International Council for the Exploration of the Sea

C.M.1974/F:44

Demersal Fish (N) Committee

OBSERVATIONS ON THE SPAWNING GROUNDS OF THE NORTH SEA AND NORWAY COAST STOCKS OF SAITHE

by

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INTRODUCTION

In the years 1903 - 1906 spawning grounds of saithe in the northeast Atlantic were mapped in connection with an extensive international program (Anon. 1909). The results from the North Sea and the Norwegian coast were presented by Damas (1909). The spawning grounds were located on the basis of the distribution of eggs and larvae and are accordingly only roughly indicated. Damas' map thus indicates that spawning of saithe takes place in the vicinity of the 200 m isobath in most of the northern North Sea and in the Svinøy area on the west coast of Norway.

Little effort has been made to improve the general knowledge of the spawning grounds of saithe, and observations that might cast a light on this problem are seldom published, although spawning saithe undoubtedly have been observed on many occasions from research and fishing vessels. However, in addition to the spawning indicated by Damas (1909), spawning of saithe has been demonstrated on the Halten Bank (Anon. 1965) and in Lofoten (e.g. Wiborg 1960). Jakobsen (1972) made a survey in the Svinøy area and on the Halten Bank and found concentrations of spawning saithe in both areas. The main spawning ground in the Svinøy area was apparently much more restricted than indicated by Damas (1909).

In 1974 a survey of spawning saithe was made in the North Sea and in addition there were observations and sampling of spawning saithe from the three known spawning grounds on the Norwegian coast. These data are used

as a basis for a discussion of the problems concerning the identity of the North Sea and Norway Coast stocks of saithe.

MATERIAL AND METHODS

The data of spawning saithe in the North Sea and on the Norway Coast in 1974 were obtained from different sources. A survey was made 12 - 21 February with the fishing vessel M/S "Feiebas" in the northern North Sea (Fig. 1). Four bottom trawl hauls were made. On two occasions spawning saithe were sampled.

R/V "Johan Hjort" surveyed part of the same area 6 - 8 February (Fig. 1), but made no trawl hauls.

R/V "G.O.Sars" operated in the North Sea 4 - 5 March and a sample of spawning saithe was taken from a bottom trawl haul in the position N 60°45' E 01°04'. Bottom trawl hauls from which spawning saithe was sampled, were made with "G.O.Sars" in the Svinøy area 6 and 14 March. Attempts to trawl on the Halten Bank spawning ground had to be abandoned because of numerous gillnet settings. "G.O.Sars" did not make detailed surveys of the saithe spawning grounds.

During a fishing experiment with gillnet in Lofoten (Hylen and Jakobsen 1974) sampling of spawning saithe from the catches was made 13 and 14 February and 15 March.

Sampling of saithe from commercial catches was made 15 January (gillnet, Halten Bank) 17 January, 11, 12, 13, and 22 February, 26 April (bottom trawl, Svinøy Area).

The sampling comprised data on age (otoliths), length, sex, and sexual maturity. The number of fish sampled on each occation was from 45 to 120.

RESULTS AND DISCUSSION

The survey made by M/S "Feiebas" 12 - 21 February is shown on Fig. 1. The echo registrations of demersal fish were sparse except in the northern part (Tampen) where continuous registrations occurred over relatively long distances. Four bottom trawl hauls were made in this area (Fig. 1) and spawning saithe were numerous in the two westernmost hauls. The saithe had not yet (18 - 19 February) started the spawning, but a few individuals were nearly ripe. The distribution of the saithe was charted on the basis of echo registrations and trawl hauls (Fig. 1). In addition, a large fleet of trawlers were fishing in the area and gave a good indication of the distribution of the saithe.

