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TABLE OF CONTENTS

List of Contents (ctd)

List of Contents (ctd) Page

-o-o-o-

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I. REPORT OF ACFM ON EFFECTS OF AREAL-SEASONAL CLOSURE OF THE NORWAY POUT FISHERY AND CONSIDERATION OF OTHER METHODS OF REGULATING THIS FISHERY (February 1979)

I. Introduction and Terms of Reference

In response to a request, from the Commission of the European Economic Community to conduct a study of the quantitative effects on the yield of the industrial fishery, and of the human consumption fishery, of a Norway pout box closed to the industrial fishery in the North Sea, ICES set up an ad hoc Working Group on the Norway Pout Box Problem, which met in Charlottenlund from 29 January to 2 February 1979 to consider this question.

The terms of reference of this Working Group, as requested by the Commission were:

"to make a quantitative assessment of:

1. The effect on the yield of the industrial fishery and of the human consumption fishery on the assumption that a Norway pout box is closed to the industrial fishery for the following areas and time periods indicated below:

1a) Areas

Box 1 is delimited to the west: 4°W longitude and United Kingdom coasts; to the east: 0° longitude

Box 2 is delimited to the west: 4°W longitude and United Kingdom coasts; to the east: 1°E longitude

Box 3 is delimited to the west: 4°W longitude and United Kingdom coasts; to the east: 2°E longitude

in all cases between 56°N and 60°N latitude.

1b) Time Periods relating to Areas

Case 1: no closure of the boxes in winter and summer.

Case 2: Box 1 closed in winter, opened in summer.

Case 3: Box 1 closed in winter and summer.

Case 4: Box 2 closed in winter and opened in summer.

Case 5: Box 2 closed in winter and Box 1 closed in summer.

Case 6: Box 2 closed in winter and summer.

Case 7: Box 3 closed in winter and opened in summer.

Case 8: Box 3 closed in winter and Box 2 closed in summer.

Case 9: Box 3 closed in winter and Box 1 closed in summer.

Case 10: Box 3 closed in winter and summer.

Explanation: winter: 1 October to 31 March
summer: 1 April to 30 September.

2. Possible effects of redistribution of fishing effort by the industrial fishery on the basis of the assumption stated in 1. above. In particular an assessment of the effects of an increase in effort outside a Norway pout box

   a) within the North Sea

   b) within EEC waters outside the North Sea

   c) within 3rd country waters.

3. The possibility of regulating fishing mortality on the Norway pout in such a way that adverse effects to the haddock and whiting stocks are significantly reduced. In particular with regard to gears selective for Norway pout, TAC regulation for Norway pout, by-catch limitations.

4. The effect on the haddock and whiting stocks of discarding in the human consumption fishery in comparison to the effect of industrial fishery on these stocks.

5. The effects on the haddock and whiting stocks of

   a) the allocation of quotas in 1978 as compared to 1977.

   b) the reduction in the permissible by-catch in the industrial fishery from 25% in 1977 to 10% in 1978.

   c) the closure of Norway pout boxes in previous years.

   d) the proposed increase in mesh size to 80 mm in the human consumption fisheries.

6. The effects of the industrial fishery on stocks exploited for human consumption other than haddock and whiting".

II. Methods Used and Assumptions Made in Assessing Effects of Box Closures

In assessing the effects of the various box closures the data from the fishery in 1976 were utilised, as this was the only year which had not been subject to box closure regulations for which catch per unit effort data for the industrial fishery were available to the Working Group on an area basis.

In relation to the effects of the closures on the yields of the industrial fishery the industrial effort, which would have been displaced by the various box combinations, was redistributed to adjacent areas, in a somewhat subjective way, based on the judgements of members of the Working Group of what would be the likely effects. The expected catch of industrial fish was then estimated by multiplying these redistributed efforts by the appropriate catch per unit effort for the areas to which it was reallocated.

The by-catch of haddock and whiting was estimated by multiplying these redistributed total industrial catches by the by-catch ratios for the appropriate areas in 1976. These estimates of by-catch of haddock and whiting which would have been taken by the redistributed industrial

effort were then used to re-estimate the fishing mortality rates which the industrial fishery would have engendered on these species under these circumstances. To assess the effects of these changed fishing mortality rates on the long-term yield of the haddock and whiting fisheries a yield per recruit model was used applied to an equilibrium stock which was estimated from average recruitment subjected to the fishing mortality rates at age which applied in 1976. The fishing mortality rates in that year on haddock and whiting were very much above F_{max} on the present exploitation pattern. This, however, has only a minor effect on the assessments; if the assessment is repeated on the assumption of a fishing mortality rate of F_{max}, for haddock, the percentage long-term gain to the human consumption landings of a closure of Box 3 is only increased from 17% to 18% if the 75 mm minimum mesh size is maintained.

Lack of adequate data precluded a more realistic approach to the total assessment of the problem but the following limitations of it should be pointed out:

a) It has been assumed that 1976 was typical of future situations in respect of the fishing effort which will be applied in the Norway pout fishery, in the total catch per unit effort of that fishery, in the proportion of by-catch of haddock and whiting in that total catch, and in the age compositions of these by-catches. The assumptions are unlikely to be true in view of the year to year variations in these fishing parameters.

b) No data were available of age compositions of the by-catches within the various sub-areas. It was therefore assumed that these age compositions were uniform over all areas. The effect of this assumption must be to minimise the estimated gains to the human consumption fisheries of any box closure which had been chosen on the grounds of giving protection to the youngest age groups of these species.

c) The conclusions on gains and losses are critically dependent on the assumed redistribution and reduction of effort. Since these would be determined partly by economic considerations outside the Group's remit the Group had to make the best predictions they could from their knowledge of the national fisheries. Nevertheless, the predictions were to some extent subjective. Hence the conclusions are partly based on judgement, not on scientific evidence.

d) The estimated effects of the closures on the industrial catch are largely determined by the assumption of the amount of effort which will be withdrawn from the fishery as a consequence. If this assumption is correct, however, the total effect may have been somewhat underestimated as it has been assumed that the redistribution of displaced effort to other areas will not reduce the catch per unit effort in these areas. It is not possible to assess whether this assumption is likely to be valid or not, as there is no basis for estimating the likely rate of migration of fish between the closed and open areas.

III. Results of Assessments of Effects of Box Closures

Largely because of the assumptions made regarding redistribution of industrial fishing effort which would result from box closures, the estimated results of many of the proposed closures are virtually identical. Accordingly only 3 outputs are given below, with the options to which they are applicable.

Option	Total loss in industrial catch as % of total	Gain in human consumption yield per recruit as %	
		Haddock	Whiting
Closure Box 1 in winter	1	3	7
Closure Box 2 throughout year	25	11	38
Closure Box 3 throughout year	28	17	47
30% reduction in industrial effort	30	20	50

On the assumption made about the redistribution of effort, the effects of a winter, or throughout the year, closure of Box 1 are virtually identical. This is estimated to result in an overall reduction of 1% in the industrial catch and gains of 3% and 7% respectively for haddock and whiting. Similarly on the assumptions about effort redistribution the effects of closure of Box 2 throughout the year do not differ significantly from closure only in winter, whether this is combined with a closure of Box 1 or not. The effects of all of these options would be a loss of total yield of 25% in industrial catch and gains of 11% and 38% respectively in the human consumption haddock and whiting fisheries. Similarly the closure of Box 3 throughout the year would be similar in its effects to only a winter closure of this box, whether or not it is combined with summer closures of smaller areas. The effects of all of these options are estimated to be a loss of 28% of industrial catch and gains of 17% and 47% respectively in long-term human consumption haddock and whiting landings, on the assumption of long-term average recruitment. In the text table above the estimated effects of a 30% reduction in industrial effort in all areas are given for comparison. This would suggest that the losses and gains given above for box closures largely arise from the effort reductions they are assumed to result in, rather than from any specific box effect due to differences between areas in by-catch rates.

IV. The Redistribution of Effort Arising from Box Closures and its Effects

The way in which industrial fishing effort would be redistributed if boxes were closed in any of the combinations specified in the terms of reference would be determined not only by biological criteria but also by social, economic, and political considerations which are outside the field of competence of ICES. It was considered that the effects of the proposed closures would be small in the case of the United Kingdom industrial

fleet which would partly be diverted into other fisheries; the remaining industrial effort being redistributed into the area north of 60°N within the EEC zone. The Norwegian industrial fishing effort is mainly distributed outside the areas proposed for closure; the effects on that fishery would be expected to be very small.

The Faroese industrial fleet has been partly diverted, as a result of the closures in 1977 and 1978, into human consumption fishing in its home waters, with the remainder being redistributed into the area north of 60°N and into Division VIa in the EEC zone, and partly into the Norwegian zone of the North Sea. This diversion would be expected to be maintained with the closures under consideration.

The major problem would arise in respect of the large vessels of the Danish industrial fleet whose activities are based on fishing for Norway pout in autumn and winter, and for sandeels in spring and summer. For these vessels a closure of Box 1 would result in redistribution of effort into the remaining North Sea areas within the EEC zone. If Boxes 2 or 3 are closed the areas for redistribution are very limited. The area within the EEC zone north of 60°N is not thought likely to be able to maintain all of the effort hitherto exerted in Boxes 2 or 3. It was assumed that the scope for redistribution of effort into the Norwegian zone of the North Sea would be small. The EEC zone of the North Sea south of the proposed boxes is an area where the only industrial resources are sandeels and sprat. The vessels under consideration already participate in the sandeel fishery during the appropriate seasons, the sprat fishery is already subject to a total allowable catch regulation and could not absorb any additional effort.

The only alternative fisheries open to these vessels in areas outwith the North Sea, which are not already subject to quota regulations and thus might be considered as capable of absorbing additional effort, are horse mackerel, blue whiting and Norway pout in Division VIa. As alternatives to a North Sea winter fishery for Norway pout these fisheries are restricted by the long voyage and adverse weather conditions. However some redistribution of Danish industrial effort has taken place to the VIa Norway pout fishery in 1978. No data are available on by-catches from this fishery, so the benefits of such diversion to the human consumption fisheries of the Community as a whole cannot be assessed.

Based on these considerations the Working Group made the following estimates of the overall effects of box closures on the distribution of industrial effort:

1. No restriction as to area of fishing: effort distributed as in 1976.
2. Closure of Box 1 in winter or throughout the year: effort from that area redistributed to the area between 0° and 1°E and to the area north of 60°N in proportion to the 1976 distribution of effort in these areas.
3. Closure of Box 2 in winter: assumed 50% of the effort would be withdrawn from the fishery. The remainder redistributed to the area between 1°E and 2°E and to the area north of 60°N in proportion to the 1976 distribution of effort in these areas.
4. Closure of Box 2 in winter and Box 1 in summer: it was assumed that this would result in the withdrawal of 50% of the winter effort in Box 2 throughout the year. This would result in little significant difference from a closure of Box 2 throughout the year.
5. Closure of Box 2 throughout the year: 50% of the effort from Box 2 was redistributed to the areas specified under 3.

6. Closure of Box 3 in winter only: this was assumed to result in withdrawal of 50% of the winter effort in Box 3. The remainder was reallocated to the area north of 60°N.

7. Closure of Box 3 in winter and Box 2 in summer: this was assumed to be equivalent in effect to closure of Box 3 throughout the year; 50% of the effort was redistributed to the area north of 60°N, 50% withdrawn from the fishery.

8. Closure of Box 3 in winter and Box 1 in summer: as 7 above.

9. Closure of Box 3 throughout the year: as 7 above.

The effects of these redistributions and withdrawals of effort on the industrial catches are given in the text table on page 5. In all cases it was assumed that the redistribution of effort would not result in any change in the catch rates of the areas to which it was reallocated.

V. Potential for Use of Gears Selective for Norway Pout, Effects of Norway Pout TACs and By-Catch Limitations

V.1 Gears selective for Norway pout

It seems unlikely that any gear can be designed for Norway pout fishing which could catch that species with the efficiency of the gear currently used and, at the same time, reduce the level of by-catch of protected species. There is no known difference, of sufficient magnitude, in the distribution above the sea bottom, or in the reaction to fishing gear between Norway pout and haddock and whiting which would provide a basis for designing such a gear.

V.2 TACs for Norway pout

A TAC for Norway pout is, in its effects, equivalent to a reduction in industrial fishing effort. This would result in a loss of industrial catch roughly proportional to the effort reductions, although this loss might be somewhat reduced by an increase in catch per unit effort. There would be a gain to the human consumption fisheries, particularly to those for haddock and whiting. The effects of various percentage reductions in industrial effort are given in the text table below.

% gains to human consumption fisheries	Percentage reduction of total industrial effort and landings				
	20	40	60	80	100
Haddock	10	22	35	49	65
Whiting	25	58	100	156	228

V.3 By-catch limitations

The imposition of by-catch limitations, if effectively enforced, must have some effect in reducing the by-catch of protected species by forcing industrial fishing vessels to leave fishing grounds where the by-catch is above the permitted level. The effectiveness of by-catch limitations in reducing the loss to the human consumption fisheries is determined by the

level of by-catch permitted, relative to the frequency of different by-catch levels encountered by the fishery when no such regulation is in force.

No data are available which permit the effects of the 25% by-catch level previously in force, and the 10% level in force in 1978, to be properly evaluated. The only data available were percentages of haddock and whiting in total industrial landings. As by-catch limitations apply to individual landings these data provide only a very rough indication of the likely effects. The data given below show the estimated total by-catches of haddock and whiting in 1977 and in the first three quarters of 1978, and the percentages these constituted of the total industrial landings from Areas 1 - 5A, which cover the distribution of the Norway pout fishery, excluding those from the sandeel fisheries (Figure 1).

Year	Areas 1 - 5A					
	Total industrial Tons	Haddock		Whiting		Haddock and whiting, %
		Tons	%	Tons	%	
1977	454 274	14 739	3.2	27 088	6.0	9.2
1978	282 591	7 261	2.6	6 537	2.3	4.9

These data would suggest that there was no significant change in the percentage by-catch of haddock between 1977 and 1978, but the percentage by-catch of whiting appears to have decreased appreciably. How far this decrease can be ascribed to the change in the by-catch regulation, it is not possible to say on such short-term data. As shown in Table 4.5 of the Working Group Report, there was an increase in the percentage by-catch of whiting in Areas 5B and 6 in 1977 and 1978. These are areas outside the distribution of the Norway pout fishery and these increases are therefore not explicable in the context of that fishery.

VI. The Effects on Haddock and Whiting Stocks of Discarding in the Human Consumption Fisheries and the Effects of the Proposed Increase in Mesh Size to 80 mm in these Fisheries

The effects of discarding and of the proposed increases in mesh size on the yields of haddock and whiting, were evaluated using the same model as utilised in assessing box closures; that is it assumes average recruitment of these species and maintenance of the fishing mortality pattern which applied in 1976, apart from any changes in the latter resulting from the mesh changes.

The results are given in the text table (page 9), as percentage changes resulting from mesh changes from the current 75 mm to 80 mm and to 90 mm, as gains or losses in industrial by-catches, human consumption landings and discards by the human consumption fisheries.

Mesh size	Fishery	% change in yield per recruit	
		Haddock	Whiting
80	Industrial by-catch	+6	+17
	Human consumption landings	+7	+10
	Human consumption discards	-10	-27
90	Industrial by-catch	+18	+43
	Human consumption landings	+22	+19
	Human consumption discards	-33	-65

These results would suggest that under maintenance of the 1976 fishing pattern situation discards would decrease by 65% and 33% for haddock and whiting respectively if the mesh size was increased to 90 mm but that little of this gain would accrue to the human consumption fishery as regards whiting. This is because of the relative patterns of fishing on the age distribution of this species by the two types of fishery.

These results also show that an increase in mesh size to 80 mm would increase the long-term yields of haddock and whiting in both fisheries; by 6% in industrial landings and by 7% in human consumption landings for haddock and by 17% and 10% respectively for whiting. Increases in mesh size will also decrease the human consumption discards for both species very appreciably. It should be noted that the increases in potential by-catch in the industrial fishery are likely to make adherence to the by-catch restrictions more difficult.

The results given above are largely determined by the assumption that the 1976 levels of fishing effort in both the human consumption and industrial fisheries will be maintained. The effects of reducing industrial effort commensurate with the effects of box closures, whilst maintaining the 75 mm mesh size, are given below.

Effort reduction equivalent to closure of:	HADDOCK		WHITING	
	Percentage change in:			
	By-catch	Discards	By-catch	Discards
Box 1	-5	+2	-5	+4
Box 2	-20	+8	-25	+19
Box 3	-30	+12	-30	+23

This would suggest that, particularly for whiting, the effects of box closures, whilst maintaining the present mesh size, would result chiefly in an increase in discard rates by the human consumption fishery.

VII. Effects on Haddock and Whiting Stocks of Previous Closures of Norway Pout Boxes

It is difficult to distinguish the effects of box closures from those due to stock fluctuations, particularly when the former have been of short duration. The major measurable effect of the closure so far enforced would have been in the last quarter of 1977 when most of Box 1 was closed throughout that period. Catches of all species in Box 1 by the industrial fishery were reduced in this quarter to a low level but, as shown in the text table below, the overall reductions were proportional to the reduction in fishing effort. It is not clear that any reduction which took place in the overall by-catches of haddock and whiting during this quarter was a direct result of the box closure.

