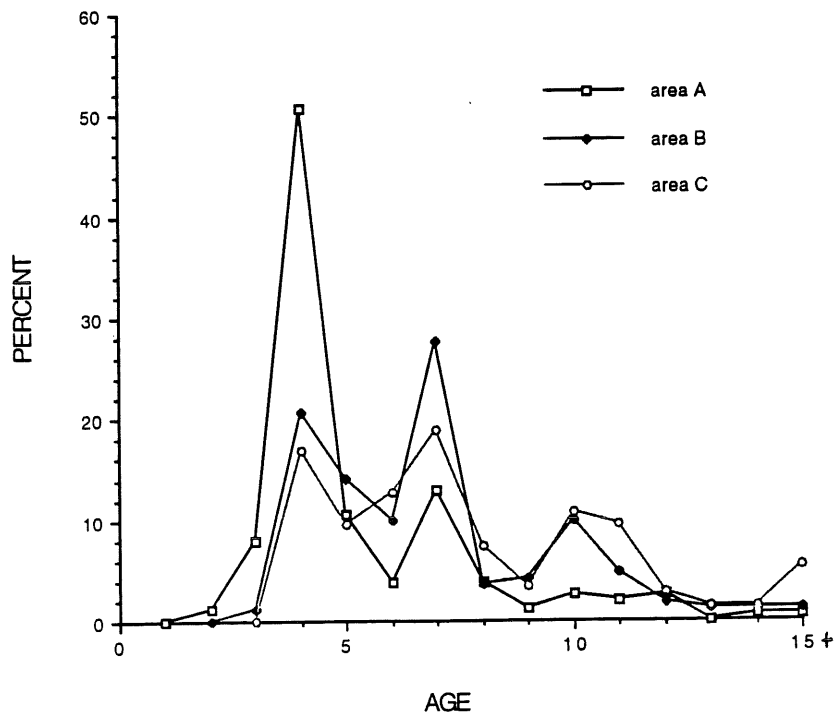


Fig. 6 Age distribution of mackerel caught in the different areas during the pair trawl survey.

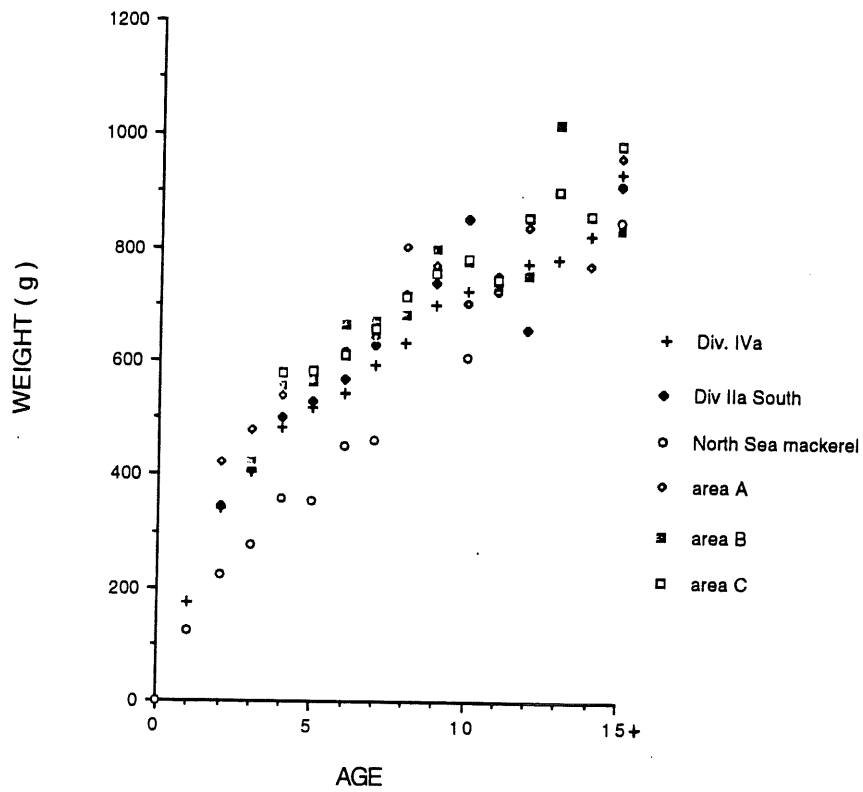


Fig. 7 The weight at age of mackerel caught in different areas.