The surveying by R/V "Johan Hjort" 6 - 8 February (Fig. 1) showed no traces of spawning saithe. On 4 March, however, R/V "G.O.Sars" recorded high concentrations of demersal fish north of the Bressay Ground for approximately 20 nautical miles along the course R/V "Johan Hjort" had followed four weeks earlier. A bottom trawl haul gave a catch dominated by mature saithe, two thirds of which had already spawned. The distribution of the spawning saithe is indicated on Fig. 1 which shows that also M/S "Feiebas" had been in the area less than three weeks earlier without recording any demersal fish. Observations from the Tampen area indicated that schools of spawning saithe might move around rapidly, but probably within a limited area. Similar movements may explain the sudden appearance of spawning saithe in the Bressay area. The possibility that the saithe recorded by "G.O.Sars" were the same as previously recorded in the Tampen area cannot be ignored. All available information (e.g. Damas 1909, Anon. 1965) does, however, confirm that saithe spawn regularly in the Tampen area.

Anon. (1965) stated that spawning of saithe in the North Sea appears to be concentrated in the Tampen - Viking Bank area, The Norwegian investigations in 1974 gave no evidence of spawning in other areas than the two charted on Fig. 1, but were carried out in too small scale to rule out the possible existence of other spawning grounds of saithe in the North Sea. It is clear, however, that the main spawning areas are much more restricted than indicated by Damas (1909).

The echo recordings made by R/V "G.O.Sars" in the Svinøy area and on the Halten Bank were in accordance with the distribution of spawning saithe

charted by Jakobsen (1972) and thus indicate that the location of these spawning grounds is relatively stable from one year to another.

Fig. 2 shows the approximate locations of the known spawning grounds of saithe in the North Sea and on the Norwegian coast. They are all found in areas with depths of 150 - 190 m, a possible exception being Lofoten where the extension of the distribution of spawning saithe is poorly known and accordingly only roughly indicated on the figure.

The observations of sexual maturity stages imply that the main spawning takes place within a relatively short time interval. The trawl hauls from the Svinøy area thus contained the following frequencies of spent saithe:

11 February:	0%
22 "	2%
6 March:	63%
14 "	86%
26 April:	98%

This is in very good accordance with the data from the North Sea. The gillnet catches from Lofoten, however, showed that spawning in that area took place considerably later with only 2% spent individuals found on 15 March.

It has been customary to treat the saithe in the North Sea and on the Norwegian coast from the Svinøy area northwards as two separate stocks and the ICES statistical regions have been applied using 62° N as border line between the stocks (Anon. 1965, Anon. 1974). According to Fig. 2 there are thus two spawning grounds for the North Sea stock and three for the Norway Coast stock.

There are two basic questions concerning the problem of the identity of the stocks: "What is the nursery area of the fry from the different spawning grounds?" and "What has been the nursery area for the saithe spawning on the different grounds ?"

Each summer 0-group saithe are found in large quantities near shore on the Norwegian Coast from southern Norway to the Soviet - Russian border.

The Skagerrak coast is the only part where the occurrence is not regular. No discontinuity in the distribution along the coast has been found. 0-group saithe are also recorded near shore on the British side of the North Sea from Shetland down to the English coast (Schmidt 1909).

Eggs and larvae from the Svinøy spawning ground are no doubt to a great extent carried northwards by the Atlantic current. The observations by Damas (1909), however, demonstrated that a large portion also drift straight to the coast. The fry from the Svinøy spawning ground are thus probably distributed all along the coast from the Svinøy area northwards. The fry from the Halten Bank and Lofoten spawning grounds are in all likelihood distributed in a similar way. 0-group saithe are generally not carried far into the Barents Sea or Bear Island - Spitsbergen area and such a drift may have disastrous effects (Hylen and Jakobsen 1971). Although the distribution of saithe fry from the Norway Coast spawning grounds is not known in detail, the basically northward direction of both the Atlantic and the coastal current will prevent distribution to any extent south of 62° N.