Time periods	Total industrial (Areas 1-6) Tons	Haddock		Whiting		Estimated industrial effort (hours fishing)
		Tons	%	Tons	%	
Quarters 1-3 1976	812 310	39 817	4.9	121 660	15.0	521 722
Quarters 1-3 1977	483 448	13 753	2.8	37 387	7.7	350 514
Ratio 1977/76	0.60	0.35		0.31		0.67
Quarter 4 1976	287 587	6 435	2.2	23 183	8.1	183 715
Quarter 4 1977	205 587	2 109	1.0	13 224	6.4	129 019
Ratio 1977/76	0.71	0.33		0.57		0.70

VIII. Effects of Industrial Fishery on Human Consumption Stocks other than Haddock and Whiting

The only species, other than haddock and whiting, which is taken in significant quantities by the Norway pout fishery is saithe, of which the by-catches were appreciable in earlier years. Since saithe became a protected species the industrial by-catch has been reduced to a very low level. The impact of the industrial fishery for Norway pout would therefore appear to be small on species other than haddock and whiting.

IX. Potential for a Norway Pout Fishery Confined to an Area which would Reduce By-Catch in the EEC Zone of the North Sea

The Working Group also examined the results of research vessel surveys with a view to investigating whether an area could be demarcated within which a Norway pout fishery could be maintained with minimal effects on the human consumption haddock and whiting yields. This suggested that the main concentrations of Norway pout and of 1- and 2-group haddock and whiting occupy zones of differing bottom depth. This is particularly true of young whiting, when compared with Norway pout. This is borne out by the distributions of the main areas of fishing for Norway pout and for human consumption haddock and whiting. This would suggest that it might be possible to define

an area, in depths greater than 130 metres, where Norway pout fishing could be permitted, with a lesser impact on the human consumption fisheries. This possibility looks interesting, but further research is required before it can be evaluated as a practicable management strategy.

X. General Conclusions

On the basis of the data available to the Working Group on by-catch rates and their age compositions it would appear that there is no specific gain to the human consumption fisheries from a "box" closure, as distinct from some other regulation which produced an equivalent reduction in fishing effort of the Norway pout fleet. This is, however, based on the assumption that there is no difference in age compositions of by-catches within, and outside, the proposed boxes.

Restrictions, such as box closures or effort reductions, would increase the yield from haddock and whiting human consumption fisheries but would reduce the yield from the Norway pout fishery. The extent of these gains and losses from different levels of restriction are given above. The choice of the form in which the yield should be taken is not within the competence of ICES, as long as the exploitation pattern and rate are set at levels which avoid major problems of stock conservation for each of the species concerned. These problems have been commented on in relation to these species in the report of the Advisory Committee on Fishery Management published as Cooperative Research Report, No.85, and will be updated in its report in July 1979. Within these constraints, the decision is largely an economic one.

From the assessments which have been done in this context, however, it would seem quite clear that any restrictions on the Norway pout fishery, either by box closures or by effort reduction, will produce little gain to the human consumption landings, commensurate to the loss of industrial catch, if the fisheries for these species continue to operate with the current minimum mesh size. In that situation any reduction in by-catch of the Norway pout fishery will be largely dissipated by an increase in discard rates by the human consumption fishery, with little gain in its landings. On the other hand, the effects of box or effort restrictions on the Norway pout fishery, coupled with an increase in the minimum mesh size of the human consumption fisheries, can result in real gains in the yields of haddock and whiting as shown in Table 1 (p.12), in which all the measures assessed are summarised.

Table 1. Long-term effect of box closures and mesh increases on whiting and haddock catches (% change).

	Box closures	Industrial by-catch			Human consumption landings			Human consumption discards		
		Mesh size (mm)			Mesh size (mm)			Mesh size (mm)		
		75	80	90	75	80	90	75	80	90
WHITING	0	0	17	43	0	10	19	0	-27	-65
	1	-5	11	36	7	18	30	4	-24	-63
	2	-25	-12	8	38	57	79	19	-12	-56
	3	-30	-18	0	47	68	93	23	-8	-54
HADDOCK	0	0	6	18	0	7	22	0	-10	-33
	1	-5	1	12	3	10	25	2	-8	-32
	2	-20	-15	-6	11	19	36	8	-3	-27
	3	-30	-26	-17	17	25	43	12	1	-25

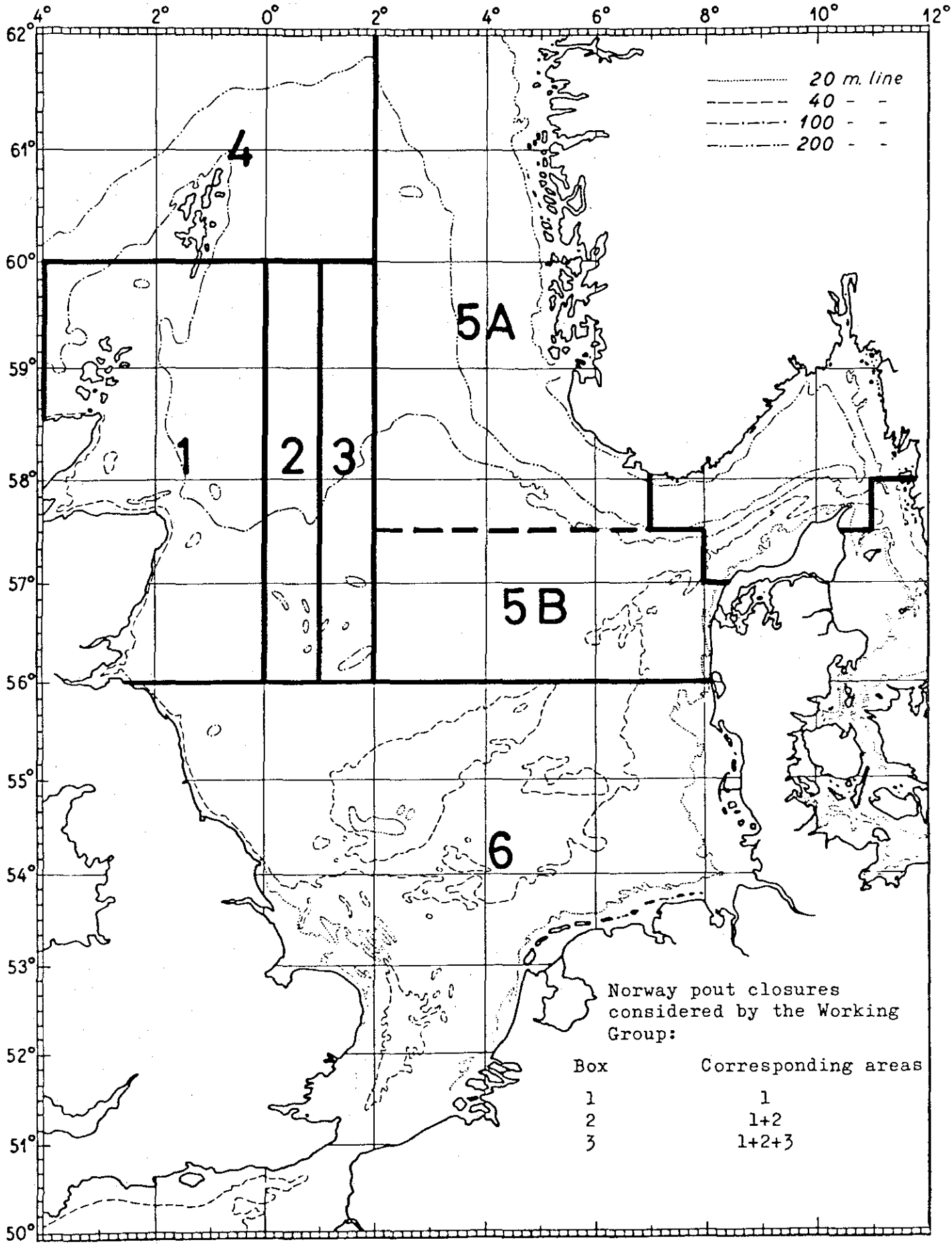

Figure 1. Chart of fishing areas adopted by the ad hoc Working Group on the Norway Pout Box Problem.

II. REPORT OF ACFM TO THE 18th ANNUAL MEETING OF NEAFC (July 1979)

INTRODUCTION

In the Introduction to its previous report, ACFM drew attention to the effects on the precision with which it could give advice on stock management which arose from uncertainties about the conditions under which the fisheries would be operating in the period between formulating the advice and the year to which it applied. This situation has not been appreciably improved by the change in the timing of the ACFM meeting and the resulting shorter time period between the provision of the advice and the period to which it applies, which it was agreed, with the cooperation of the management bodies, would be acceptable in 1979. A major source of the problem has been the failure of the management bodies to fix a firm timetable for the implementation of advice received from ACFM, as for example in the case of recommended changes in mesh size.

As an example of the former problem, the advice ACFM gave in its previous report regarding TACs for Sub-area IV roundfish was based on the assumption that a mesh increase to 80 mm would be implemented from 1 January 1979. This would have gone at least some way towards following the advice given by the Liaison Committee on this topic in 1977. To date this advice has been implemented only in a small part of the relevant Sub-area, and it now seems unlikely that it will be implemented in the remainder before 1980, if then. This has been one factor in the revision of the TAC for North Sea whiting in 1979, which is given in Section D.3. The effects of this revision, and of continuing the unsatisfactory exploitation pattern which fishing with such a small mesh size entails for yet another year, will of course have adverse effects on the stock and TACs in subsequent years. Such revisions of TACs are inconvenient for both the management bodies and for the fishing industries under their jurisdiction. But they are unavoidable when assumptions have to be made about fishing conditions in an intervening period and these assumptions are not met.

ACFM, however, regrets the delay in implementing their advice regarding mesh changes even more because of the effects this delay is having on the state of the stocks, and accordingly on the fisheries which are based on these stocks. It must be stressed that the state of the stocks, and yields from them, can in general be improved much more dramatically by improving the exploitation patterns by way of appropriate mesh changes, than by reducing the fishing mortality rates. The only exception to this is, in the rather rare cases, where the stocks have become so depleted that recruitment is affected. In that situation both remedies may have to be applied urgently to correct the situation.

The situation regarding agreement on, and enforcement of, total allowable catches is in many areas also highly unsatisfactory. ACFM would wish to stress that agreement on a TAC is meaningless if agreement has not also been reached on how these TACs will be sub-divided between the countries which participate in the fishery. Under these circumstances, which apply in many cases in 1979, there would seem to be little prospect that the TACs will be adhered to. Accordingly, in estimating stock sizes and the appropriate TACs for 1980, ACFM has had no option but to make the best estimates it can of the likely catches in 1979. These are generally appreciably greater than the recommended TACs. Even in the situation where national quotas have been agreed, their enforcement, in many cases, leaves much to be desired. In relation to several of the stocks dealt with in this report catches are known to have been taken which are greatly in excess of the national quotas, and in aggregate of the TACs, for these stocks. It would seem most unlikely that these illegal landings are entirely confined to the countries which estimate them quantitatively. So the total removals from the stock are likely to be even greater than those

on which the assessments are based. Even in the case of some stocks on which fishing is ostensibly prohibited, because of their very dangerously depleted state, there are catches reported either from blatantly illegal fishing activities or under the pretext of by-catches, at levels which are liable to prevent any recovery of the stocks. ACFM must stress that it deplores the lack of meaningful agreements on such essential elements of stock management, and proper enforcement of these which are agreed, both because of their effects on the stocks themselves, and because, under these circumstances, predictions of future TAC levels must be much less precise than they would be with proper agreement on and control of stock removals. It also appears that, in some countries, it is thought that the catches taken within the base lines, from which zones of national fisheries jurisdiction are drawn, should not be counted against the national quota. This misunderstanding must be corrected. The TAC is estimated for the whole stock, over its entire area of distribution, and all removals from it must be counted against the quota.

For short-lived species, such as North Sea sprat and Norway pout, ACFM has not been able to recommend TACs for 1980 based on analytical assessments. Because of the age composition of the catches taken from such stocks, there is no way that such assessments can be done so far in advance of the date to which they apply. Given satisfactory surveys, the recent year classes, which play a major role in determining the catch which can be taken from such stocks, could be estimated late in the year preceding that for which the TAC applies. This would demand, however, that the management bodies would be prepared to accept advice on the management of such stocks much closer in time to the start of the quota year, and to revise their machinery for implementing the advice given so that it can be put into force much more quickly. ICES will be considering whether the scientific resources can be found to mount such surveys, on an adequate scale to provide the required data. A decision about proceding with such surveys, however, will be dependent on some indication from the management bodies that the resulting advice will be usable, as a result of greater flexibility by management bodies in implementing it quickly.

A. REVIEW OF NOMINAL CATCHES IN NEAFC AREA, 1970-77

1. A general review of fish catches in the Convention Area from 1970 to 1977 is given in Tables 1-3. The tables, which are based on data reported by national statistical offices for publication in ICES "Bulletin Statistique" (and which may not necessarily be in agreement with figures used by Assessment Working Groups), show for each NEAFC region:

(i) the nominal catch of all species combined:

(ii) the catch in the main fishing areas of:

(a) pelagic species (such as herring, sprat, mackerel, horse mackerel and capelin);

(b) demersal species (comprising gadiforms - codfishes; demersal percomorphs - redfishes, gurnards, sandeels, etc.; pleuronectiforms - flatfishes);

(c) each of the main species within the pelagic and demersal fish groups.

Freshwater and anadromous species, invertebrates and catches by non-member countries of ICES are not included in these tables.

2. The main changes in the fish catches in each Region for the years under review are summarised below. A chart showing the Regions, Sub-areas and Divisions referred to is found at the end of this report. It should be noted, however, that the boundaries of the Regions, Sub-areas and Divisions were drawn for statistical purposes, and the grouping of catches into these spatial units does not necessarily accord with the distributional pattern of the individual stocks.

Table 4 presents a combined table of recent catches and recommended TACs by areas and/or stocks.

Region 1 (Table 1)

3. The 1977 total production of all species combined, of 6 303 000 tonnes, was the highest during the period under consideration, being nearly 2 million tonnes above the 1970 level and 564 000 tonnes (or about 10%) higher than in 1976. This figure, in addition to the sum of total catches of pelagic and demersal species in Sub-areas I, II, V and XIV, includes 38 000 tonnes composed of cartilaginous species and of unsorted and unidentified fish, and the 9 000 tonnes of total catch from Sub-area XII which consisted almost entirely of Roundnose Grenadier.

4. In Sub-areas I and II the 1977 total catch of 4 550 000 tonnes of pelagic and demersal species combined was also the highest recorded and 247 000 tonnes above the 1976 level.

The total catch of Pelagic species increased further to 2 966 000 tonnes in 1977, or by 112% over the average 1970-75 level. This resulted from the continued rise in Capelin catches, which increased to 2 940 000 tonnes, or by 110%, from the pre-1976 average level in the 1970s. Herring catches, at 18 000 tonnes (of which 5 000 tonnes were taken in the White Sea), continued to be very low. "Other Pelagic Species" consisted mainly of Sprat (78%) and Mackerel (16%) caught in Division IIa.

In contrast, the 1977 total catch of Demersal Species of 1 584 000 tonnes continued to decline further from the highest level, recorded in 1974, of 2 008 000 tonnes. As in the previous two years, there was a noticeable decrease in gadoid catches, except for Cod which at 943 000 tonnes were above the average level of the 1970s. Haddock catches of 112 000 tonnes were 27 000 tonnes below the 1976 level and 46% below the average 1972-76 level. Catches of Polar Cod, at 8 000 tonnes, became negligible and more than twenty times below the average 1970-75 level. Saithe catches, for the first time in the 1970s, dropped below the 200 000 tonnes level to 183 000 tonnes. The most noticeable drop, however, occurred in Redfish catches which, having been boosted from about 30 000 tonnes in 1969-70 to 318 000 tonnes in 1976, were reduced to 186 000 tonnes in 1977. Flatfish catches of 48 000 tonnes were below the average level, most of the catch (60%), as in 1976, consisting of Greenland Halibut, with Flounder and Plaice next in importance. The only noticeable increase (of 30% over the 1970-76 average level and of nearly 58% over the 1976 catch) took place in the "Other Demersal Species" category, within which Blue Whiting emerged as a major species, accounting for 47% of the total catch of 104 000 tonnes. The shares of Tusk, Catfishes and Norway Pout in this category were 14%, 13% and 12%, respectively.

5. In Sub-area V the situation was similar to that in the North-East Arctic. The 1977 total catch of 1 606 000 tonnes of pelagic and demersal species combined exceeded by 29% the stable average level of 1973-76, and was the highest during the period under consideration.

The total catch of Pelagic species increased from 451 000 tonnes in 1976 to 791 000 tonnes in 1977, following a sharp increase of 70% in Capelin

catches (761 000 tonnes in 1977) over the stable average level of 1973-76. Herring catches (off Iceland) continued to increase for the third consecutive year, and reached 29 000 tonnes in 1977.

The total catch of Demersal species of 815 000 tonnes in 1977 was practically at the average 1970-76 level, notwithstanding a continuing decline in the major gadoid catches. Cod catches in 1977, at 377 000 tonnes, were the lowest in the 1970s and 25% below the 1970 level. The 65 000 tonnes of Haddock caught in 1977 were slightly above the average catch in 1970-76, but 4 000 tonnes below the 1976 level. Saithe catches declined by 41% from the high 1971-73 level and were 18 000 tonnes below the low 1976 catch. Redfish catches showed a slightly declining trend, with the 1977 figure of 69 000 tonnes being 6 000 tonnes below the 1976 catch and 13% below the 7-year average. Flatfish catches, having reached the lowest level in 1975, showed signs of improvement, and the 1977 catch of 26 000 tonnes was slightly above the 1970-76 average. This could be attributed to Greenland Halibut which made up 62% of the increased total catch in this category. A marked increase in catches of "Other Demersal Species", which occurred in 1976, continued in 1977 with the total reaching 181 000 tonnes, i.e. 174% above the average 1970-75 level. Practically the entire increase resulted from the spectacular development in the Blue Whiting fishery (predominantly on the Faroe Plateau), which yielded 100 000 tonnes in comparison with 3 000 tonnes in 1975. Norway Pout catches off Iceland were second in importance accounting for 13% of the total in this category.

