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Exploration of the Sea

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Demersal Fish (Northern) Committee

REPORT OF THE 1969 COALFISH WORKING GROUP

To examine the effect of the use of small-meshed cod-ends in the Norwegian trawl fishery for coalfish in the area between 62° and 64°N and east of 4°E

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Participants:

Mr. A. Hylen (Norway), Convenor
Mr. B. W. Jones (U.K.),
Mr. R. Jones, (U.K.),
Dr. H. H. Reinsch (Germany),
Dr. A. I. Treschev (U.S.S.R.), Part Time
Mr. V. P. Ponomarenko (U.S.S.R.), Part Time.

1. Terms of Reference

At the 56th Statutory Meeting of ICES it was resolved (C.Res.1968/2:13) that a Coalfish Working Group be established to examine the requests in the NEAFC Resolution NC 6/98, Annex E. The NEAFC Resolution requested that ICES should examine information submitted by the Norwegian Delegation together with any other information, and report to the Seventh Meeting of the Commission on:

1. The relationship between the stocks of coalfish within the area of the proposed exemption and those in adjacent areas of the north-east Atlantic.
2. The relationship between coalfish and other associated species in this area, and
3. The effect upon the stocks of coalfish and associated species of exempting the fishery in this area from the provisions of the Recommendation 1(a) (i).

2. Introduction

The Memorandum (NC 6/91) by the Norwegian Delegation at the Sixth Meeting of NEAFC pointed out that when the Commission's Recommendation to increase the minimum size of mesh of trawl nets from 120 (110) mm to 130 (120) mm was put into effect the new minimum size was applied to the whole of NEAFC Region 1 whereas the previous regulations had applied only to the part of Region 1 north of 66°N. The effect of the new Recommendation was to increase the minimum mesh-size from 80 mm to 130 mm in the area of Region 1 between 62°N and 66°N. The Norwegian Delegation pointed out that the adoption of the larger minimum mesh-size raised serious difficulties for a special Norwegian coastal fishery for coalfish. They reported that the Norwegian Ministry of Fisheries had granted a provisional exemption allowing trawlers not exceeding 200 gross tons when fishing for coalfish in an area between 62°N and 64°N and east of 4°E to use cod-end meshes below the recommended size but not less than 80 mm.

The present Working Group met to study the available data for this fishery and to assess the effects of the use of a minimum mesh-size of 80 mm in this special coalfish fishery in the area referred to according to the terms of reference given to the Working Group. Hereafter the area between 62°N and 64°N and east of 4°E will be referred to as the "special area".

3. Coalfish

The area under consideration is shown in Figure 1 and includes the continental shelf of the Norwegian coast off Møre and Romsdal. Generally speaking there are two types of coalfish fishery in this area. One is the fishery by larger vessels fishing mainly with trawls and gill-nets for the mature fish which aggregate to spawn in the early part of the year on Svinøy Bank. The other fishery is continued throughout the year by smaller vessels (less than 200 tons) exploiting the younger fish with trawls, purse-seines and other gears. It is the latter fishery with which the present report is mainly concerned.

Coalfish catches from the main fishing areas in the north-east Atlantic for recent years are given in Table 1. Catches from the Norway coast area (Division IIa) have exceeded those from any other area, although the large catches in recent years have been due, to some extent, to above average strength of the 1959, 1960 and 1962 year-classes. The catches of the individual countries from Division IIa are given in Table 2, which shows the importance of the Norwegian fishery compared with that of other countries.

The catches of coalfish by the trawlers less than 200 gross tons for the years 1961-1967 are given in Table 3. Over this period trawl catches have been steadily increasing.

Table 4 gives the fishing effort by small trawlers and indicates that the increase in trawl catches is due to a large extent to an increase in abundance of fish giving higher catch rates (Table 9). However, in the period 1961-1967 there has also been a slight increase in fishing effort by the trawlers. By far the largest catches are those taken by purse-seiners, although the quantity landed by these vessels is known accurately only for 1967. Purse-seiners tend to work mainly close to the shore, while the trawlers fishing for coalfish take the greater part of their catches on the edge of the shelf. A smaller quantity of coalfish is caught by trawlers working on the shelf, and in these catches there tends to be a greater by-catch of cod and haddock than on the edge (Hylen, 1968). Although the purse-seiners exploit different grounds from the trawlers they exploit coalfish of a similar size range.