The situation in the North Sea is more complex. The existence of a southward current east of Shetland extending at least down to the Scottish coast is well established (e.g. Böhnecke 1922) and the Bressay spawning ground is located within this current. Thus, the 0-group saithe on the east coast of the British Isles may well have been recruited from the Bressay spawning ground. Some of the fry may be carried by an eastward extension of the current to the southwestern part of the Norwegian coast. It is, however, also possible that fry from spawning grounds west of Scotland drift into the North Sea. According to e.g. Svansson (1965) there is a southeastward current over the Tampen area extending into the eastern North Sea. Fry carried along by this current will eventually come in contact with the northward coastal current and be distributed along the west coast of Norway.

The observations of Damas (1909, Planche IX) are mostly in good accordance with the larval drift suggested in the preceeding sections, but indicate that the fry also may follow a more direct course from the Tampen area to the Norwegian coast. The crucial point concerning the identity of the stocks is, it seems, to what extent fry from the Tampen area are distributed along the coast north of 62° N.

The Norwegian tagging experiments show no evidence of large-scale migrations of immature saithe and it seems safe to assume that the majority of the saithe stay within a relatively small area until they are maturing.

Tagging experiments have demonstrated a yearly migration of mature saithe from nothern Norway to the spawning grounds on the Norwegian coast (Olsen 1961, Anon. 1965). However, a considerable number of the mature saithe from northern Norway were recaptured in the North Sea, but the extent of this migration has not been established. Data on the spawning migration from other parts of the coast or from the British side of the North Sea are scarce.

Considering the non-migrating behaviour of the immature saithe, it seems likely that the spawning migration should be roughly a reverse of the larval drift. The age distributions of the spawning saithe in 1974 (Fig. 3) do to some extent confirm this. It is evident that the strength of a year class may vary considerably from the Svinøy area to northern Norway (Hylen and Jakobsen 1971). The age distributions from Lofoten (K - M) and the Halten Bank (J) show a much higher frequency of 9 year old fish relative to 10 year old fish than the samples from the Svinøy area (D - H). This difference may have been caused by mixing of fish from Svinøy and northern Norway on the Svinøy spawning ground.

Such mixing is also indicated by the decrease in the frequency of 6 year old fish from trawl catches of younger, partly immature saithe in the Svinøy area (N - P) which is parallelled by an increase in the frequency of 6 year old fish in the samples of spawning saithe (D - H). There is little variation in the age distribution trawl hauls from the North Sea (A - C). They contained on the average younger fish than in the Svinøy area, but are inconclusive as far as mixing with fish from the Norway Coast stock is concerned.

The present knowledge of the saithe in the North Sea and on the Norwegian coast indicate that there are two stocks which possibly are overlapping in some area on the Norwegian coast and where fish from one spawning stock frequently mix with the other. It is also possible that the saithe in the North Sea are divided into two stocks, but the spawning areas are apparently too closely spaced and the age distributions too similar to make this likely.

SUMMARY

In 1974 spawning grounds of saithe in the North Sea were charted and data from the spawning grounds on the Norwegian coast were collected.

Two spawning grounds of saithe in the North Sea were found, in the Tampen and Bressay areas. In addition, three spawning grounds are known on the Norwegian coast.

Problems concerning the identity of the North Sea and Norway Coast stocks of saithe are discussed on the basis of these obervations.