6. In Sub-area XIV the total catches decreased to 100 000 tonnes in 1977 after the big boost experienced in 1976, as a result of an explosive development in the Redfish fishery. Due to a sharp fall in Redfish catches in 1977 (to 14 000 tonnes from 114 000 tonnes in 1976) the leading species' composition of the total catch changed again for the second successive year. Capelin made up 71% of the total, having reached 70 000 tonnes from a zero level in 1975 (20 000 tonnes in 1976), while Cod catches decreased to 9 000 tonnes, although still considerably above the low 1975 level. Greenland Halibut practically disappeared from the catch.

Region 2 (Table 2)

7. Region 2 was most affected by the extension of zones of fisheries jurisdiction in 1977. This, together with a decline in some of the stocks, brought about a sharp drop to 3 999 000 tonnes in the recent steady increase of total yield of all species combined (5 088 000 tonnes in 1976). This figure, in addition to the sum of total catches of pelagic and demersal species in Sub-areas IV, VI, VII and Division IIIa, includes 127 000 tonnes of unsorted and unidentified fish and cartilaginous species.

8. In Sub-area IV and Division IIIa the 1977 total catch of pelagic and demersal species combined decreased by 415 000 tonnes, or 12%, from the 1976 level and was nearly 8% below the average 1970-76 level.

The decrease resulted from a reduction in the total catch of Pelagic species by 414 000 tonnes from the 1976 level of 1 223 000 tonnes. Herring catches decreased further to 157 000 tonnes (112 000 tonnes of which were taken in Division IIIa in comparison with 92 000 tonnes in 1976). The fluctuating Mackerel catches decreased from 304 000 tonnes in 1976 to 259 000 tonnes and were 7% below the average 1970-76 level. The greatest decrease occurred in Sprat catches which, having risen from 58 000 tonnes in 1970 to 758 000 tonnes in 1975, declined to 658 000 tonnes in 1976 and dropped further to 385 000 tonnes in 1977. Horse Mackerel catches declined further to 4 000 tonnes, while catches of "Other Pelagic Species" increased to the same level.

The 1977 total catch of 2 279 000 tonnes of Demersal species remained at the previous year's level, which was exceeded only in 1974 (2 501 000 tonnes); the situation, however, differed between individual species. Cod catches were 24 000 tonnes below the 1976 level of 251 000 tonnes and 17% below the 1970-76 average. Whiting catches of 201 000 tonnes, although 8 000 tonnes lower than in 1976, were still 18% higher than the average 1970-76 level. Catches of Haddock at 160 000 tonnes were 54 000 tonnes below the 1976 level and 42% below the 1970-76 average. Saithe catches of 190 000 tonnes in 1977 were 22% below the 1970-75 average, although 38% below the exceptionally high 1976 catch of 307 000 tonnes. Catches of Norway Pout continued to decline from the all-time record level of 833 000 tonnes in 1974 and amounted to 446 000 tonnes in 1977 (126 000 tonnes lower than in 1976). Catches of Sandeels, on the other hand, increased sharply from 517 000 tonnes in 1976 to the record level of 803 000 tonnes in 1977, which is 103% above the 1970-76 average. At 144 000 tonnes, Plaice catches in 1977 were 12 000 tonnes above the 1976 level and slightly (about 6%) above the 1970-76 average, while Sole catches of 15 000 tonnes remained at the 1976 level which is 25% below the average level of 1970-75. Catches of "Other Flatfish Species" of 29 000 tonnes were 3 000 tonnes above the 1976 level, the major part of the catch consisting, as before, of Dab, Lemon Sole, Turbot and Flounder. There was a marked increase in catches of "Other Demersal Species" which, at 64 000 tonnes, were 73% above the average 1970-76 level. Most of the increase was due to a rapid development of the Blue Whiting fishery which yielded 21 000 tonnes in 1977 (in comparison with 2 000 tonnes reported in 1976).

9. In Sub-areas VI and VII the total 1977 catch of pelagic and demersal species combined fell by 513 000 tonnes, or 40% short of the 1976 catch of 1 297 000 tonnes.

A great part of this decline could be attributed to a reduction of total catches of Pelagic species from 815 000 tonnes in 1976 to 466 000 tonnes in 1977. Declining Herring catches amounted to only 91 000 tonnes in 1977, 55 000 tonnes of which were taken in Division VIa. Mackerel catches dropped from 419 000 tonnes in 1976 to 307 000 tonnes in 1977. The Horse Mackerel fishery nearly collapsed, yielding only 30 000 tonnes in 1977 after having reached the record level of 181 000 tonnes in 1976. Sprat catches in 1977 remained the same as in the previous year, but this could not affect the general trend, since the yield was insignificant (i.e. 21 000 tonnes or less than 5% of the total pelagic catch). Catches of "Other Pelagic Species" increased further to 17 000 tonnes in 1977, with Pilchard accounting for 94% of the total.

The total catch of Demersal species, of 318 000 tonnes in 1977, was 164 000 tonnes less than the 1976 level. Cod catches decreased by 8 000 tonnes to 31 000 tonnes in 1977, although they were only slightly (by about 5%) below the 1970-76 average. Reduction in Haddock catches was much more pronounced, i.e. 41 000 tonnes less than the 1976 catch of 67 000 tonnes and 47% lower than the pre-1974 average. Whiting catches decreased from 59 000 tonnes in 1976 to 46 000 tonnes in 1977, which is still 13% above the 1970-76 average. Hake catches dropped to 17 000 tonnes from the average 1974-76 level of 43 000 tonnes. Flatfish catches also decreased from 43 000 tonnes in 1976 to 36 000 tonnes in 1977, with Megrim and Plaice making up, as before, more than half of the catch (35% and 25%, respectively). Catches of "Other Demersal Species" decreased sharply to 162 000 tonnes from a record high level of 233 000 tonnes in 1976. Blue Whiting was a leading species in this catch with 46 000 tonnes (28% of the total) followed by Saithe (21%).

Region 3 (Table 3)

10. The total production of all species combined continued to increase from the lowest level of 625 000 tonnes in 1974 and reached 723 000 tonnes in 1977, which was 42 000 tonnes above the 1976 level and only 5% below the average 1970-76 level. This figure, in addition to the sum of total catches of pelagic and demersal species in Sub-areas VIII, IX and X, includes 30 000 tonnes of unsorted and unidentified fish and cartilaginous species.

The 1977 total catch of Pelagic species of 512 000 tonnes was 8 000 tonnes above the 1976 level, 85 000 tonnes above the low 1974 level, and nearly 15% greater than the 1970-76 average. Pilchard catches decreased by 16 000 tonnes from the 1976 level of 146 000 tonnes and were 17% below the average 1970-76 level. Mackerel catches dropped to 34 000 tonnes from 61 000 tonnes in 1976 (it should be noted, however, that the former figure represents the catch of Atlantic Mackerel (S.scombrus) only, while in previous years catches of Chub (=Spanish) Mackerel reported by Portugal were also included under this category. If these had been added to the 1977 figure, the decrease from the 1976 level would have been more moderate, i.e. 26% instead of 44%, but the 1977 catches would still be 29% below the average 1970-76 level). The above consideration is also applicable to the 1977 catches of "Other Pelagic Species" which rose to 157 000 tonnes. However, as in the previous case, the exclusion of 11 000 tonnes of Chub Mackerel from this category would not have affected the general conclusion about the 1977 catches being the highest during the period in question (i.e. 30 000 tonnes higher than in 1976 and 35% above the average 1970-76 level). As before, Anchovy was the predominating species in the category accounting for about 40% of the total; Albacore made up nearly 17%. Horse Mackerel catches also increased, surpassing by 10 000 tonnes the 1976 catch of 181 000 tonnes and being 29% above the 1970-76 average.

The 1977 total catch of Demersal species, at 181 000 tonnes, was 41 000 tonnes above the 1976 level and 16% above the average 1970-76 level. This resulted from the 42 000 tonnes increase in catches of "Other Demersal Species" which, at 135 000 tonnes, were the highest on record during the period under consideration and 45% above the 1970-76 average. There was a marked change in species' composition within this category: Snipefishes accounted for less than 6% of the total in 1977, Seabreams retained their percentage (16%), and catches of Blue Whiting increased more than four times, making up nearly 15% of the total. Hake catches were slightly below the 1976 level of 47 000 tonnes and 27% below the average 1970-76 level.

Total catches of pelagic and demersal species combined generally followed the trend in the total yield of all species combined.

B. REGION 1 FISHERIES

B.1 Atlanto-Scandian Herring

11. The Working Group on Atlanto-Scandian Herring met in Bergen 21-23 May 1979 to assess the state of the Atlanto-Scandian herring and to evaluate all available evidence on the relation of the capelin at Jan Mayen with neighbouring stocks.

B.1.1 Norwegian spring spawners

12. Recent catches and recommended TACs in thousand tonnes:

1976		1977			1978		1979	1980
NEAFC TAC	Recorded catches	Recom. TAC	National TAC	Recorded catches	National TAC	Recorded catches	Recom. TAC	Recom. TAC
0	0	0	10	12.8	7.5	9.0	0	0

The recorded catches of the Norwegian spring spawners since 1971 have been very low, between 0 and 21 100 tonnes. In recent years, 1976-78, less and less faith has been placed in these recorded catches; so the Working Group on Atlanto-Scandian Herring could not give the catch-in-number by age data, which is customarily given in working group reports. The age composition of the catches was, however, considered to be similar to that of the spawning stock, which was sampled during experimental fishing. This age distribution shows that the spawning stock consists mainly of the same year classes as two years ago, and that younger year classes contribute only a very small proportion to the age distribution.

No information was available on the by-catches of herring taken in the Norwegian fjord sprat fishery, but all mixed catches which include 50% or more of sprat are recorded as sprat.

13. The recovery of the spawning stock has been monitored mainly by a large-scale tagging project. The experimental fishing, and the tag detection system used in that fishing, are integral parts of the project.

In 1977 the Working Group assessed the spawning stock to be of the order of 200 000 tonnes. Based on 0-group acoustic abundance estimates, especially of the 1975 and the 1976 year classes, and an assumption that no herring fishing would take place, a prognosis, made in 1977, gave a spawning stock in 1979 of 895 000 tonnes.

The 1975 and 1976 year classes have, however, not recruited to the spawning stock in the strength expected, nor has a fishing ban been enforced as advised.

In accordance with this the results of the tagging project show that no increase has taken place in the spawning stock since 1977. On the contrary, the stock may perhaps have declined to only 170 000 tonnes. In addition, the recruitment from the 1977 and 1978 year classes is expected to be low. In the light of this serious state of the stock ACFM can only recommend that there should be no directed herring fishery in 1979 and 1980. It is further recommended that by-catches (e.g. in the sprat fishery) should also be limited as far as possible.

14. As requested by ACFM the Working Group considered the optimal range of spawning stock size for the Norwegian spring spawning herring. It was noted that this had in fact been estimated by Dragesund, Hamre and Ulltang (1978). They found that the recruitment was drastically reduced at spawning stock sizes below 2.5 million tonnes. The ACFM agreed that the long term aim should be to rebuild the stock to at least this order of magnitude.

It was agreed that a substantial increase in the spawning stock, as well as a much higher level of recruitment, must be confirmed before even a limited fishery can be recommended. Care should then be taken that such a fishery only generates a very low fishing mortality, less than $F_{0.1}$, and that it does not appreciably delay further rebuilding of the stock.

B.1.2 Faroese spring spawning herring

15. At the Faroe Islands three different groups of herring have been identified, two spring spawning groups and one summer spawning one. The summer spawners occur at irregular intervals and are only found in the fjords. The larger spring spawning component spawned on the banks east of the Islands in March-April, the other one in the fjords in April-May.

The bank spawners arrived on the spawning grounds in late February, from the overwintering areas in the Norwegian Sea, and were formerly recognised as a part of the Norwegian spring spawning stock which spawns at the Faroes.

16. A fishery on this component took place in the late 1960s and yielded about 16 000 tonnes in 1967. Since 1968 practically no bank spawning herring have been found on the Faroe Plateau.

In 1978 maturing herring were reported from the spawning area on the banks in March as a by-catch of the trawl fishery for cod and haddock. A small sample was dominated by the 1968 year class. During an echo survey in February 1979 only one school of maturing herring was recorded. A sample from this also proved to be dominated by the 1968 year class.

It is recommended that a directed fishery for the bank spawning herring at the Faroes should be prohibited in 1980.

B.1.3 Icelandic spring and summer spawners

17. Traditionally, two herring stocks spawn at Iceland, Icelandic spring and summer spawners. Both stocks collapsed during the 1960s.

On 1 February 1972 a ban on herring fishing with all gear other than drift nets was introduced. This ban was in force until 15 September 1975. Since then the fishery has been limited by catch quotas, seasonal closures, and a minimum landing size of 27 cm. No recovery of the spring spawners has so far been observed, and the fishery since 1975 has been based entirely on summer spawners.

18. Recent landings and TACs in thousand of tonnes are given below:

1976		1977		1978		1979
Catches	TAC	Catches	TAC	Catches	TAC	TAC
17.8[1)]	10[2)]	28.7	25	37.3	35	35

1) 10 000 tonnes were taken by purse seine

2) TAC was set only for purse seine

The recovery of the Icelandic summer spawners has primarily been monitored by echo abundance surveys on the wintering grounds at southeast Iceland. The results of these surveys have been used to calculate the values of the fishing mortalities during the fishing season immediately preceding the survey. These values have then been used to initiate a VPA.

During the years 1975-78 the adult F has increased from 0.08 to 0.21. The adult stock biomass increased sharply in 1975 and has, until 1977, been about 160 000 tonnes.

Based on the echo abundance estimate in December 1978 the adult stock biomass will be about 200 000 tonnes in 1979. This level of stock abundance is well within the range of stock biomasses during the 1954-63 period of high, and steady, recruitment (Jakobsson, 1978).

19. It was noted that this is one of many herring stocks which collapsed in recent years in the Northeast Atlantic, but the first one to be rebuilt to the earlier range of abundance.

A TAC for 1979 has been set at 35 000 tonnes. This will generate an F on the adult age groups which is close to the $F_{0.1}$, which for this stock for the present exploitation pattern is about 0.2 (Jakobsson, 1973).

It is recommended that for 1980 the TAC should be calculated as before on the basis of the results of 1979 echo abundance survey, and using an F close to $F_{0.1}$.

B.1.4 Capelin at Jan Mayen

20. While scouting for blue whiting a Norwegian purse seiner located dense concentrations of capelin 15-20 n.m. southwest of Jan Mayen in mid-August 1978. The first catch, of about 1 300 tonnes, was taken on 19 August. During the following weeks a considerable fishery developed as shown below:

Catches in tonnes in the Jan Mayen area August-October 1978

	August	September	October	Total
Faroe	-	3 353	-	3 353
Iceland	-	59 937	-	59 937
Norway	19 776	133 160	2 306	154 143
				217 433

21. During the 1960s the area was surveyed regularly in spring (May-June) without positive results. In mid or late summer, on the other hand, the Jan Mayen area was reasonably well covered only in 1966 and 1967. In the former year dense concentrations were located north of Iceland (68°N 19°W), while in the latter year (July-August) they were located west of Jan Mayen (71°N 12°W).

In the 1970s a few scouting surveys were carried out to locate capelin in the Jan Mayen area without positive results until August 1978. The coverage of the area was, however, poor and therefore it is not possible to draw any conclusions on the regularity of the occurrence of capelin in the Jan Mayen area.

22. During July-August 1978 the Icelandic summer fishery took place off NW and N Iceland. In September the fishery moved to Jan Mayen, while in October it moved back to the area off NW Iceland. The movements of the main stock of capelin were reflected in the changes in the distribution of the fishery. They are also in conformity with survey results in the same period.

Thus in September, while the fishing took place at Jan Mayen, an intensive search for capelin concentrations was carried out NW and N of Iceland with negative results. Similarly in October, when the fishing had shifted to NW Iceland, the area NW and W of Jan Mayen was surveyed also with negative results.

23. In July and early August 1978 11 750 capelin were tagged with internal steel tags off the western N-coast of Iceland and the NW-peninsula. Four of these tags subsequently turned up in Norway, from catches taken in the Jan Mayen area.

During the period 21-25 September 1978 a further 5 114 capelin were tagged by the same method to the west of Jan Mayen. From this experiment tags were recovered in October-December from catches taken N and NW of the NW-peninsula of Iceland (Figure 1).

In 1979 14 tags from the Jan Mayen tagging experiment have been recovered so far. All of these tags are from the component of the spawning stock which was fished off NE, E and SE Iceland in the period January-March 1979 (Figure 1).

Tag returns, therefore, clearly indicate a migration from the deep water area off N Iceland to Jan Mayen in August as well as a return of these capelin to spawn at the Icelandic coast in winter.

24. The age distributions from the Jan Mayen fishery in 1978 are very similar to those from the Icelandic summer, autumn, and winter (spawning) fishery. Thus, the age distributions indicate that the Jan Mayen fishery and the fishery at N Iceland are based on the same capelin stock.

25. A survey of the waters off W, N and E Iceland in spring 1978 indicated more or less normal hydrographic conditions, compared to recent years. The East Icelandic Current was pronounced and salinity off N Iceland was relatively low.

As the summer advanced, however, a pronounced warming of the upper layers was observed resulting in indistinct border areas between the various warm and cold water masses. The extension of drift ice was consequently much reduced and in autumn the E Greenland coast was practically free of drift ice north to the 72°N parallel.