3.1 Assessment

The effect of changing the minimum trawl mesh-size to 130 mm was calculated both in terms of the immediate loss which would be experienced by the Norwegian small trawlers and also in terms of the long-term change, which would be expected. The method used is that described by Gulland (1961).

It has been assumed that the present effective mesh-size in the special trawl fishery is 80 mm nylon, which is equivalent to 88 mm polypropylene.

The selection factor used was 3.79 as determined by Hylen (1969) for coalfish using polypropylene cod-ends. Data of the length composition of fish taken in the special trawl fishery were available only for a single sample taken in May 1968 (Table 5), and it is not known how representative this sample is of the fishery as a whole. The immediate loss to the special trawl fishery was calculated for mesh changes from 88 mm (polypropylene) to 100 mm, 110 mm and 130 mm. The results are given in Table 6. The immediate loss to the special trawl fishery is expected to be 46% (equivalent to 2,300 tons) of the present catch for a mesh increase to the recommended size of 130 mm. For the intermediate mesh-sizes the immediate losses will not be so great.

To calculate the likely long-term gains to this and other coalfish fisheries some information on the stock relationship is required. In the Report of the Coalfish Working Group (Anon., 1965) it was shown that there is a significant interchange of coalfish between the different fishing grounds of the north-east Atlantic, and these migrations at times reach substantial proportions. The relationship between the young fish in the special fishery and the fisheries in other areas is still far from clear. Tagging experiments were described by Hylen (1968), in which coalfish were tagged in the special area in the years 1955-1958. About 1.500 fish were released within the 4 mile limit and 114 fish within the special area outside the 4 mile limit. Of those released near the coast the majority were recaptured in the same area with very few fish being recaptured outside the 4 mile limit. Small numbers of fish moved north and south along the Norwegian coast, and a small number were recaptured from the northern North Sea and north of Scotland. Of the fish released outside the 4 mile limit 9 were recaptured inside the limit, 6 outside the limit, and 15 from other areas. The results of German tagging experiments showed that from 33 coalfish tagged on the Svinøy Ground in 1967, 4 fish migrated to the Shetland Islands and 1 went towards the Lofoten area. The length range of these fish were 40 to 60 cm and by the end of 1968 none were recaptured from the special area.

The long-term effect of a change to the larger mesh has been calculated by taking account of the quantity of the fish released which can be expected to be subsequently captured. For this calculation a natural mortality coefficient of M = 0.3 has been assumed, and values for the exploitation rate $E(=\frac{F}{F+M})$ have been taken as 0.6 and 0.8 (B. W. Jones, unpubl.data). Discarding of small fish is believed to be negligible and has been ignored. The expected long-term effects of the adoption of an increased mesh-size are given in Table 6 (b). Of the fish released by the special trawl fishery the weight that is expected to be subsequently captured either in that fishery or elsewhere amounts to 250-300 tons for a 100 mm mesh and 1,450-1,900 tons for a mesh-size of 130 mm. Taking account of the immediate loss of 2,300 tons gives a net result of a change to a mesh-size of 130 mm as a net loss of between 400 and 850 tons to the fisheries of the NE Atlantic. This net loss would be less for mesh increases to intermediate sizes between 88 mm and 130 mm (Table 6 (b)).

Because of the uncertainty of the stock relationship it is difficult to be certain which fisheries would benefit from the fish released by the 130 mm mesh-size. They will not all be caught in the special trawl fishery, however, and it seems likely that there would be a net loss to the Norwegian trawl fishery in the special area of an amount up to but not exceeding the immediate loss. There would probably be a net gain to other fisheries and mainly to those in Division IIa. These gains would, however, be a negligible proportion of the catch from the Division as a whole. The net effect on the NE Atlantic fisheries would still be a loss, however, as indicated above.