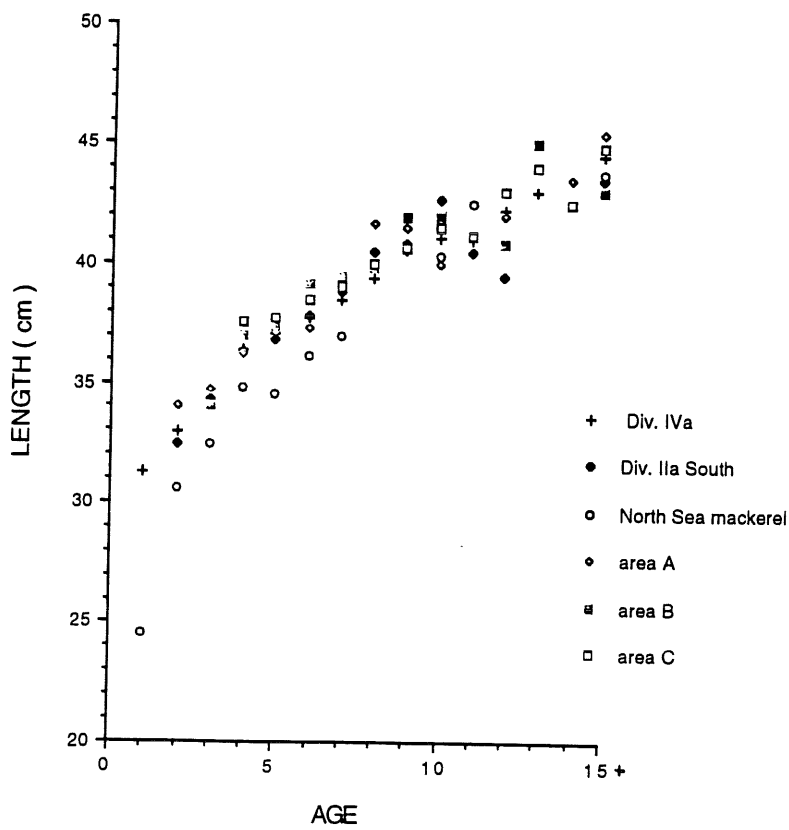


Fig. 8 The length at age of mackerel caught in different areas.

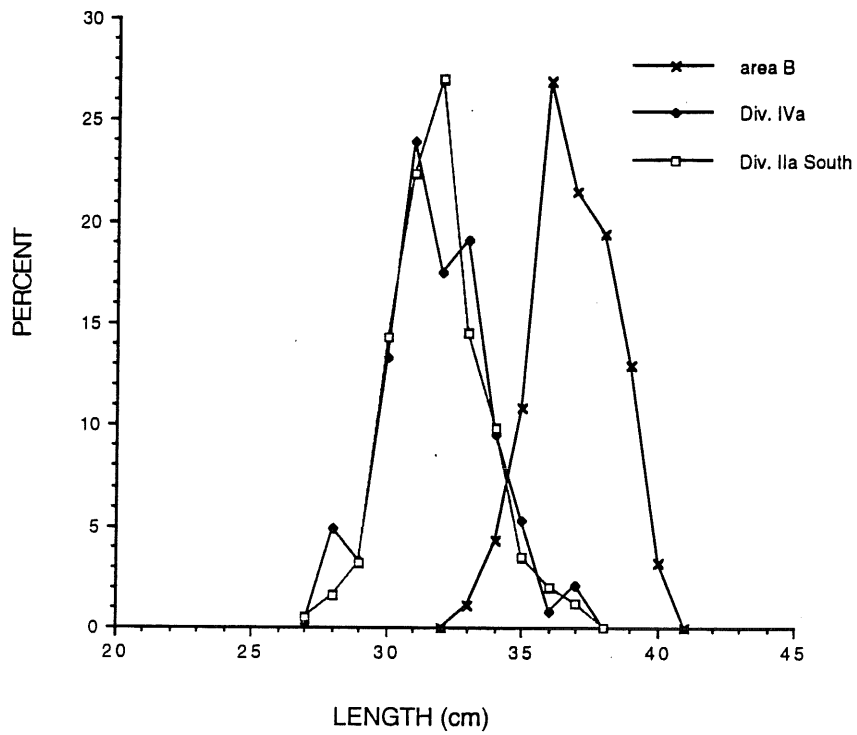


Fig. 9 The length distribution of horse mackerel in the Norwegian commercial catches and from the pair trawl survey (area B).