The above changes in the environment may well explain the extensive migrations of the capelin to northerly regions that took place in 1978.

26. The survey results, the age distribution data, and especially the tag returns in 1978 and 1979 clearly show that maturing Icelandic capelin migrated from the N Iceland area to Jan Mayen in August. During late September and October a return migration took place to the area off NW Iceland, from which the spawning migration started at the beginning of 1979, as illustrated in Figure 1.

Thus there is convincing evidence that the capelin fishery which took place in the Jan Mayen area in August-September 1978 was based on the stock which has its spawning grounds at the Icelandic coast. This conclusion does not preclude the possible existence, at Jan Mayen, of a local population which spawns in the area. Such local stocks are known from many Arctic coasts, e.g. the Greenland fjords, but these stocks are small and generally not of commercial interest.

B.2 North-East Arctic Cod and Haddock

27. The Arctic Fisheries Working Group met in May 1979 to:

(a) assess TACs for 1980 for cod and haddock,

(b) examine any new data from midwater trawl fisheries, and study the effect on the exploitation of these species,

(c) assess, if possible, the effective mesh size in use, and report on the effects of increases in mesh size.

The Working Group was also asked by ACFM to answer some questions put to ICES by the Norwegian Ministry of Fisheries concerning the management advice given for North-East Arctic cod in the ACFM report for 1978. These questions were asked in a letter dated December 1978.

B.2.1 North-East Arctic cod

28. Recent catches and recommended TACs in thousand tonnes:

1977			1978			1979			1980
Rec. TAC	Total quota	Actual catch	Rec. TAC	Total quota	Actual catch	Rec. TAC	Total quota	Estimated catch	Rec. TAC
850	850	905	850	850	690[1)]	600	700	700	390

1) Preliminary figure

Final figures for cod landings in 1977 amounted to 905 301 tonnes, about 15 000 tonnes higher than the preliminary figures used in the previous report. This is 55 301 tonnes higher than the total TAC of 850 000 tonnes, Murman cod included.

Preliminary figures for the 1978 fishery indicate a substantial reduction in catches, of more than 200 000 tonnes, from the 1977 level, to about 684 000 tonnes (Table 5). This reduction in catch was reported from all areas. Compared with the 1977 figures, the total landings in Sub-area I, Division IIb, and Division IIa decreased by 116 194, 90 799 and 14 129 tonnes, respectively. The reduction was very pronounced for Division IIb where the catch dropped to the lowest level recorded since 1960.

29. In 1978 the changes in total international effort, as measured in the different national units, reflect a considerable change in the area distribution of the fishery. In Division IIb, in particular, effort of both United Kingdom and USSR vessels was reduced by more than 80%, and the total international effort in United Kingdom and USSR units was reduced by 78% and 37%, respectively. This development can be explained by a low stock density in that area since all fleets reported reduced catch per unit effort, continuing the downward trend observed in Division IIb since 1974 for all high seas fisheries.

The catch per unit effort increased in the Lofoten gill net and long-line fisheries, and in the Norwegian coastal trawl fisheries in 1977, 1978, and 1979 compared with the preceding years.

30. The 1975 year class was recorded as strong in the 0-group survey, the USSR young fish surveys, and in the Norwegian winter echo surveys in Sub-area I and the northern part of Division IIa, and in the catch per unit effort figures for the United Kingdom trawlers in Sub-area I.

The Norwegian winter echo surveys give data for the number of fish of the 1975 year class present at age 3 and age 4 in 1978 and 1979, respectively. Although these numbers are underestimates of the stock size, caused by incomplete coverage of the area of distribution and difficulties in recording echo abundance close to the sea bottom, they clearly indicate that the 1975 year class is at least of the order of magnitude indicated by the USSR survey. Survey estimates of the 1975 year class strength (in millions of fish), in comparison with the results of the VPA estimates are given below:

Age	Year	USSR survey	Norwegian survey	VPA estimates
3	1978	1 395	1 029	476
4	1979		480	319

The estimate of the year class strength at 3 years old, based on the 1978 United Kingdom catch per unit effort figures, indicates that the 1975 year class is even stronger than estimated by the USSR young fish survey. The low VPA estimate is generated by the fishing mortality of 0.20, for 3 year old cod in 1978, estimated by the Working Group to be the most likely value. A much lower fishing mortality of 0.06, would be required to generate a year class strength for the 1975 year class as estimated from the USSR survey data. Such a low fishing mortality in 1978 is highly unlikely because the fishing mortality on the 3 year old cod has, since 1973, been at the level estimated for 1978. The large reduction of the 1975 year class abundance from 1978 to 1979, observed in the Norwegian echo survey, also indicates a high F in 1978.

Accepting a relatively high fishing mortality on the 1975 year class in 1978, and disregarding the possibility of unreported catches in 1978, the low figure for the year class strength, as estimated from the number of fish landed in 1978, might be caused by an under representation of this year class in the age composition of the landings.

Comparison of the proportion of 3 year old fish in age compositions of United Kingdom and USSR catches from Sub-area I over the years 1973-77 shows that the proportion of 3 year old fish in the USSR catches has always been higher, by a factor of 1.8 on average. In 1978, however, the proportion of 3 year old fish in the USSR catches was about 10% below the United Kingdom value. Applying the factor of 1.8 to the proportion of 3 year olds in 1978 would result in a corresponding proportion of 66% in the USSR catches. Applying the relation in 1977 between the USSR age compositions from Sub-area I and data from the Norwegian winter surveys on the survey age composition in 1978 gives a proportion of 65% of 3 year old cod in the USSR catches, a value which is almost identical to that derived from comparison with United Kingdom age compositions.

This analysis results in a representation of the 1975 year class in the total landings from Sub-area I of 55%, compared with only 28% used by the Working Group. This proportion is in good agreement with that in 1973 (56%) when the good 1970 year class recruited to the fishery.

A VPA, based on these revised age compositions and on the terminal Fs used by the Working Group, results in an estimate of the 1975 year class at age 3 of 1 249 million fish. This is in good agreement with the result of the USSR young fish survey.

31. Mean fishing mortality in 1978 for ages 4 to 7 was estimated as 0.51 compared to 0.71 in 1977. This drop in F reflects the reduction in effort in 1978 from the high 1977 level. Similarly the average weighted F of fish aged 8-12 in 1978 is estimated as 0.69 compared to 0.87 in 1977.

32. Spawning stock biomass has increased continuously, from the low 1975 level of 239 000 tonnes to 460 000 tonnes at the beginning of 1978, because of the contribution of the 1970 year class. This was, however, less than expected from its original size, due to heavy exploitation as younger fish. A decline in spawning stock biomass to 303 000 tonnes by the beginning of 1979 is estimated as a result of

the 1978 catches. A further decline to 200 000 tonnes is to be expected by the beginning of 1980 if one assumes that the 1979 TAC of 700 000 tonnes will be fully taken.

33. Based on length and age compositions of the catches the effective mesh sizes used in the trawl fisheries for cod and haddock have been estimated. The essence of the method is to compare the simulated relative length (or age) distribution of the catches, in each of the fisheries, and the corresponding relative length (or age) distributions observed. The mesh sizes of the fisheries are systematically changed until the difference between the observed and the estimated relative length distributions are minimised. The outcome of the calculations are estimates of the effective mesh sizes in use. The model assumes stable recruitment. Therefore, the age and length compositions used were long-term averages. In the mesh assessments for Sub-areas I and II data for the period 1967-77 were used. This period was chosen, because the legal mesh size has remained unchanged since 1967.

The best average estimates of the effective mesh sizes used in the cod fisheries are given in Table 7. The estimates based on length distributions are considered to be the more reliable. These assessments show that the effective mesh sizes for some fisheries are far below the minimum trawl mesh size of 120 mm. Several factors may contribute to a lower effective (compared to the legal one) mesh size, such as special rigging of the trawl, chafers, small mesh lining inside the cod end, smaller mesh size in the cod end, big catches, and high trawling speed. The relative importance of these factors cannot be estimated at present.

34. The effects of increasing the effective mesh sizes above those used in the period 1967-77 were estimated as an extension of the results of the mesh assessments. Three alternatives for a new effective mesh size were considered by the Working Group:

1) The legal mesh size of 120 mm becomes the effective mesh size,
2) The effective mesh size becomes 135 mm,
3) The effective mesh size becomes 150 mm.

Both short-term and long-term effects of applying a higher effective mesh size to the average situation for the period 1967-77 are given in the Working Group report for the total and the individual cod fisheries.

The expected long-term gains of increasing effective mesh sizes are increases in total yield of 11%, 20%, and 27% respectively. The long-term increase in spawning stock biomass would be 22%, 50%, and 90% respectively.

35. Mean fishing mortality on 4 year old fish, in the period 1961-72, was 0.18. Since 1973 the average F on this age group has increased by more than 80%, to a level of 0.33 in the period 1973-78. This increase was even more pronounced on age group 3 where the respective values are 0.03 and 0.17, indicating a drastic change in exploitation pattern towards younger fish. In the light of this development the effective mesh size in use might have been overestimated, since the data prior to 1973 have been included in the analysis, and the beneficial effect on the spawning stock of an increase in effective mesh size might be even greater. If the 1970 year class had been fished, at ages 3 and 4, at the moderate level of F prior to 1973 the contribution to the spawning biomass in 1978, by this year class, would have been about 60% higher. This would correspond to an additional

contribution of about 180 000 tonnes. In 1980 the good 1975 year class, at age 5, would still benefit from a change in exploitation pattern, if a higher mesh size, of at least 150 mm, were to become effective in that year. Since 155 mm mesh sizes are already in use in adjacent areas an increase to that level might be appropriate. ACFM recommends that the minimum mesh mesh size in Sub-areas I and II should be increased to 155 mm for all towed gears. This should become effective in the 1980 fishery.

36. The minimum landing size corresponding to an 155 mm mesh size is 55.9 cm (25% retention length). The corresponding figures for 150 mm and 135 mm mesh sizes are 54.1 cm and 48.7 cm respectively. Strict enforcement of such minimum landing sizes without the corresponding increase in mesh size recommended above would probably only increase the amount of discards.

An effective method of reducing exploitation of young cod, as an addition to mesh size regulations, would be a short-term closure of areas at times when small fish are dominant in the catches. The figures for the 25% retention lengths, given above, could be used as guidelines for closing areas where fish below these sizes are dominant. Such regulations would require close monitoring of the size composition of the stock by time and area.

37. Based on the revised estimates of stock size, given in paras. 30-32, there is no reason to assume that the 1979 TAC will not be taken. Therefore the calculation of TACs for 1980 is based on the assumption that it will be taken. This is expected to generate a fishing mortality of 0.81 in 1979.

In view of the very low level of spawning stock biomass at the beginning of 1980 prime consideration should be given to at least halting a further decline. This could be achieved by keeping the fishing mortality in 1980 at the 1979 level of 0.81. This would give a catch of 460 000 tonnes. Under this option, however, the total exploited biomass would decline further, even if fishing with an improved exploitation pattern as a result of the recommendations given in paras. 35 and 36.

Reducing F in 1980 by 20% from the 1979 level, to 0.65, would allow a catch of 390 000 tonnes, a reduction of 44% from the 1979 TAC. Under this option both spawning stock biomass and total exploited biomass would be expected to increase, by 15% and 3% respectively, at the beginning of 1981.

ACFM therefore recommends a TAC for North-East Arctic cod of 390 000 tonnes for 1980 (including Murman cod).

38. The recommendation given above is based on the assumption that a 155 mm mesh size will become effective in 1980. If there is no change in mesh size in 1980 the TAC associated with F = 0.65 would result in a higher catch, which would, however, reduce the survival of younger fish. This would mean that their growth potential would not be utilised and their contribution to the spawning stock would be heavily reduced. The spawning stock biomass can only be expected to reach the desired long-term level if the pattern of exploitation is improved considerably, or if fishing mortality is immediately set at much lower levels. This would result in a lower TAC than recommended above for the coming years.

39. If the 1975 year class is not as strong as estimated above it is unlikely that the 1979 TAC of 700 000 tonnes will be taken, due to reduced availability of younger fish in the area. Under these conditions a catch of 500 000 tonnes in 1979, associated with F = 0.6, was thought to be a more realistic basis for a TAC prediction. Under this assumption, and

assuming an increase in mesh size in 1980, a TAC of 390 000 tonnes in 1980 would result in a reduction of spawning stock biomass of 14% below the 1980 level in 1981, and a marginal reduction in total exploited biomass. This option is associated with an increase in F over that of the preceding year. Keeping F at the 1979 level would, under this assumption, give a catch of about 350 000 tonnes in 1980.

B.2.2 North-East Arctic haddock

40. Recent catches and recommended TACs in thousand tonnes:

1977			1978			1979			1980
Rec. TAC	Total quota	Actual catch	Rec. TAC	Total quota	Actual catch	Rec. TAC	Total quota	Estimated catch	Rec. TAC
110	120	110	150	150	94[1)]	206	206	140[2)]	50

1) Preliminary figure

2) Estimated on the basis of a consideration of the average 1970-74 fishing pattern and assuming the same total effort as recorded for 1977.

Total landings in 1978 amounted to 94 000 tonnes, a further reduction of haddock catches by about 16 000 tonnes from the 1977 level (Table 6). Although the reduction in catch was reported for all areas, as in the cod fishery, the reduction in Division IIb was large, amounting to 8 600 tonnes. The assumed catch of haddock in 1978, of 125 000 tonnes, as the basis for the catch prediction in the previous assessment, was overestimated by about 31 000 tonnes.

41. Catch per unit effort figures for 1978 did not fall below the very low 1977 level. This indicates that the downward trend, observed in all areas since 1974 due to declining abundance of the strong 1969 year class, has at least been stopped as a result of the 1975 year class entering the fishery. This year class was expected to be of similar strength to the rich 1969 year class from the 0-group survey, as well as from the USSR young fish survey. Based on these results the Working Group estimated last year that this year class at age 3 was 900 million fish.

The VPA analysis made by the Working Group this year, based on age compositions given for 1978 and earlier years, and a terminal F of 0.32 for the 3 year olds, gave a number of 3 year old haddock of the 1975 year class (193 million fish) which is too low compared with the figure expected from the relationship between the USSR young fish survey indices and the year class strength at an age of 3 years (566 million fish). The VPA estimate is also less than estimated on the basis of the 1978 Norwegian winter echo survey in the Barents Sea (791 million fish), which must be an underestimate of the stock size because of difficulties in recording fish near the bottom.

A fishing mortality of 0.10 on the 3 year olds in 1978 would bring the VPA estimate for the 1975 year class into agreement with the year class strength expected from the relationship between the USSR young fish survey indices. However, this fishing mortality is much less than the most likely figure estimated by the Working Group, and than those observed for the years 1972-77. The great reduction of the 1975 year class observed between 1978 and 1979 in the Norwegian winter surveys also suggests a higher fishing mortality on the 3 year olds in 1978 than 0.10.

To get the strength of the 1975 year class comparable to those estimated from the USSR young fish survey and the Norwegian winter survey, if the fishing mortality on the 3 year olds in 1978 is accepted to be at the 1972-77 level, the number of this year class caught in 1978 must have been much higher than estimated.

42. Correcting for this bias in the basic data would give changes in the assessments of the stock and the catch predictions. But the available data are not sufficient for a re-assessment of the haddock stock at present. Generally, the status of the stock would be somewhat better than given by the Working Group.

Fishing mortality in 1977 was high, at 0.95, as a result of very high effort in that year. In 1978 fishing effort was reduced and the estimated fishing mortality was 0.65. To take the TAC of 206 000 tonnes in 1979 a fishing mortality of about 0.8 would be required, assuming the 1975 year class to be as estimated by the Norwegian acoustic survey. This is approximately the same level of F in 1979 required to take a catch of 140 000 tonnes, under the assumptions made by the Working Group. Under all assumptions as to the strength of the 1975 year class the spawning stock biomass is reduced to a dangerously low level at the beginning of 1980. The options connected with a rapid rebuilding of the spawning stock require very low TACs for 1980. Since, however, haddock is mainly taken as a by-catch in the fishery for cod a very low TAC would only result in high discarding of haddock, and would therefore not have any conservation effect.

43. Fishing with an 155 mm mesh size, the estimated by-catch of haddock from a cod TAC of 390 000 tonnes is not more than 50 000 tonnes, even if the 1975 year class is stronger than estimated by the Working Group. Using the Working Group's estimate this catch level would result in an F of 0.84 in 1980 and leave a spawning stock biomass of 40 000 tonnes by the beginning of 1981. This would be a slight increase compared to the previous year. If, however, the 1975 year class, which is expected to recruit to the spawning stock in 1981, is as strong as estimated by the surveys then the increase in spawning stock biomass can be substantial. ACFM therefore recommends a TAC of 50 000 tonnes for haddock in 1980 in the North-East Arctic. Since this is the estimated by-catch in the cod fishery, it further recommends that no directed fishery for haddock should be allowed in that area in 1980.

44. In the previous assessment the stock and the spawning stock biomass in 1978 and subsequent years have been greatly overestimated. The reasons were:

1) the extremely high provisional estimate of total international effort in 1977 was not considered to be a reliable value because of the mixed fishery problem;

2) the TAC in 1977 was not fully taken, this was not interpreted as an indication of reduced stock size, but rather as reduced F compared with previous years;

3) the strength of the 1975 year class was overestimated on the basis of the USSR young fish survey.

45. The long-term effects of an increase in mesh size to 155 mm for haddock are a slight increase in yield per recruit, and a substantial increase in spawning stock, which is the primary management objective.