4. Cod (Table 3)

The cod in the Norwegian waters are composed by Arctic cod and coastal cod. Immature Arctic cod live in the Barents Sea, around Bear Island and along the west Spitsbergen coast. Mature fish migrate every year to the Norwegian coast as far south as western Norway for spawning. Migration of the coastal cod is, however, less extensive, leading to a predominance of this type of cod in coastal waters.

In 1958 and 1963 trawl samples of cod were taken in February-April from the special area and on these occasions the percentages of Arctic cod were found to be 65% and 13%, respectively. Outside the spawning period of the Arctic cod, trawl samples of cod were composed exclusively of coastal cod.

From the information available only Norway and Germany are fishing for demersal species in the special area. The German statistics are only separated into saithe and "Other Species" (Table 7). German annual landings of "Other Species" show a steady decrease from 1,052 tons in 1961 to 57 tons in 1967.

The annual landings of cod including Arctic cod by Norwegian trawlers from the special area in the period 1961-1967 have been fluctuating between 464 and 860 tons (Table 8). The catch per unit effort in the Norwegian trawl fishery has in the same period been fluctuating (Table 9).

As far as the Arctic cod is concerned only fish more than 60 cm and older than 6 years are caught in the special area. Adopting a selection factor of 3.7 for Arctic cod, for cod-ends made of polypropylene the 100% retention length of cod-ends with a mesh-size of 130 (120) mm is below 60 cm. This means that the conservation effect on Arctic cod by increasing the mesh-size from 88 (80) mm to 130 (120) mm for Norwegian trawlers (less than 200 tons) fishing in the special area would be nil.

A large proportion of the coastal cod caught by trawl in the area is more than 50 cm long. The selection range (5-95%) for a mesh-size of 130 mm (120 mm) is 35-53 cm, if a selection factor of 3.4 for the North Sea cod is used. This selection factor has been used because the body shape of the coastal cod is more like that of the North Sea cod. The number of cod in the selection ranges of cod-ends with mesh-sizes up to 130 (120) mm seems to be small and in 1967 less than 6%. The immediate loss of using the Convention mesh-size is therefore likely to be about 3% by weight, and the long-term change can therefore be expected to be less than 3%.

5. Haddock

The results of tagging experiments show that no Arctic haddock tagged north of 68°N have been recaptured in the special area, and conversely no haddock tagged in the special area have been recaptured north of the area.

The Norwegian trawl landings (Table 3) from the special area have been fluctuating in the period 1961-1966 from 349 tons to 665 tons. Catch per unit effort for the same fishery has also been fluctuating.

Length and age composition data were available but only from experimental fishing with prawn trawls, Danish seines and trawls with the cod-ends covered with nets of small meshes. These data indicate that haddock as small as 11 cm occur in the special area. An increase in the mesh-size from 88 (80) mm may, therefore, cause an immediate loss to the trawlers but in the absence of length-composition data from these vessels, no assessment could be made.

6. Annex II Species other than Cod and Haddock

A small quantity of whiting, halibut and plaice are taken by Norwegian trawlers in the special area (Table 8). No biological data exist either from commercial landings or from experimental catches, however, and no assessment could be made.

7. Summary

In the very short time at its disposal, the Working Group concentrated its efforts on an assessment of the effects of increasing the mesh-size in the Norwegian trawl fishery in the area between 62°N and 64°N and east of 4°E from its present level, equivalent to 88 mm polypropylene to various mesh-sizes up to 130 mm.

The immediate effect of an increase to 130 mm was found to lead to a loss of 46% equivalent to 2300 metric tons, in the landings of Norwegian trawlers less than 200 tons in the special area. In the long-term, the subsequent capture of many of these fish was expected to amount to about 1700 tons. Owing to the extensive migrations made by saithe in the North Atlantic it was impossible to say to what extent these fish would be recaptured in the special Norwegian trawl fisheries. It can only be said that there would be a net loss of the order of 600 tons in the north-east Atlantic as a whole. It is likely that this would be distributed so as to leave a net loss to the Norwegian special trawl fishery of between 600 and 2300 tons and to generate negligible gains in other saithe fisheries.