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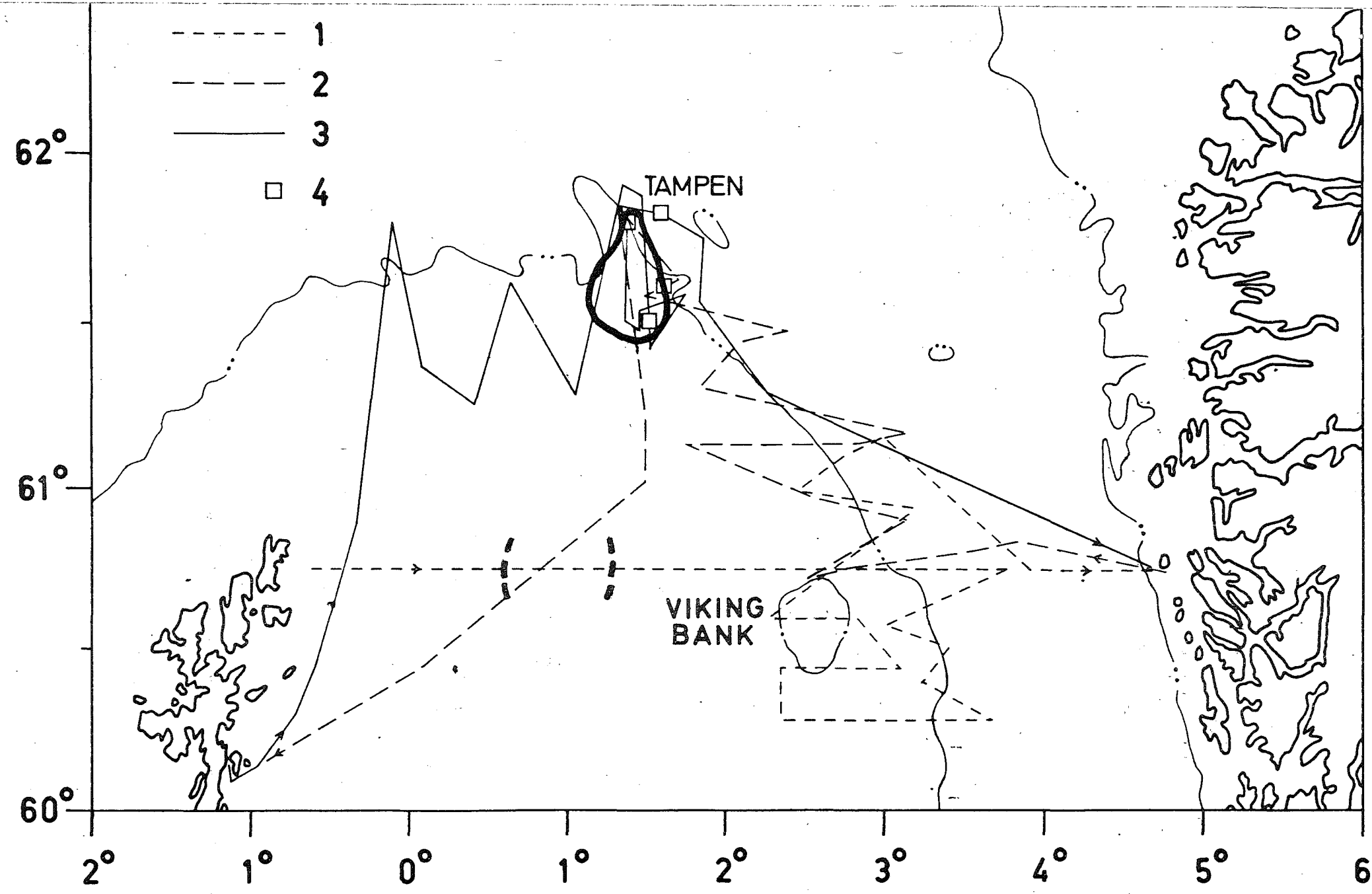

Fig. 1. Survey routes and trawl stations in the North Sea in February 1974. 1) R/V "Johan Hjort" 6 - 8 February, 2) M/S "Feiebas" 12 - 15 February, 3) M/S "Feiebas" 17 - 21 February, 4) Bottom trawl stations. The thick line shows the distribution of spawning saithe in the Tampen area. The thick broken lines indicate the area where spawning saithe were recorded by R/V "G.O.Sars" 4 March.