B.3 Redfish in Region 1

46. The Working Group on Redfish in Region 1 met at Charlottenlund from 21-26 May 1979 to:

(a) assess TACs for 1980 for redfish,

(b) calculate effective mesh sizes in use,

(c) estimate the by-catch of cod in the redfish fishery in Sub-area XIV.

47. Since redfish are not separated in the landing statistics according to species, Sebastes marinus and Sebastes mentella, catch figures had to be split into the different species components, based on information on the geographical distribution of the species, the fishing pattern of the respective fleets and analysis of sampling data (Tables 12 and 16). The question whether there are, within the species, different stocks of redfish is still open. Therefore, the different fishing areas within Sub-areas I and II combined in the eastern part of Region 1, and within Sub-areas V and XIV in the western part of Region 1, could not be assessed separately. The data available would not have allowed this to be done in any case.

B.3.1 Redfish in Sub-areas I and II

48. Recent catches and recommended TACs in thousand tonnes:

	1974	1975	1976	1977	1978	1978	1979	1980
	Actual catches					Recommended TACs		
Golden redfish (S. marinus)	27	39	49	40	29[1)]	20	22	19
Beaked redfish (S. mentella)	69	239	269	146	93[1)]	130	135	81
Total	96	278	318	186	122[1)]	150	157	100

1) Preliminary

Total catches have shown an increasing trend from 1968 to 1976 (Tables 8-12). A remarkable increase took place in 1975 and 1976 to a level of five times the average of 1970-74. This can be mainly attributed to a substantial increase in USSR effort in the fishery for S. mentella in Division IIb. In 1977 a drastic reduction from the high 1976 level was recorded in total redfish catch. Preliminary catch figures indicate that this declining trend continued in 1978. This development, which was more pronounced in the directed fishery for S. mentella, was partly caused by the introduction of a quota scheme; but a declining trend in abundance, as indicated by reduced catch per effort figures from the USSR fishery, also played a part.

49. Sebastes marinus

Average fishing mortality increased in the 1974-77 period to a level of 0.13 which is more than twice the 1964-73 average. For 1978 only a marginal reduction in F was estimated. Both total biomass and spawning stock biomass declined from the relatively stable situation prior

to 1976. Estimates prior to 1976, however, are affected by inadequate sampling of some of the catches, and therefore the importance of this decline cannot be evaluated.

Sebastes mentella

50. Average fishing mortalities increased, from a level of about 0.1 prior to 1975 to a level of about 0.5 for the 1975-77 period. In accordance with the trend in fishing effort, F in 1978 was estimated as 0.2. Stock size and spawning stock size increased considerably from 1965 to 1975, by about five times from the 1965 level. From the very high level in 1975 both stock size, and spawning stock size, have decreased by 27% and 52% respectively by the beginning of 1978 due to the high level of exploitation since 1975.

Prior to 1974, the fishery was mainly concentrated on age groups 13 to 24 and only 25% of all fish caught were 12 years old and younger. In the period 1974-77 this proportion increased to 75%, and to 87% in 1978. This change in exploitation pattern is reflected in higher fishing mortalities on younger age groups since 1974.

Sebastes marinus

51. Sebastes marinus in the North-East Arctic region is to a large extent taken as by-catch in the fishery for cod. Therefore there are some uncertainties about the likely size of the 1979 catch of this species, on which the calculation of TACs for 1980 must be based. Accepting the catch level for 1979 recommended by ACFM of 22 000 tonnes a fishing mortality rate of 0.17 would be required.

The management objective, on which the advice on a TAC for 1979 was based, was to maintain the 1978 level of spawning stock biomass. If this approach is to be followed for the management of this species in 1980 fishing mortality has to be reduced to the level of 0.08, corresponding to $F_{0.1}$. This would require, for 1980, a reduction in the TAC by 50% from the 1979 level to 11 000 tonnes.

However, in view of the fact that S. marinus is taken mainly as a by-catch in the fishery for cod it seems unrealistic to assume that the fishery for that species could be managed at a TAC level as low as 11 000 tonnes, even with a reduced TAC for cod.

The management objective of maintaining the total biomass in 1981 at the level estimated for 1978 of 227 000 tonnes would allow a catch of 25 000 tonnes in 1980 but would reduce the spawning stock biomass by 8% from the 1978 level. The fishing mortality associated with this option is 0.20, the same level as estimated for 1978.

It was estimated that the by-catch of S. marinus to be expected from a TAC of about 400 000 tonnes of cod in the North-East Arctic would amount to 19 000 tonnes. A TAC less than that would only increase discarding of redfish and could, therefore, not contribute to a reduction of fishing mortality. A catch of 19 000 tonnes of redfish in 1980 would result in a fishing mortality of 0.145, a reduction of F by 28% from the 1978 (F_{max}) level towards $F_{0.1}$. Spawning stock biomass at the beginning of 1981 would be about 5% lower than in 1978 and 1979, and total stock biomass would be expected to increase slightly, by about 3%, compared to 1978. Since the recommended catch level is derived from an estimate of likely by-catches of S. marinus in the fishery for cod, no directed fishery for S. marinus should be allowed in 1980 in the North-East Arctic.

The ACFM therefore recommends a TAC of 19 000 tonnes of Sebastes marinus in 1980. It further recommends that no directed fishing for this species should be allowed in 1980.

Sebastes mentella

52. It was assumed that the catch in 1979 would be 135 000 tonnes, the level recommended for that year. Three options have been considered for the management of this species in 1980:

1) maintaining the level of fishing mortality required to take the 1979 TAC (F = 0.27),

2) reducing fishing mortality to the level of $F_{0.1}$ on the yield per recruit curve (F = 0.1),

3) fishing at the level of F estimated for 1978, which is equal to $F_{(max)}$ = 0.20.

Under all options both total biomass and spawning stock biomass are expected to increase above recent levels by the beginning of 1981, but under Option 1 this increase is only marginal compared to the other options. The corresponding catch in 1980, of 139 000 tonnes, is associated with a fishing mortality about 35% above $F_{(max)}$.

Option 2 would result in a considerable increase in stock size, but would also require a drastic reduction in the catch in 1980. This would impose unnecessary hardship on the fishery when the size of the stock does not require a stock rebuilding programme.

Option 3 provides a moderate increase in stock size at the beginning of 1981, and would allow a catch of 106 000 tonnes. This would be a reduction of 20% from the 1979 TAC, but about 14% higher than the preliminary 1978 catch estimate.

A fourth option of fishing at an intermediate level of F, between $F_{(max)}$ and $F_{0.1}$, would allow a TAC of 81 000 tonnes in 1980. This would bring the spawning stock biomass back to the 1977 level, about 25% above that of 1978. Total biomass would be expected to increase by 20% over the 1978 level This option, which entails an F of 0.15, is selected by ACFM, since it would provide a considerable increase in both spawning stock and total stock biomass and since it is in accordance with the management principles of ACFM to bring the fishing mortality as close to $F_{0.1}$ as possible.

The ACFM therefore recommends a TAC of 81 000 tonnes of Sebastes mentella in 1980.

53. The Advisory Committee on Fishery Management reiterates the note on enforcement of redfish TACs made in the previous report.

B.3.2 Redfish in Sub-areas V and XIV

54. Recent catches and recommended TACs in thousand tonnes:

	1974	1975	1976	1977	1978	1978	1979	1980
	Actual catches					Recommended TACs		
S. marinus	50	61	94	53	47[1)]	-	58	58
S. mentella	41	43	95	31	17[1)]	-	12	7
Total	91	104	189	84	64[1)]	90[2)]	70	65

1) Preliminary

2) Precautionary TAC for total redfish.

Catches of redfish from the Irminger Sea stock complex decreased steadily from 156 000 tonnes in 1965 to about 90 000 tonnes in 1973 and 1974 (Tables 13-16). In 1976 the catch amounted to about 189 000 tonnes, as a result of increased USSR fishing effort off the coast of East Greenland. This increase was linked with a change in the exploitation pattern towards younger fish. In 1977, in the absence of USSR vessels in the area, the catch decreased to 84 000 tonnes and the pattern of exploitation reverted to normal. In 1978 preliminary catch figures show a further reduction to 64 000 tonnes, mainly due to the elimination of the Federal Republic of Germany effort in Division Va.

Sebastes marinus

55. Average fishing mortality on age groups 16 and older in the period 1967-71 fluctuated without trend around 0.19. It then decreased to a level of 0.11 in 1972-74 and increased again to 0.19 in 1976. For 1978, F was estimated as 0.10.

The biomass of the exploited part of the stock decreased continuously from 880 000 tonnes in 1967 to 767 000 tonnes in 1971, followed by an increase to about 930 000 tonnes in 1975 due to reduced exploitation levels and good recruitment in the 1972-74 period. The decline in stock size since 1976 is partly caused by high exploitation in 1975 but also reflects low recruitment figures since 1976, The estimates for the more recent years, however, are influenced by the 1978 estimate of fishing mortality, and are therefore not as reliable as the figures prior to 1976. Spawning stock biomass declined continuously from 454 000 tonnes in 1967 to the lowest level on record, of 314 000 tonnes, in 1972. Since then it has increased again to 364 000 tonnes in 1975. For 1978 the spawning stock biomass was estimated as 331 000 tonnes and for 1979, as a result of reduced exploitation in 1978, as 363 000 tonnes.

Sebastes mentella

56. Average fishing mortality on age groups 12 to 24 fluctuated without trend around an average value of 0.085 during the period 1967-71; followed by an increase to about 0.115 in the 1972-75 period. In 1976, F increased by a factor of 3.2 from the level of the previous year as a result of heavy exploitation, particularly on younger age groups. For 1978 average fishing mortality was estimated as 0.09.

Both spawning stock biomass and total biomass decreased continuously during the period 1967-78 by about 2/3, to the very low level of 91 000 tonnes and 150 000 tonnes, respectively. Due to the complex stock situation in Sub-areas V and XIV this decline cannot be attributed to a particular fishery.

Sebastes marinus

57. In the absence of any information on likely catch levels in 1979 it was assumed that the 1979 catch would correspond to the recommended TAC, which is 58 000 tonnes. Based on this assumption, several options have been considered. Under all options, spawning stock biomass is expected to increase at the beginning of 1981 to the high 1967-68 level.

On the basis of an $F_{0.1}$ of 0.075, the estimated catch for 1980 would be 31 000 tonnes. This option, however, would impose unnecessary hardship on the fishery, in a situation where the spawning stock is expected to increase considerably at, or even above, the present level of fishing effort.

Fishing at an F of 0.16, the fishing mortality at which the yield per recruit curve approaches the maximum level, will not have adverse effects on either the spawning stock biomass or the total recruited biomass at the beginning of 1981, compared to previous years. Under this option the catch in 1980 would be 64 000 tonnes.

Maintaining the 1979 level of TAC in 1980 would result in a marginal reduction of F from the 1979 level towards $F_{0.1}$, and would allow the increasing trend in both spawning stock biomass and total biomass estimated for 1979 and 1980 to continue. This option is also in line with the general management principles of ACFM to bring fishing mortality close to $F_{0.1}$, particularly when the stock is in good condition and the sacrifices of the fisheries are expected to be small when following this approach.

The ACFM therefore recommends that a TAC of 58 000 tonnes of Sebastes marinus for 1980 should be introduced in Sub-areas V and XIV.

Sebastes mentella

58. Calculations of possible catches in 1980 have been made on the assumption that the catch in 1979 will be equal to the recommended TAC of 12 000 tonnes. The option for catch in 1980, which would halt the decline in spawning stock biomass, gives a very low catch level. To keep the spawning stock at the level of about 90 000 tonnes, as estimated for 1978 and 1979, a catch of not more than 7 000 tonnes could be allowed. This TAC is associated with a fishing mortality of 0.15, about 57% below $F_{0.1}$. Higher catch levels in 1980 would reduce the spawning stock biomass further below the present level, which is the lowest on record, and should therefore not be considered seriously for the management in 1980. Although under all options total recruited biomass is expected to increase slightly, it will not reach the already low 1977 level by the beginning of 1981.

The ACFM therefore recommends that a TAC of 7 000 tonnes of Sebastes mentella for 1980 should be introduced in Sub-areas V and XIV.

59. Since the two species of redfish are often caught together, and are not recorded separately in the statistics, the calculated TACs have to be combined as a TAC for total redfish of 65 000 tonnes. Of this not more than 7 000 tonnes should consist of Sebastes mentella.

The Advisory Committee on Fishery Management cannot, at present, provide precise advice on how to allocate TACs for the two species to different fishing areas. It should be noted, however, that with the present pattern of fishing, Sebastes mentella is mainly caught in Division Vb, and off the south and southeast coasts of Iceland, whereas Sebastes marinus is mainly fished at East Greenland and off the west coast of Iceland.

60. Since the data base of the Working Group was not improved substantially during 1978, it should be pointed out that the estimated TACs for redfish in both management areas are less accurate than those for other species. This is particularly the case for S. marinus in the North-East Arctic, and for both species in the western part of Region 1. The conservative approach adopted to the recommended catch levels should also serve as a precautionary measure for the not unlikely situation that, in the present limited state of knowledge, fishing mortality in 1978 may have been seriously underestimated, and the size of the stocks consequently overestimated.

B.4 Greenland Halibut in Region 1

61. The Working Group on Greenland Halibut in Region 1 met at Charlottenlund from 7-10 May 1979 to assess TACs in 1980 for Greenland halibut.

62. Recent catches and recommended TACs in thousand tonnes:

	1976	1977	1978		1979	1980
	Actual catch	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Rec. TAC
Sub-areas I and II	36	29	40	24[1)]	25	14
Sub-areas V and XIV	6	17	2)	14[1)]	15	15

1) Preliminary

2) No recommended TAC for 1978.

The preliminary reported total catch of Greenland halibut in Region 1 in 1978 was 38 656 tonnes, compared with 45 465 tonnes in 1977 (Table 17). The total catch in 1978 in Sub-areas I and II of 24 448 tonnes is the lowest catch since 1968, representing a drop of 4 439 tonnes from the amount taken in 1977 (Table 18).

Greenland halibut catches in Sub-areas V and XIV show a decline from 16 578 tonnes in 1977 to 14 208 tonnes in 1978 (Table 19).

B.4.1 State of the stocks

63. Greenland halibut in Sub-areas I and II

The fishing mortality in 1978 was calculated on the basis of an estimate of the total effort, derived from the catch per unit effort in the USSR trawl fishery. Data from the USSR trawl fishery show a considerable decrease in the catch per unit effort in 1977 and 1978 compared with the period 1970-76.

Because of the difficulties in getting a close relationship between total effort and calculated F values, from preliminary VPA runs, for the whole period 1970-78, two alternative approaches were considered.

Under Alternative 1 the fishing mortality in 1978 was chosen so that the total effort and the corresponding F in 1978 fitted the regression line between the same set of values for 1970-74. The estimated F in 1978 under this alternative was 0.42. The consequence of this alternative is that the relationship between total effort and fishing mortality breaks down for the years 1975-77.

Alternative 2 takes into account that the actual total effort in 1978 was 18% higher than the average total effort in 1975-77. Therefore fishing mortalities were adjusted so that the F in 1978 became 18% higher than the mean F in 1975-77. The calculated fishing mortality in 1978 under this assumption was 0.75.

For the present exploitation pattern the $F_{0.1}$ and the F_{max} values correspond to 0.12 and 0.20, respectively; therefore the 1978 fishing mortality under both alternatives is far above the level corresponding to F_{max}. Furthermore, under both alternatives the total stock biomass, as well as the spawning stock biomass, decreased continuously throughout the period 1970-77 (Figure 2). Except for the total stock biomass under Alternative 1 this decline continued in 1978.

Greenland halibut in Sub-areas V and XIV

64. For Greenland halibut in the Iceland and East Greenland areas reliable age composition data were available for the period 1975-78, and a VPA was done based upon these data.

Unfortunately there were difficulties in evaluating the terminal F value, and therefore the present state of the stock, due to the lack of catch per unit effort data. A catch curve, constructed by combining the 1975-78 data, indicates an average fishing mortality of 0.35. This value represents average removals of about 23 000 tonnes annually over the past 10 years. This F value of 0.35 was considered high for the terminal F in 1978 and an arbitrary value, somewhat lower, of 0.25 was used in the VPA. This value was considered to possibly be in the neighbourhood of the true value, since the calculated F for 1975 was close to the value derived from the catch curve and the catch in 1975 was the same as the long-term average of 23 000 tonnes.

For the estimated 1978 exploitation pattern the $F_{0.1}$ and F_{max} values correspond to 0.15 and 0.45, respectively. Therefore the F value of 0.25 selected for 1978 falls between $F_{0.1}$ and F_{max}.

B.4.2 Total allowable catches

Greenland halibut in Sub-areas I and II

65. On the basis of all the available data, it was impossible to obtain evidence as to which alternative seemed to be more likely. Therefore, catch predictions were made for each of the alternatives, using four options of fishing mortality in 1980. It was further assumed that the TAC of 25 000 tonnes will be taken in 1979. The F required in 1979 to catch the TAC under Alternative 1 and Alternative 2 would be 0.41 and 1.05 respectively.

The results of the catch predictions in 1980 are given below (in thousand tonnes):

Option of F in 1980	Alternative 1		Alternative 2	
	F	Catch	F	Catch
A: $F_{80} = F_{79}$	0.41	30	1.05	21
B: $F_{80} = \frac{F_{79} + F_{max}}{2}$	0.30	23	0.62	14
C: $F_{80} = F_{max}$	0.20	16	0.20	5
D: $F_{80} = F_{0.1}$	0.12	10	0.12	3

The results of Alternative 1 show that the spawning stock biomass would increase under all options from 1980 to 1981. Under Alternative 2 the spawning stock biomass will continue to decrease for options A and B in 1981. For the other options the spawning stock is expected to increase above the 1980 level.