This result is directly dependent on the length-composition data available from the Norwegian special trawl fishery. In view of the limited amount of data actually available, it should be stressed that no great confidence can be expressed in the numerical values of the results obtained.

Assessments were also made of the effects on cod of an increase in mesh-size to 130 mm. A limited amount of length-composition data were available, and from these it was calculated that an increase in mesh-size to 130 mm would have a negligible effect on cod landings. In the case of other species there were insuffucient data from mesh assessments to be made.

8. Recommendations

In view of the limited amount of data available to the Working Group it was recommended that:-

1. Further length and age composition data of all species, but particularly of saithe, be collected from Norwegian trawlers less than 200 tons operating in the area off the Norwegian coast between 62°N and 64°N and east of 4°E.

2. Further tagging experiments of saithe in the special area should be carried out at various times of the year.

3. When further data as specified under (1) and (2) have been collected, the Working Group meet again to make further assessments.

9. References

Anon. 1965 "Report of the Coalfish Working Group". Coop.Res.Rep., A, No.6:1-23.

Anon. 1968 "Report of the North Sea Working Group". ICES, C.M.1968/F:4 pp.1-13. (Mimeo.).

Gulland, J.A. 1961 "The estimation of the effect on catches of changes in gear selectivity". J.Cons.perm.int.Explor.Mer, 26(2):204-214.

Hylen, A. 1968 "Selectivity experiments with a cod-end made of polypropylene splitfibre". Coop.Res.Rep., Series B, pp.47-51.

Hylen, A 1968 "Norwegian trawl fishery for saithe in the area limited by 62°N and 64°N and east of 4°E". ICES, C.M.1968/F:13. (Mimeo.).

Table 1. European coalfish landings by areas and total quantities for all areas. Metric tons, round fresh weight
From Bulletin Statistique

	Divisions								
Year	I	IIa	IIb	IV	Va	Vb	VIa	Others	Total
1961	12,868	92,802[1]	414	35,810	50,929	9,592	6,652	5,975	215,042
1962	(9,770)	109,919[1]	403	40,576	48,278	10,455	7,032	6,482	232,915
1963	(20,130)	128,785[1]	44	47,286	43,985	12,696	6,478	7,321	266,725
1964	53,968	144,069[1]	994	55,102	60,417	21,993	13,475	10,466	360,334
1965	16,149	168,567[2]	884	68,907	60,107	22,181	18,323	24,136	379,254
1966	10,479	191,575	921	86,927	52,168	25,497	11,389	20,341	399,297
1967	13,358	167,389	275	72,504	76,269	21,126	12,911	20,695	384,527

[1]French catches including Subarea I and Division IIb. [2]French catches including Division IIb.

Table 2. Landings of coalfish by countries in Division IIa, 1961-1967.
Metric tons, round fresh weight
From Bulletin Statistique

Year	England	France	Germany	Norway	Scotland	Others	Total
1961	2,727	3,625[1]	19,559	66,879	12	-	92,802
1962	3,211	544[1]	12,651	93,513	-	-	109,919
1963	3,032	1,110[1]	8,108	116,535	-	-	128,785
1964	4,088	1,525[1]	4,410	133,882	-	164	144,069
1965	4,498	1,618[2]	11,387	150,842	5	217	168,567
1966	9,418	2,987	11,250	167,671	-	249	191,575
1967	6,628	9,472	11,589	139,211	-	489	167,389

[1]Subarea I and Division IIb included [2]Division IIb included

Table 3. Norwegian landings from Division IIa within the area bordered by 62° and 64°N and east of 4°E. Metric tons, round fresh weight.