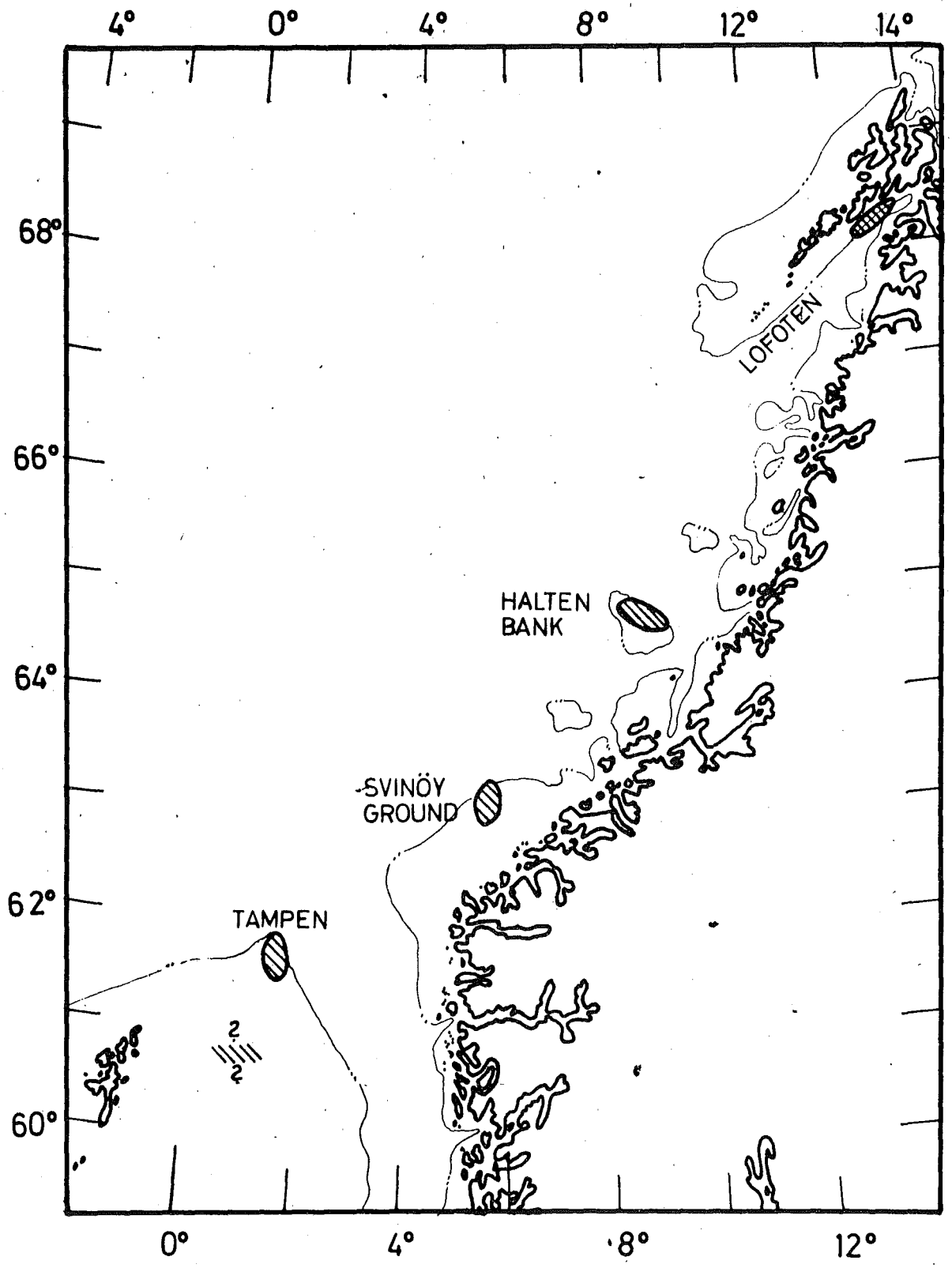

Fig. 2. Spawning grounds of saithe in the North Sea and on the Norwegian coast.