In view of the results of these forecasts, it is proposed to reduce the catch in 1980 to a level of 14 000 tonnes. This TAC level seems advisable, since it causes the least danger to the stock without excessive disruption to the fishery. A catch of 14 000 tonnes is also lower than the expected long-term yield at $F_{0.1}$ as estimated from the yield per recruit curve under Alternative 2.

Therefore, the Advisory Committee on Fishery Management recommends that the TAC for Greenland halibut in Sub-areas I and II should be set at a level of 14 000 tonnes in 1980.

Greenland halibut in Sub-areas V and XIV

66. With the many assumptions and uncertainties connected with the estimation of the F in 1978, predictions of catch levels for 1980 were considered very unreliable. From the yield per recruit analysis it appears that estimated fishing mortality in 1978, even with a fairly large degree of probable error, is within the range between $F_{0.1}$ and F_{max}. Furthermore, the expected long-term yield at $F_{0.1}$, as estimated from the yield per recruit curve, is close to 15 000 tonnes.

Therefore the TAC for 1979 of 15 000 tonnes is considered an acceptable catch level and should be continued in 1980.

The Advisory Committee on Fishery Management recommends that the TAC for Greenland halibut in Sub-areas V and XIV should be set at a level of 15 000 tonnes in 1980.

B.5 Fish Stocks at the Faroes

67. Following a resolution from the 66th Statutory Meeting of ICES, a meeting of the Working Group on Fish Stocks at the Faroes was convened at Charlottenlund, 30 April to 2 May 1979, in order to assess TACs for 1979 for cod and haddock, to assess further the effective mesh size in current use, and to estimate the effects of further increases in mesh size for these species.

B.5.1 The Faroe Plateau stocks of cod (Sub-division Vb_1)

68. Recent catches (Table 20) and recommended TACs in thousand tonnes:

1975	1976		1977		1978		1979	1980
Actual catch	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Rec. TAC	Rec. TAC
37	40	26	35	30	27[1)]	28	26	22

1) Preliminary.

Effort by Faroese trawlers increased on the Plateau (Vb_1) in 1978, but effort by other Faroese vessels and foreign vessels declined, resulting in an estimated net reduction of fishing effort on cod of about 25% compared with 1977.

69. The changed fishing pattern at the Faroes during recent years, especially the increase in the proportion taken by Faroese vessels, has resulted in a change in the average weight at age in the catches. This change affects the yield per recruit and changes the fishing mortality which gives the maximum yield per recruit under the current exploitation pattern (F_{max}) from 0.4 to 0.3. As a result the average long-term yield has changed from 29 000 tonnes with the old weight at age data to 23 000 tonnes. Recruitment is not known for recent year classes, so predictions have been made on the assumption of average recruitment.

It has been assumed that TAC for 1979 of 26 000 tonnes will be taken, and on this basis two catch predictions have been calculated: one assuming a step-wise reduction from the 1979 level of fishing mortality (F = 0.52) towards the fishing mortality giving maximum yield per recruit, and one keeping the fishing mortality at the 1979 level.

70. The results of these predictions, including predicted spawning stock sizes are:

	OPTION 1			OPTION 2		
Year	Fishing mortality	Yield (tonnes)	Spawning stock biomass (tonnes)	Fishing mortality	Yield (tonnes)	Spawning stock biomass (t)
1979	0.52	26 000	63 000	0.52	26 000	63 000
1980	0.45	22 000	59 000	0.52	24 000	59 000
1981	0.35	18 000	59 000	0.52	23 000	56 000

With average recruitment Option 2 will result in a continuing decrease of the spawning stock, lower long-term catch levels, and lower average sizes of fish in the catches. The Advisory Committee on Fishery Management accordingly recommends a TAC for cod in Sub-division Vb_1 of 22 000 tonnes in 1980.

B.5.2 Faroe Bank stock of cod (Sub-division Vb_2)

71. Recent catches (Table 21) and recommended TACs in thousand tonnes:

1975	1976		1977		1978		1979	1980
Actual catch	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Rec. TAC	Rec. TAC
2	2	2	2	2	5[1)]	2	2	3.3

1) Preliminary.

Catches of cod on Faroe Bank increased in 1978 due to an increase in Faroese effort.

72. No data are at hand to assess current levels of fishing mortality and the size of the Faroes Bank stock. The Bank was closed to trawl fishing in the latter half of 1978. This means that the main part of the catch will be taken by Faroese long liners.

On average the catch per unit effort for cod on the Faroe Plateau is 1.27 higher than on the Faroe Bank. Taking into account the size of the area of the Plateau compared to the Bank, this would suggest that the exploitable biomass of the Bank stock might be one fifth of that on the Plateau.

One fifth of the long-term average yield from the Plateau stock is 4 600 tonnes. The average annual yield of cod in 1968-78 from the Faroe Bank is 3 300 tonnes. Considering the limited data at hand for this stock the Advisory Committee on Fishery Management accordingly recommends that the TAC for cod in Sub-division Vb_2 should be 3 300 tonnes in 1980.

B.5.3 Haddock

73. Although it is known that the haddock stocks on the Plateau and the Bank are separate, it has not been possible to make separate assessments, and the Faroe Plateau and Bank stocks have been treated as one unit.

Recent catches (Tables 22 and 23) and recommended TACs in thousand tonnes:

1975	1976		1977		1978		1979	1980
Actual catch	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Rec. TAC	Rec. TAC
21	26	17	26	17	19[1)]	23	20	20

1) Preliminary.

Both Faroese and foreign effort declined on the Plateau in 1978, with lower catches as a result. The reduction in the foreign effort is mostly the result of the increase in mesh size introduced in 1978, but the reduction in effort by Faroese long liners was due to the very severe weather conditions in the autumn of 1978.

Catches on the Plateau went down from 24 538 tonnes in 1977 to 16 349 tonnes in 1978. For the Bank there was an increase in Faroese effort, resulting in an increase in landings from 1 015 tonnes in 1977 to 2 979 tonnes in 1978.

74. With the current exploitation pattern the level of fishing mortality is less than that giving maximum yield per recruit. This latter fishing mortality is 0.55, whereas the current level is estimated to be 0.35.

Spawning stock is at a high level. No firm data are available on the recruitment of recent year classes, and average recruitment has been assumed for the two catch predictions made.

The first option keeps F at a level very close to that necessary to take the recommended TAC for 1979 (F = 0.37). The second option increases the fishing mortality to the level giving maximum yield per recruit, under the current exploitation pattern.

	OPTION 1			OPTION 2		
Year	Fishing mortality	Yield (tonnes)	Spawning stock biomass (tonnes)	Fishing mortality	Yield (tonnes)	Spawning stock biomass (tonnes)
1979	0.37	21 000	87 000	0.37	21 000	87 000
1980	0.37	20 000	85 000	0.55	28 000	85 000
1981	0.37	20 000	84 000	0.55	24 000	75 000

75. The yield per recruit curve is rather flat topped and in the long term the gain in yield per recruit at the F_{max} level will be marginal. Furthermore, staying at the present level of mortality gives the opportunity to build a buffer stock, and to keep the stock at a level where catch rates are more profitable to the fisheries.

76. The Advisory Committee on Fishery Management accordingly recommends a TAC for haddock in Division Vb of 20 000 tonnes in 1980.

B.5.4 Mesh assessments

77. It was attempted to make mesh assessments for cod and haddock on the Faroe Plateau on the basis of the 1974-77 catch data. These data only allowed the mesh assessment to be carried out for haddock which, at present, is mainly exploited by Faroese long liners.

The assessment is a projection of the fishing situation in the period 1974-77 in respect of annual catch composition, fishing mortality induced by the fleets of different countries, etc. in which the only parameter which is allowed to change is the mesh size of the trawls. The assessment therefore does not reflect the changes which have taken place in the fishery, especially in 1978, and which will continue in future years. The results of this assessment for haddock are:

Effective mesh size 1974-77

Faroese trawl	109 mm
Scottish trawl	105 mm
English trawl	107 mm

Initial losses and long-term gains in %. Faroe haddock

Increase of effective mesh size to:	Faroese trawl	Faroese long line	Scottish trawl	English trawl	Total
135 mm					
Initial losses	-47.6	0	-47.3	-41.4	-23.6
Long-term gain	-26.2	+43.4	-25.3	-18.4	+18.8
155 mm					
Initial losses	-78.5	0	-76.8	-66.1	-39.0
Long-term gain	-61.8	+79.4	-78.1	-41.9	+10.2
175 mm					
Initial losses	-93.5	0	-93.0	-81.8	-47.8
Long-term gain	-86.5	+88.5	-85.1	-64.8	+ 1.4

Because of the assumption of an unchanged fishing situation, inherent in the assessments, and the fact that a mesh change will mainly affect other fisheries than that for haddock, the Advisory Committee on Fishery Management is not at present able to make any recommendation about mesh changes in Division Vb.

C. SAITHE (COALFISH) IN REGIONS 1 AND 2

78. The Saithe (Coalfish) Working Group met at Charlottenlund, 25-28 April 1979, to assess TACs for 1980 for the saithe fisheries.

79. Recent catches, estimated catches in 1979, and recommended TACs in thousand tonnes:

	1977		1978		1979		1980
STOCK	Rec. TAC	Actual catch	Rec. TAC	Actual catch[1]	Rec. TAC	Estimated catch	Rec. TAC
Sub-areas I+II	200	183	160	147	153	152	129
Sub-area IV and Div. IIIa	210	195	200	145	200	147	129
Div. Va	60	62	58	48	58	59	54
Div. Vb	40	35	32	28	31	36	34
Sub-area VI	20	29	32[2]	31	32	33	31

1) Preliminary

2) Revised from 20 000 tonnes on the basis of new data.

80. Earlier assessments have been updated with the addition of revised 1977 data and provisional data for 1978. For all areas, except Faroe, age compositions for 1978 were available, which represented 87-97% of the landings. At Faroe only 67% of the landings were represented by age composition data, as French and Norwegian landings from the area were not sampled. In the North Sea Danish industrial by-catches were drastically reduced after 1976, and the lack of age and length compositions for these catches does not now create serious problems for the assessment. For 1977 and 1978 age compositions of USSR catches from the North Sea, submitted to Annales Biologiques were used. These USSR age compositions were not available last year and the use of these new data has resulted in a revised total age composition which differs significantly from that used in last year's assessment.

81. Total landings from all areas combined fell by 104 000 tonnes, from 503 000 tonnes in 1977 to 399 000 tonnes in 1978 (Tables 24-29). Landings from west of Scotland increased slightly; landings from all other areas were 20-26% lower than in 1977. Quota restrictions have undoubtedly limited the catches of some countries in some areas. However, the fact that landings, except west of Scotland, have failed to reach the TAC levels would suggest that the reduction can be chiefly ascribed to deterioration of the stocks. There have been considerable differences in the level of exploitation between the stocks. Nevertheless the variations in spawning stock biomass after 1960 follow a similar pattern in all five stocks, increasing up to about 1970 and declining after 1973. This could mean that factors other than exploitation also influence the size of saithe stocks.

State of the Saithe Stocks and Catch Predictions

C.1 North-East Arctic

82. Fishing in 1978 by non-coastal states was restricted by quotas. According to the provisional catch figures the catch by non-coastal states was 17% below the total quota. Norwegian landings, which in 1978 made up 78% of the total, were reduced by 18%. Relevant effort data are not available. There is no information which would indicate major changes in Norwegian effort, whereas the total effort of non-coastal states has probably been slightly reduced because of the quotas. Norway, in principle, has accepted the recommended TAC of 153 000 tonnes for 1979; quotas for non-coastal states are based on a Norwegian catch at the 1976-77 level of 135 000 tonnes.

If fishing mortality continues at the estimated 1978 level of 0.65 for the most heavily exploited age group the catch is expected to be close to the TAC of 153 000 tonnes in 1979.

83. For this stock there is much to be gained by changing the exploitation pattern. The high fishing mortalities on age groups 2-4 could be much reduced by stopping the purse seine fishery for saithe. For example, of an estimated total fishing mortality on 2 year olds in 1978 of 0.2, 0.19 was generated by the purse seine fishery. On 3 year olds this fishery generated a fishing mortality of 0.5 compared to a total of 0.65, and on 4 year olds an F of 0.15 of the total F of 0.40. With a complete ban on the purse seine fishery, the long-term yield is estimated to be 22% higher than the yield obtained with the present exploitation pattern. A further improvement in the exploitation pattern could be attained by increasing the mesh size in the trawl fisheries. It is strongly recommended that the purse seine fishery is reduced to at least the level which would generate F values on 3-4 year old saithe no higher than the F on the older age groups. This could be done, stepwise, by aiming to reach this objective in 1982.

84. Following this strategy, it is recommended that the TAC for 1980 is set at 129 000 tonnes, of which not more than 38 000 tonnes should be taken by purse seine. F_{max} for this new exploitation pattern would be 0.21. The long-term aim should be to reduce fishing mortality to at least this level. From 1982 onwards purse seine catches would have to be limited to less than 10% of the appropriate TAC.

If the recommendation of limiting the purse seine fishery is not followed, the TAC for 1980 should not be higher than 122 000 tonnes, aimed at getting the fishing mortality down to F_{max}, for the present exploitation pattern, in 1981.

C.2 North Sea, Skagerrak and Kattegat

85. The fishery in 1978 was subject to quota regulations, but this had little effect on the landings which, according to provisional figures, were 27% below the recommended TAC and 37% below the quota agreed between EEC and Norway. The great changes which have taken place in the fisheries following the extension of fisheries jurisdiction by coastal states, and the fact that relevant data on effort are not available makes it very difficult to estimate the present level of exploitation. Most states have failed to take their quotas, and the possibility that the Fs for 1978 are seriously underestimated, and the stock accordingly overestimated, clearly exists. The 1978 exploitation pattern gives an F_{max} of 0.22 on the yield per recruit curve, compared to the 1978 level of F of 0.35 on the fully recruited age groups. In order to take the TAC of 200 000 tonnes in 1979, which has been accepted by the coastal states, fishing effort in 1979 must be increased to generate an F of 0.51. In view of the 1978 catches it seems more reasonable to assume no change in effort from the 1978 level. This will give an estimated catch of 147 000 tonnes in 1979.

86. With the aim of getting a stepped reduction towards a more optimal F the Advisory Committee on Fishery Management recommends that the TAC for North Sea, Skagerrak, and Kattegat saithe (Sub-area IV, Division IIIa) for 1980 be 129 000 tonnes. This will reduce the F in 1980 to 0.28.

87. A change in exploitation pattern with lower mortalities on the younger age groups will have a greater effect in increasing the long-term yield than adjusting the exploitation rate by TAC regulations, under the present exploitation pattern. This will not be achieved by the present proposed increase of mesh size in the North Sea. This will affect the exploitation pattern of saithe only to a very minor extent.

C.3 Iceland

88. Catches at Iceland have been falling since 1971, chiefly because the year classes after the 1968 one have been much less abundant than in former years. So far there is no firm evidence of improvement in recruitment, but there are some indications that the 1975 year class may be more abundant than the year classes 1969-74. A somewhat higher figure has been used in the predictions for this year class. The subsequent year classes are assumed to be at the low 1969-74 level. Effort by non-coastal states has been decreasing in recent years. This has had its most pronounced effect on the exploitation of the age groups 4 to 7. The F values for 1978 were chosen bearing this in mind. With the 1978 exploitation pattern F_{max} = 0.6, compared with the present level of F of 0.35 on age groups subject to maximum exploitation. To take the TAC for 1979 requires an increase in F to 0.46. A decrease from that level to an F of 0.40 in 1980 will give a catch of 54 000 tonnes.

Effort on saithe is expected to increase somewhat at Iceland, due to attempts to divert effort from the cod fisheries. The Advisory Committee on Fishery Management recommends that the TAC for saithe at Iceland in 1980 should be 54 000 tonnes. This fishery would still be on a level below F_{max}, and would give a slight increase in spawning stock.

C.4 Faroe

89. Catches declined after 1973, partly because of reductions in fishing effort by non-coastal states. There has been some increase in Faroese effort. In 1979 fishing by non-coastal states will be restricted by quotas and area regulations. Effort data indicate a somewhat lower exploitation rate in 1978 than in 1977, and Fs for 1978 were chosen mainly to reflect a moderate decrease in effort. Yield per recruit calculations give an F_{max} of 0.45, compared to an F of 0.3 for 1978. In the catch prediction increased fishing effort by Faroese trawlers in 1979 is expected to raise F to 0.4, giving a catch of 36 000 tonnes. The recommended TAC for 1979 is 31 000 tonnes.

In the late 1960s recruitment was at an unusually high level which generated high catch levels in the early 1970s. In recent years there is some evidence of a decline in recruitment, and it is assumed that this lower level will continue for the year classes affecting the TAC in 1980.

Some diversion of effort towards saithe is expected in the Faroe area. Taking this into account the fishing mortality will still stay below F_{max} and give an approximately stable spawning stock size.

The Advisory Committee on Fishery Management recommends a TAC for Faroe saithe (Division Vb) for 1980 of 34 000 tonnes.

C.5 West of Scotland

90. Landings increased from 28 000 tonnes in 1977 to 31 000 tonnes in 1978, and have been relatively stable since 1973. French data indicate

that total effort in 1978 was not very different from that in 1972-74. This was taken as the basis for the choice of F for 1978 of 0.35. Yield per recruit calculations gave an F_{max} of 0.5. In the catch prediction the F in 1979 was assumed the same as in 1978, and this gives an estimated catch in 1979 of 33 000 tonnes, close to the 1979 TAC. Using the same F also in 1980 will then give a TAC of 31 000 tonnes. The spawning stock biomass will not be much affected.