COALFISH

Year	Total Norwegian	Trawlers less than 150 tons gross	Other Gears
1961	17,507	981	16,526
1962	33,129	1,758	31,371
1963	43,471	2,070	41,401
1964	31,382	2,914	28,468
1965	43,767	7,146	36,621
1966	49,984	9,573	40,411
1967	45,000	11,654*	33,346 **
Mean 1961-67	37,748	5,157	32,592

* Trawlers less than 200 tons gross.
** Includes 27,679 tons caught by purse-seine.

COD

1961	22,776	848	21,928
1962	14,233	499	13,734
1963	18,527	628	17,899
1964	20,197	712	19,485
1965	19,842	510	19,332
1966	20,129	464	19,665
1967	15,000	860	14,140
Mean 1961-67	18,672	646	18,026

HADDOCK

1961	2,571	510	2,061
1962	2,152	349	1,803
1963	3,135	532	2,603
1964	4,828	665	4,163
1965	4,003	562	3,477
1966	3,115	452	2,663
1967	2,500	463	2,037
Mean 1961-67	3,186	500	2,687

Table 4. Hours fishing by Norwegian trawlers less than 150 tons gross.

Year	1961	1962	1963	1964	1965	1966	1967
Hours	13 721	13 199	17 027	18 770	23 715	15 899	18 462

Table 5. Length composition of coalfish landed by Norwegian trawlers less than 200 tons from the special area.

Length-group	‰
35-39	2
40-44	189
45-49	407
50-54	335
55-59	54
60-64	9
65-69	2
70-74	1

Table 6. Effect on coalfish of increases in mesh-size from 88 mm (polypropylene) in the Norwegian trawl fisheries between 62° and 64°N and east of 4°E.

(a) Immediate effects

	Mesh-size		
	100	110	130
Immediate loss,%	6	14	46
Immediate loss, tons	300	700	2300

(b) Long-term effects

	Mesh-size		
	100	110	130
Immediate loss to special Norwegian trawl fisheries (tons)	300	700	2300
Subsequent catches of fish released by the larger mesh in north-east Atlantic fisheries (tons)	250-300	450-650	1450-1900
Net loss to north-east Atlantic fisheries (tons)	0-50	50-250	400-850

Table 7. German landings and landings per days fishing from the Svinøy Ground. Metric tons, round fresh weight.

Year	Total Landings		Landings per Fishing Days	
	Coalfish	Others*	Coalfish	Others
1961	4,973	1,052	11,2	3,0
1962	1,387	717	6,9	1,9
1963	1,267	831	7,2	2,5
1964	1,030	475	10,4	1,8
1965	696	119	14,2	2,4
1966	621	299	10,7	5,2
1967	441	57	10,0	1,3

* Cod, haddock, redfish and spiny dogfish.

Table 8. Norwegian landings from the area limited by 62° and 64°N and east of 4°E by Norwegian trawlers of 150 tons gross and less. Metric tons, round fresh weight.

	Annex II Species					Non Annex II, Non Article 6 Species		
Year	Cod	Haddock	Whiting	Halibut	Plaice	Coalfish	Others	Total
1961	848.3	509.5	22.5	9.2	1.0	981.3	52.9	2 424.7
1962	498.8	349.2	38.5	6.0	0.3	1 758.2	61.6	2 712.6
1963	627.9	532.0	17.1	13.9	1.9	2 070.4	56.2	3 319.4
1964	711.8	664.7	20.6	22.6	2.6	2 913.8	179.0	4 515.1
1965	509.0	526.4	15.4	16.1	2.8	7 145.8	335.2	8 551.6
1966	464.4	452.3	1.5	10.9	0.5	9 573.0	209.9	10 712.5
1967	860.3	462.8	2.4	8.8	1.6	11 654.1	199.2	13 189.2

Table 9. Catch per hours trawling by Norwegian trawlers of of 150 tons gross and less in the area limited by 62° and 64°N. Kg., round fresh weight.