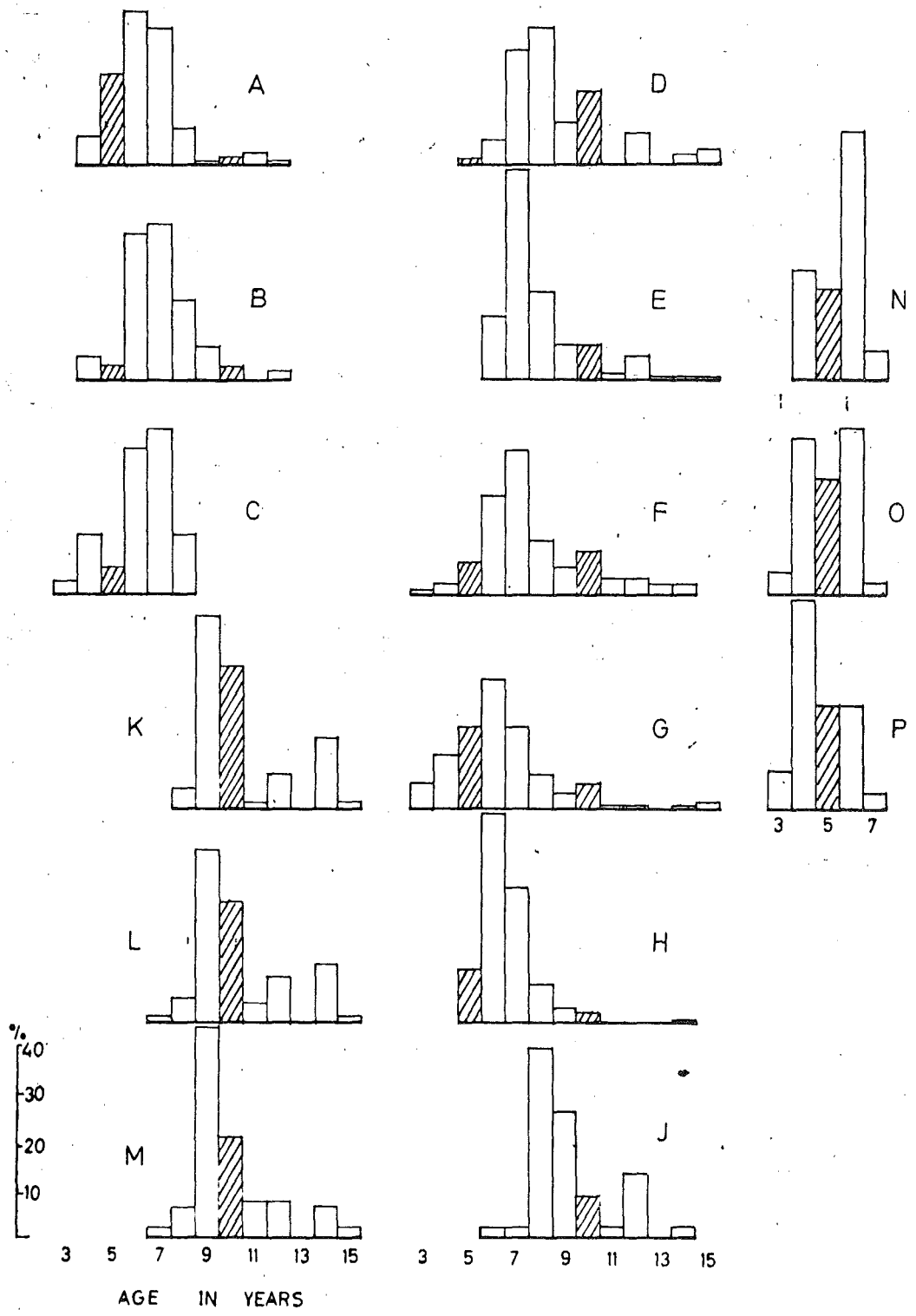

Fig. 3. Age distribution of saithe from the spawning areas in 1974. A) Bottom trawl, Bressay area 4 March, B) B.trawl, Tampen 18 February, C) do. 19 February, D) B.trawl, Svinøy area 11 February, E) do. 22 February, F) do. 6 March, G) do. 14 March, H) do. 26. April, N) do. 17 January, O) do. 12 February, P) do. 13 February, J) Gillnet, Halten Bank 15 January, K) Gillnet, Lofoten 13 February, L) do. 14 February, M) do. 15 March.