The Advisory Committee on Fishery Management recommends that the TAC for saithe west of Scotland (Sub-area VI) for 1980 be 31 000 tonnes.

D. REGION 2 FISHERIES

D.1 Herring and Sprat Stocks

91. The Herring Assessment Working Group for the Area South of 62°N met at Charlottenlund, 30 April - 4 May 1979, to re-assess the herring stocks in Sub-areas IV and VII, Divisions IIIa and VIa, and the sprat stock in Sub-area IV.

D.1.1 North Sea herring

92. Recent catches[1] and recommended TACs, in thousand tonnes:

1976			1977		1978		1979	1980
Rec. TAC	NEAFC TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Rec. TAC
140[2]	160	190	0	84	0	30[3]	0	0

1) Catch figures taken from the Working Group Report (Skagerrak included).

2) Later, in October 1975, it was recommended that no directed fishery for herring should be permitted in 1976.

3) Preliminary.

93. The catch of herring from the North Sea, excluding the Skagerrak, in 1978 was 9 138 tonnes as compared with 46 010 tonnes in 1977 (Table 30). Throughout 1978 directed fishing for herring was prohibited, and the above catch was therefore considered as a by-catch. About 95% of these landings were juvenile herring, 0 and 1 group. The catch taken in the Skagerrak in 1978 was 21 227 tonnes, compared with 37 618 tonnes in 1977.

94. The results of the International Herring Larval Surveys indicated an increase in the spawning stock in the northern and central North Sea of about 76 000 tonnes; with a total spawning stock of 206 000 tonnes for these two areas combined.

95. The results from the International Young Herring Surveys show that the 1974-76 year classes are all very weak, and that the 1977 year class is, according to preliminary estimates, the weakest of any year class in recent times.

96. The estimate of total fishing mortality on 0-group in 1978 was 0.21. This is at a similar level to 1976, but somewhat higher than in 1977. This mortality rate was presumably entirely generated by the Recommendation 2 fisheries.

97. In the absence of any direct estimate of stock abundance, as for example from an echo survey, the results of the larval surveys were the only source of information by which the Working Group could derive estimates of the spawning stock size. These estimates confirm that the stock is still at a very low level of abundance. It was also noted with concern that the results of the International Young Herring Surveys show that there is no evidence of improved recruitment. The ACFM reiterates its advice, given in previous reports that the policy should be to rebuild the spawning stock, as quickly as possible, to at least 800 000 tonnes. A limited fishery should not be allowed before there is evidence of a recovery of the spawning stock, and of improved recruitment; and that, therefore, the rebuilding to this goal would take place within a fairly short period with a limited fishery operating.

In the light of this, and in the absence of any evidence of improved recruitment, ACFM recommends that no fishery should be allowed in 1980. ACFM also reiterates its request for the most stringent measures to be taken to minimise the by-catch of North Sea herring.

98. It must be stressed that at present the monitoring of the recovery of the North Sea herring is far from satisfactory. Little information on the age composition of the stock has been obtained for the last two years. This is urgently needed, as are direct estimates of spawning stock size from another source in addition to those from larval surveys.

D.1.2 Division IIIa herring (Tables 31 and 32)

99. The management of Division IIIa herring presents some special problems because of the mixed stock composition, and because of migrations into and out of the area. The Working Group on Division IIIa Stocks considered data on K_2, VS, and average length as possible means by which different components of the juvenile herring in the area could be distinguished. It concluded that, on the evidence available it could not rule out the possibility that juvenile herring caught in Division IIIa contain recruits to the North Sea autumn spawning stock.

100. Based on advice from a Danish-Swedish Study Group a TAC of 45 000 tonnes of herring for Division IIIa was agreed by Sweden, Norway, and the EEC for 1979; for the Skagerrak the TAC was 10 000 tonnes, for the Kattegat 35 000 tonnes. It seems highly unlikely that such a TAC will reduce the fishing mortality to an acceptable level, even if strictly enforced. It must also be pointed out that all removals of Division IIIa herring, whether beyond or within the base lines, from which zones of national jurisdiction are drawn, should be counted against the national quota, since the TAC is estimated for the whole stock, over its entire area of distribution. Lack of data makes it impossible to carry out a realistic prognosis for Division IIIa herring. There is no adequate method of estimating F during 1978, nor is it possible to calculate the exploitation pattern on the basis of historical catch per age data.

Exceptionally low catches of 1-ringers during the International Young Herring Survey in Skagerrak-Kattegat in 1979 indicate that the number of 2-ringers may be low in 1980. Since regulatory measures have already been taken in an attempt to reduce the exploitation of 0- and 1-ringers, and since 2-ringers have traditionally dominated the catches of older herring, it is possible that the TAC in 1980 would have to be reduced far below the 1979 level if the fishing mortalities on older fish are to be reduced to an acceptable level.

101. ACFM strongly recommends that a survey be carried out, during September 1979, to monitor further the abundance of 1-group fish. The TAC for 1980 could then be considered by ACFM during the 67th Statutory Meeting of ICES in October 1979.

D.1.3 Celtic Sea herring

102. Recent catches[1] and recommended TACs, by season (1 April to 31 March), in thousand tonnes:

1976/77			1977/78			1978/79			1979/80	1980/81
Rec. TAC	NEAFC TAC	Actual catch	Rec. TAC	EEC TAC	Actual catch	Rec. TAC	EEC TAC	Actual catch[4]	Rec. TAC	Rec. TAC
10-12	16.8[2]	7	0[3]	0	3	0	0	4	0	0

1) Catch figures taken from the Working Group Report

2) Later reduced to 10 800 tonnes

3) 6 500 tonnes, if TAC for 1976/77 were reduced to 6 500 tonnes

4) Preliminary.

In the Celtic Sea all fishing for herring was prohibited during the seasons 1977/78 and 1978/79. Despite this, about 3 000 tonnes of herring were taken in the former season, and nearly 4 000 tonnes during the latter one (Tables 33 and 34). This mainly resulted from a directed Irish trawl and drift net fishery but partly from catches of herring, reported as by-catch in the Dutch and the Federal Republic of Germany mackerel fisheries.

103. It is evident that the effort in the Irish trawl and drift net fishery increased substantially in 1978/79, and was probably at least twice the 1977/78 level. It was reported that these illegal fishing activities were so extensive that it was not possible to carry out a survey, as was done in the previous season, to obtain an impression of stock abundance. The adult stock size at 1 April 1978 had previously been estimated as 10 000 tonnes. Taking into account the increased, illegal, fishing effort in the area the stock was re-assessed and is now estimated to have been only 5 000 - 6 000 tonnes during the last two years. It is therefore clear that the catches taken during 1977/78 and 1978/79, together with poor recruitment in both of these seasons, have prevented any recovery of the stock.

104. The adult stock is therefore in a very critical state. Consequently, it is recommended that all fishing for Celtic Sea herring should be prohibited in 1979/80 and in 1980/81. It is imperative that the prohibition on herring fishing in the Celtic Sea be rigorously enforced because even the relatively small catches taken in 1978/79 generated a high fishing mortality (F = 0.8). About 30% of this fishing mortality was generated by the reputed by-catches in the mackerel fishery. Most members of ACFM considered these by-catches to be too high to be genuine by-catches. For example, there was a marked disparity in by-catches between the French and Dutch fleets fishing mackerel in the area. It is recommended that management bodies should, therefore, seriously consider what action can be taken to limit these catches to absolutely unavoidable by-catches.

105. In previous reports the management objective suggested has been to rebuild the spawning stock to 40 000 tonnes as soon as possible. This objective has been reviewed and it is recommended that the stock should be rebuilt as rapidly as possible to at least 40 000 tonnes.

D.1.4 Herring in Division VIIj (Southwest Ireland)

106. Accurate statistics of herring catches from Division VIIj are not available, because all countries report their catches as having been taken in Divisions VIIg-k. At the present time, it would appear that catches from Division VIIj are almost entirely taken by Irish vessels. The average annual landings in the period 1960-70 did not exceed 5 000 tonnes. In more recent years, however, the effort in the area has increased considerably because of the closure of the Celtic Sea. As a result the total Irish catch has increased, and in 1978 it exceeded 7 500 tonnes.

107. Scientific data about these herring are very limited and are not sufficient to estimate stock size. However, catch per unit effort data would indicate that the fishery is based on rather small stocks, which react quickly to increased effort. Most of the herring in the area are autumn spawners and there are a number of well defined spawning beds along the Irish coast. The age distributions in 1977 and 1978 indicate that the 1974 year class was a good one in this area, as it was in the adjacent Division VIIb, and was responsible for approximately 40% of the catch in both years.

108. Until more scientific data become available it would seem desirable to stabilise the fishery at about the level of recent catches. The ACFM recommends that a precautionary TAC in Division VIIj should be set at 6 000 tonnes. This would prevent diversion of effort to the area, and inaccurate reporting of catch statistics.

D.1.5 Herring in Division VIa

109. Recent catches[1] and recommended TACs in thousand tonnes:

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1) Catch figures taken from the Working Group Report.

1976			1977			1978		1979	1980
Rec. TAC	NEAFC TAC	Actual catch	Rec. TAC	EEC TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Rec. TAC
66	136	111	48	64	49	53[2)]	32	0	0

2) In March 1978 it was recommended to stop all fishing for herring in 1978.

The preliminary catch in 1978 of 32 371 tonnes was considerably less than that of 48 568 tonnes taken in 1977 (Table 35). This decrease probably reflects the effect of the closure of the fishery, within United Kingdom fishery limits, from 6 July, which was imposed on the advice of ACFM. As a result in 1978 a higher percentage of the annual catch was taken in the first half of the year, 59% compared with 32% in 1977, and the catch in this period increased between the two years. This increase could, of course, have been due to increased effort just prior to the partial fishing ban.

110. However, it seemed likely that the total effective fishing effort fell from 1977 to 1978. By how much is, on the other hand, difficult to estimate. Several runs of the VPA were made until the decrease in fishing mortality between 1976 and 1977 approximated to 30%, the level of decrease used in the 1978 assessment. This indicated that the fishing mortality on adults, 3-ringers and older, was 0.6 in 1978. The comparable values for 1976 and 1977 were 1.01 and 0.69, respectively. These latter values are a little lower than those estimated in 1978.

111. Based on these new calculations the spawning stock at 1 January 1978 is estimated to have been 71 000 tonnes compared with 68 000 tonnes calculated in 1978. Similarly for 1979 the spawning stock is now estimated to be about 79 000 tonnes. On the assumption of zero fishing mortality on 2-ringers and older herring in 1979, and an F on the 1-ringers at the same level as in 1978, the spawning stock in 1980 will be considerably higher. How much higher will depend upon the strength of the recruiting 1977 year class. As a conservative approach a value equal to the lowest one estimated by VPA, 240 x 10^6 as 1-ringers, has been used. On this assumption the adult stock at 1 January 1980 is estimated as 107 000 tonnes.

112. For this stock the spawning stock should be allowed to increase as quickly as possible to at least 200 000 tonnes, and strong year classes should then be used to rebuild it further.

ACFM therefore <u>recommends that no catches be taken from this stock in 1979 and 1980.</u> If new evidence becomes available, e.g. of a very strong recruiting year class, the advice for 1980 will be reconsidered; but this is not considered likely.

D.1.6 Herring in Division VIIb,c (Table 36)

113. The relationship between herring taken in Division VIa and in Division VIIb,c has been discussed in several previous reports. In an attempt to examine this problem Spearman rank-correlation coefficients were calculated using paired sets of age composition data of autumn spawners from the Hebrides, South Minch, northwest Ireland and west Ireland. The results of this analysis indicate that a varying degree of association exists between all combinations of areas; but there is no demonstrable relationship between the age structure in the areas Hebrides and west of Ireland. These results suggest that the South Minch and northwest Ireland are areas in which a stock mixing takes place. The results also suggest that the boundary between Division VIa and Division VIIb,c is not a realistic biological boundary. A new boundary between these two Divisions cannot, at present, be defined, but attention is drawn to the fact that the fishery to the northwest of Ireland takes place in the area of the present boundary. This has, of course, obvious enforcement difficulties.

114. Because of the dangers of overexploitation in Division VIIb,c the ACFM reiterates the advice given in the previous report. It is recommended that a precautionary TAC for herring in Divisions VIIb,c should be set at 7 000 tonnes for 1979 and for 1980.

D.1.7 Clyde herring

115. Recent catches and recommended TACs in thousand tonnes:

1976	1977	1978		1979	1980
Actual catch	Actual catch	Nat. TAC	Actual catch	Rec. TAC	Rec. TAC
4.1	4.8	4	3.9	2	2

It should be noted that in 1976, 1977 and 1978 the fishery was regulated by a seasonal closure during the first three months of the year. The preliminary catch figure of 3 900 tonnes for 1978 (Table 37) decreased by nearly 20% from that of the previous year, almost entirely because of the reduction of a nationally set quota for this area.

The Clyde herring was first dealt with by ACFM in October 1978. Although there is no doubt that the Clyde catches are based on two components (i.e. spring and autumn spawners), the splitting of the catches into these components was not completely reliable. An attempt has been made to use maturity stages for this purpose. On this basis spring spawning herring were estimated to make up 26% and 11% of the catches, by number, in 1977 and 1978, respectively.

Since the spring spawners are indigenous to the Clyde and the origin of the autumn spawners is not known, it was concluded that the area should be managed as a separate unit. It is recommended that the TAC for 1980 should be set at the same level as in 1979, that is 2 000 tonnes.

D.1.8 Irish Sea herring (Division VIIa)

116. Recent catches[1] and recommended TACs, in thousand tonnes:

1976	1977		1978		1979	1980
Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Rec. TAC
21	12	15	9	11	11	10

1) Catch figures taken from Working Group Report.

The reported catch from the North Irish Sea in 1978 was about 11 000 tonnes, of which about 8 500 tonnes were attributed to the Manx stock and about 2 500 tonnes to the Mourne stock (Tables 38 and 39). In 1978 the catches of Manx herring were dominated by 2-ring fish (1975 year class) while very few 1-ring fish were caught. As in all recent years 0- and 1-ring herring made up the major part of the catch in number of Mourne herring; all of 0-ring and 60% of the 1-ring being taken in the industrial fishery.

117. In 1976, 1977 and 1978 stock estimates for the Manx herring were initiated with fishing mortalities derived from a regression of fishing mortality on fishing effort over the previous 7 to 10 years. This method was inappropriate for the 1978 fishing season because the measure of fishing effort in that year is unlikely to reflect F due to catch quota arrangements.

In order to obtain a stock estimate for 1978, cohort analyses were run with a range of input F at intervals of 0.05; from these analyses a series of estimates for Fs in earlier years were obtained. For each set the correlation of F with effort for the years 1967 to 1977 was calculated. It was found that the correlation was highest for input Fs of 0.25 and 0.3. It was decided to apply an input F for 1978 of 0.30 for a stock estimate.

118. Although there is some evidence that the fishing mortality has decreased for the Manx stock it must be stressed that the stock is still very heavily dependent on the recruiting year class. One poor year class would thus delay the recovery of the stock, which appears to have started with a moderate fishing mortality and good recruitment in 1978.

Given moderate recruitment the TAC of 11 000 tonnes recommended in the previous report for 1979 and 10 000 tonnes for 1980 should allow continued rebuilding of the stock.

It is quite clear as stated in earlier reports, that the Mourne stock has declined to a very low level and that all fishing on that stock should be prohibited until a substantial recovery has taken place.

Accordingly, for the herring fishery in the North Irish Sea a TAC of 11 000 tonnes is again recommended for 1979 and one of 10 000 tonnes for 1980, including inshore bays and loughs in the area.

It is also recommended that herring fishing in the North Irish Sea be prohibited for 8 weeks from 22 September of each year. This is an extension of the period previously recommended and is designed to afford

greater protection to the spawning shoals which frequent the spawning beds from early September to mid-November. In order to protect the juvenile component of the Manx stock it is recommended that directed herring fishing be prohibited in a zone extending 12 miles from the English coast between latitude 53°20'N and 55°N. As regards the Mourne stock it is recommended that the present prohibition on fishing for herring within 12 miles of the coast of Ireland between 53°N and 55°N should be continued in order to protect the remaining spawning stock. ACFM would once more reaffirm that it is imperative that the industrial herring catch should be terminated at once.

D.1.9 North Sea sprat

119. Recent catches[1] and recommended TACs, in thousand tonnes:

1976			1977		1978		1979	1980
Rec. TAC	NEAFC TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch[2]	Rec. TAC	Rec. TAC
650	650	622	450	304	400	378	400	400

1) Catch figures taken from the Working Group Report

2) Preliminary.

The total international catch of North Sea sprat in 1978 was 378 000 tonnes (Table 40). That is about 75 000 tonnes more than in 1977, but about 250 000 tonnes less than the catches in 1975 and 1976.

The possibility was examined of using a quarterly VPA, rather than an annual one; but without any data which could be used to set the input F values for 1978 or for the last quarter of that year this method of assessing the present state of the stock could not be used.

120. In the previous report the results of an echo survey were presented. These suggested that the pelagic biomass was of the order of 795 000 tonnes in the area of distribution of the winter sprat fisheries off the east coasts of England and Scotland. In February 1979 Scottish and English research vessels again conducted acoustic surveys off the United Kingdom North Sea coasts.The results of these surveys suggested that the total abundance of pelagic biomass in the surveyed area was about 216 000 tonnes, or less than a third of the 1978 echo abundance level. There was, however, no information available on what proportion of the total North Sea sprat stock these abundance estimates represent. The recommendation of a TAC of 400 000 tonnes for 1979 was reconsidered and no adequate reason to change this advice was found. It should be pointed out that, while it is difficult to advise on a TAC for sprat for the current year, it is much more difficult to try to project a TAC for the following year.