Year	Cod	Haddock	Coalfish
1961	62	37	72
1962	38	26	133
1963	37	31	122
1964	38	35	155
1965	22	22	301
1966	29	28	550
1967	47	25	631

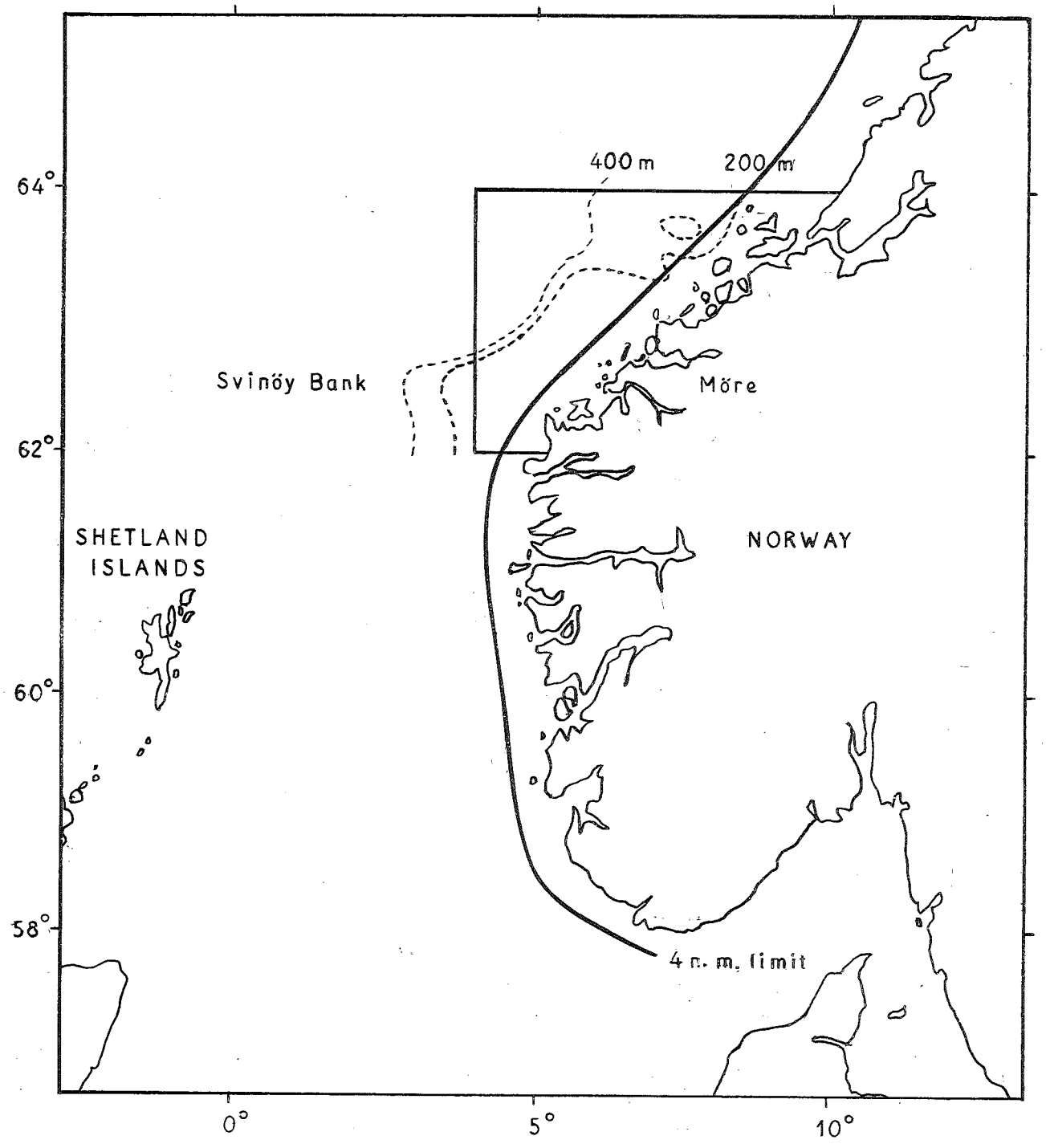

Figure 1. The special area off the Norwegian coast limited by 62° and 64°N and east of 4°E.