This is because the recruit year class, which might contribute more than half of the catch in the following year, is not yet born at the time of the ACFM meeting. For a short-lived fish like the North Sea sprat

more meaningful advice can only be based on real time assessment and management bodies should provide for this feature of these species in their procedures. Until such real time management machinery has been established it was considered necessary to recommend a precautionary TAC.

121. On this basis ACFM recommends that a precautionary TAC of 400 000 tonnes be set for 1980.

D.2 Stocks in Division IIIa

122. The Working Group on Division IIIa Stocks met from 2-6 April 1979 in order to:

(i) assess the stock composition of Division IIIa herring and make recommendations on future censuses of it with special reference to the occurrence of North Sea autumn spawners;

(ii) assess TACs for cod, whiting, plaice and sprat;

(iii) consider a number of questions from EEC which arose from the Agreed Record between EEC, Norway and Sweden on the fisheries in Division IIIa.

D.2.1 Herring in Division IIIa

123. The results of this study are given in paras. 99-101 under Herring and Sprat Stocks.

D.2.2 Sprat in Division IIIa

124. Landings in 1978 amounted to about 74 000 tonnes (excluding the Norwegian fjords south of 62°N), the same level as in 1977 (Table 41). Exhaustion of the allocated national quota, however, forced Denmark to close her sprat fishery as early as the end of August 1978, while the fishery was unrestricted in preceding years. This indicates that the year class 1977 was strong and comparable to that of 1974. This is corroborated by estimates from the International Young Herring Survey in Division IIIa. In 1980, however, the 1977 year class will be of very small importance to the fishery. On average, for the period 1975-78, the contribution to the total Danish catch in weight of III-group sprat was only 3%, while I-group and II-group sprat made up 77% and 14% respectively. The prospects for 1980 are thus heavily dependent upon the strength of the 1979 year class, which is not yet born at the time of the ACFM meeting.

For this reason, ACFM can only suggest a precautionary TAC in order to prevent transfer of effort from adjacent areas, misreporting of catches, and other adverse effects on management of leaving an area unrestricted amidst adjacent areas where restrictions are in force.

ACFM recommends a TAC for Division IIIa sprat, including Norwegian fjords south of 62°N, of 70 000 tonnes in 1980. Landings of this size correspond to the average taken in 1976-78 and to the agreed TAC for 1979. A more realistic TAC can only be based on estimates of 0-group abundance. This appears to be feasible in case of Division IIIa, but in order to utilise such information assessment would have to be carried out shortly after the data have been collected in September, and the resulting TAC implemented very soon afterwards.

D.2.3 Cod in Division IIIa (Table 42)

125. The question of management units within the Division IIIa cod stocks cannot be satisfactorily clarified at the present state of knowledge. Tagging experiments indicate rather restricted migrations and low exchange rates with adjacent areas. They have, however, mainly been concentrated on the younger age groups (fish less than 80 cm in length) and may give biased information on migration patterns throughout the age range of the Division IIIa cod. Despite this, and mainly because the quality of the data bases for the Kattegat and Skagerrak are very different, separate assessments were carried out.

Cod in the Skagerrak

126. Total landings remained at a level of 8 000 tonnes until 1974. They increased to about 19 000 tonnes in 1976-77, and reached 24 000 tonnes in 1978 (Table 43). The increase in recent years is probably due both to an increase in effort and to the strong 1976 year class which entered the fishery in 1977/78. Owing to the lack of biological data prior to 1978, the only basis for a recommendation on TAC is past landings. In order to stabilise the fishery until further information is available ACFM therefore recommends that the agreed TAC of 14 000 tonnes for 1979 should also be applied in 1980.

Cod in the Kattegat

127. Since 1960 the landings have fluctuated between 10 000 tonnes and 22 000 tonnes. The catch in 1978 amounted to 13 000 tonnes, which is a decrease of 7 000 tonnes from the previous year (Table 44).

The stock size, calculated by VPA, has fluctuated between 15 000 tonnes and 29 000 tonnes in the period 1971-77. There is no clear indication that recruitment is dependent on spawning stock size within this range.

128. I-group recruitment, calculated by VPA, and abundance indices from the International Young Herring Surveys show only a poor correlation, except that the surveys apparently give indications of outstanding year classes, like the good 1973 year class, and the very poor one of 1975. In that case the 1977 year class would be quite strong.

The mean values of fishing mortality varied between 0.56 in 1972 and 0.91 in 1974. In 1977 and 1978, where the VPA estimates are not very reliable, F is thought to be about 1.1 and 0.9, respectively. In order to safeguard the spawning stock against depletion, it is recommended that F be reduced from the apparently high recent level and three options were envisaged under different assumptions:

	Catch in tonnes		
	Option		
	i) Constant F	ii) F reduced by 20% in 1980 and 1981	iii) Constant catch
1978	13 200	13 200	13 200
1979	16 400	16 400	16 400
1980	17 900	15 400	16 400
1981	18 100	13 900	16 400

In all three options, it is assumed that the fishing mortality in 1979 will be maintained at the 1978 level. This results in a catch in 1979 very close to the agreed TAC of 16 000 tonnes.

The corresponding fishing mortalities, expressed as a proportion of that in 1978, are given below:

Option	i)	ii)	iii)
1978	1	1	1
1979	1	1	1
1980	1	0.80	0.87
1981	1	0.60	0.78

As Option (iii) will have the least disruptive effect on the fisheries and should achieve a reduction in F about half way towards F_{max} in 1981, ACFM recommends a TAC for the Kattegat cod in 1980 of 16 400 tonnes.

D.2.4 Whiting in Division IIIa

129. The whiting stock in Division IIIa is considered as being a self contained management unit with a very limited exchange with other stocks.

In the period 1966-77 the total landings have fluctuated between 13 000 and 30 000 tonnes, without any obvious trend. According to preliminary catch figures, the landings in 1978 increased to 49 000 tonnes (Table 45). This increase is probably due to the strong 1977 year class, which according to the International Young Herring Surveys was 3-5 times stronger than the two preceding ones.

There are no biological data upon which analytical advice can be based. Apparently the mean annual catch of 22 000 tonnes in 1966-77 has had no adverse effect on the stock and a continuation at this level could be justified for 1980, when the strong 1977 year class will have lost its major impact upon the catch. ACFM would accordingly recommend a TAC for whiting in Division IIIa of 22 000 tonnes in 1980.

D.2.5 Plaice in Division IIIa (Table 46)

130. According to data on the infection rate of plaice with the parasite Myxobolus aeglefinus it appears that the plaice stocks in Division IIIa are readily distinguishable from those in the North Sea. It is not clear, however, to what extent exchange takes place between the Skagerrak and the Kattegat plaice stocks. For the time being, separate assessments had to be made for each of the two areas.

Plaice in the Skagerrak

131. Intensive sampling of landings from this area was only initiated in 1978. There are, therefore, not sufficient data on which to base a factual prognosis or to recommend a TAC with a different management objective in mind.

Landings by Denmark and Sweden fluctuated between 3 000 and 5 000 tonnes in 1966-75. In 1976 this level was doubled and in 1977 and 1978 the landings increased to about 13 000 tonnes (Table 47). Other countries have, in 1976 and 1977, reported landings of plaice from the Skagerrak but the major part of these probably result from misreporting, and should be included in the statistics for the North Sea.

In order to curtail any further increase in landings from the Skagerrak, until the statistics and the biological data base can provide a better foundation for advice on the management of this stock, ACFM recommends that a precautionary TAC of 14 000 tonnes, the same as agreed upon for 1979, be applied to Skagerrak plaice.

Plaice in the Kattegat

132. Since 1960 the plaice landings from the Kattegat have fluctuated between 8 000 and 20 000 tonnes. Preliminary catch figures for 1978 indicate a total catch of 13 000 tonnes, a slight increase from the 1977 landings which were about 12 000 tonnes (Table 48).

Biological data, such as numbers caught at each age, are only available from the Danish fishery. In 1978 a much extended sampling programme was initiated. Prior to 1978 sampling was done only in one harbour, and the results applied to the total Kattegat landings. In 1978 four other main landing ports were included.

The calculated catch in number at age for 1978 indicates that the year class 1976 is very weak,as it shows the lowest annual landing figure in the period 1968-78. It is, however, not possible, at present, to be sure whether this is due to the change in the sampling system, or to this year class being a very poor one.

If the year class 1976 is as weak as indicated by the recent age distribution, some precaution is advisable regarding management proposals for 1980. It is, therefore, recommended that the average yearly landings in 1973-77, that is 10 800 tonnes, be applied as a TAC in 1980. This would imply a decrease of 17% from the catch level in 1978 and of 12% from the long-term mean of 1969-78.

D.2.6 Haddock in Division IIIa

133. Due to the unsatisfactory data base, only a precautionary TAC, based on average landings can be recommended before an analytical assessment can be made. In order to stabilise the fishery until further information is available, ACFM, therefore, recommends that the 1979 TAC of 6 600 tonnes should also be applied to haddock in Division IIIa in 1980.

D.2.7 Mesh size and minimum landing size for cod, whiting, and plaice in Division IIIa

134. In Division IIIa the legal minimum mesh sizes range from 70 to 80 mm depending on the material of the net. In the Skagerrak and the Kattegat 70 mm is commonly used in Swedish gears, and 100-120 mm in Danish gears.

In the text table below, selection factors, minimum landing sizes and the mesh size for which the 25% retention length equals the minimum landing size are given for cod, whiting and plaice. An increase in the mesh size to 80 or 90 mm will improve the consistency between minimum landing size and mesh size for cod and plaice, although for plaice the discrepancy will still be large.

Cod, whiting and plaice in Division IIIa. Relations between mesh size and minimum landing size

Species		Selection factor	Minimum landing size	Min.landing size corresp. to 80 mm mesh size (25% r.l.)	Min.landing size corresp. to 90 mm mesh size (25% r.l.)	Mesh size where 25% ret.length = min. landing size
Cod	High s.f.	3.77[a)]	30	28	31	87
Cod	Low s.f.	2.82[a)]	30	21	23	117
Whiting		3.83[b)]	23	28	31	66
Plaice		2.2[c)]	27	17	19	126

a) The North Sea Roundfish Working Group 1978.
b) Coop.Res.Rep., Ser.A, No.25 (1971).
c) The North Sea Flatfish Working Group 1978.

135. As an increase in minimum mesh size for cod would improve the exploitation pattern, it is recommended that minimum mesh sizes and landing sizes in Division IIIa should not be smaller than those in force in the North Sea.

For sprat in Division IIIa, it seems reasonable to adopt the minimum mesh size of 16 mm applied for sprat trawls in the North Sea, as the growth patterns in the two areas are very similar. ACFM recommends accordingly.

D.2.8 Effect of mesh sizes smaller than 16 mm

136. Mesh sizes smaller than 16 mm are only allowed in Division IIIa in directed fisheries for sandeel. The species compositions of samples from this fishery in the Skagerrak and the Kattegat are shown below:

Species compositions. Percentage by weight. Sandeel fisheries, Skagerrak, 1978

Species	May	Jun	Jul	Aug	Sep
Sandeel	95.13	94.57	97.22	96.69	90.20
Herring	0.81	1.03	0	0	0
Sprat	2.08	0.71	0	0	0
Cod	0	0.27	0.02	0	0.83
Haddock	0	0	0	0.18	0
Whiting	0.99	0.82	1.16	1.83	8.97
Mackerel	0.20	0	0	0	0
Plaice	0	0.22	0	0.24	0
Others	0.79	2.38	1.60	1.06	0
No. of samples	4	4	5	10	1
Catch (in tonnes)	2 503	6 445	3 141	4 221	688

Species composition. Percentage by weight. Sandeel fisheries, Kattegat 1977

Species	Mar	May	Jun
Sandeel	99.92	99.21	97.58
Herring	0	0	0
Sprat	0.02	0.07	0
Cod	0	0	0
Haddock	0	0	0
Whiting	0	0	0
Mackerel	0	0	0
Plaice	0	0	0
Others	0.06	0.72	2.42
No. of samples	2	4	2
Catch (in tonnes)	65	3 180	794

In 1974-78 landings from the Skagerrak sandeel fishery fluctuated between 6 000 tonnes and 21 000 tonnes, in the Kattegat between 400 tonnes and 5 000 tonnes.

On this basis it can be concluded that as long as the use of trawls with meshes less than 16 mm is kept under strict control, these fisheries have no appreciable effect on the protected fish species in Division IIIa.

D.3 Cod, Haddock and Whiting Stocks

137. The North Sea Roundfish Working Group met from 7-11 May 1979 to:

a) assess TACs for 1980 for cod, haddock, and whiting in Sub-areas IV, VI and VII (excluding Divisions VIIa, VIIf, and VIIg);

b) assess the current exploitation status of skates and rays in Sub-areas IV and VI and advise on regulatory measures needed.

D.3.1 Sub-area IV

138. Recent landings (see Tables 49-51) and recommended TACs in thousand tonnes:

Year	1975			1976			1977	
Species	Rec. TAC	NEAFC TAC	Actual catch	Rec. TAC	NEAFC TAC	Actual catch	Rec. TAC	Actual catch
Cod	120-130	236	186	130-210	236	214	220	185
Haddock	150-260	275	174	106-155	206	208	165	151
Whiting	110-190	189	140	160	189	197	165	120

Year	1978			1979			1980
Species	Rec. TAC	Agreed TAC	Actual catch x)	Rec. TAC	Agreed TAC	Revised TAC	Rec. TAC
Cod	210	236	260	183	183	247	200
Haddock	105	109	90	83	83	-	66
Whiting	111	168	100	85	85	111	100

x) Preliminary.

D.3.1.1 State of exploitation

139. For all three species it appears that there has been a slight reduction in fishing mortality compared with the early 1970s but the level is still very high, especially in view of the high level of fishing mortality on the younger age groups. For haddock and whiting, in particular, the by-catches in the industrial fisheries and the high rates of discarding in the human consumption fisheries, contribute substantially to the mortality on the young fish. In 1978 the fishing mortality rates on the age groups subject to maximum exploitation were estimated to be as follows (the equivalent values of F_{max} from the yield per recruit curves are given for comparison):

Species	F_{1978}	F_{max} x)
Cod	0.74	0.25
Haddock	0.80	0.25
Whiting	0.78	0.30

x) Based on exploitation pattern used for 1980 catch prediction which assumes an 80 mm minimum mesh size.

It should be noted that the exploitation patterns vary from year to year and changes in the exploitation patterns alter the shape of the yield per recruit curves, and hence the values of F_{max}.

Cod and haddock yields and stock biomasses have responded to the recruitment of a number of very abundant year classes in recent years but stock sizes are now closer to the levels of the early 1960s rather than the higher levels which were realised in the late 1960s to early 1970s.

D.3.1.2 TACs for 1979 and 1980

140. For North Sea cod, haddock and whiting estimates of the abundance of the 1977 and 1978 year classes at age 1 were available from the International Young Herring Surveys. These values, back-calculated to age 0 where appropriate, were used in the assessments. For the 1979 year classes no data were yet available from the IYHS and average figures, based on VPA estimates, were used:

Number at age 1 (millions)

Year class	1977	1978	1979 (long-term average)
Species:			
Cod	163	130	216
Haddock	678	793	456
Whiting	1 287	1 248	1 234

The values used in the assessments for fishing mortality in 1978 have been based on averages calculated for the period 1973-75, and adjusted according to the estimated changes in fishing effort in 1978 compared with 1973-75. These values, together with the 1978 catch data, have been used to estimate the stock size at the beginning of 1979. On this basis catch predictions have been prepared for 1979 and 1980 for a range of options for fishing mortality rates in these two years. No account was taken of a mesh change in 1979. There was no change in the EEC zone in the first half of 1979, and an increase before the end of the year was thought to be unlikely. The mesh size in the Norwegian zone was increased to 80 mm at the beginning of 1979 but the effect of this change in that area was expected to be very small. For 1980 it was assumed, for the catch predictions, that a minimum mesh size of 80 mm would operate throughout the North Sea.

North Sea cod

141. Two options were considered for 1979: a) fishing mortality would be at the level required to take the agreed TAC, and b) fishing mortality would be reduced by 10% compared with 1978. For 1980 three options (for each 1979 option) were calculated:

1. Fishing mortality would continue at the 1979 level.
2. Fishing mortality would be reduced by 20% compared with 1979.
3. Fishing mortality would be at the F_{max} level.

The recommendation of a TAC for 1980 is very dependent on a correct estimation of the size of the 1976 year class. The estimate from VPA is 582 millions at one year old, which would make it the largest year class on record. If this estimate is correct the TAC agreed for 1979 (recommended on the basis of a smaller size for the 1976 year class), if adhered to, would require the fishing mortality in 1979 being reduced by 39% from the 1978 level. This is a greater decrease in effort than ACFM envisaged during its 1978 meeting.

Therefore ACFM recommends a revised 1979 TAC of 247 000 tonnes followed by a 1980 TAC of 200 000 tonnes. These TACs represent a 10% reduction in F from the 1978 level in 1979 and a further reduction of 10% from the 1979 level in 1980.

North Sea haddock

142. The range of options for North Sea haddock catch predictions was the same as for cod but in the event the two options for 1979 were so close (option A: F_{79} to take TAC = 0.76, and option B: F_{79} = 0.9 F_{78} = 0.72) that only option A was considered.

For haddock the updated assessments indicate that the agreed TAC for 1979 will achieve the objective of reducing fishing mortality by 10%. For 1980 the choice of TAC will depend on the management objectives. The size of the spawning stock is at its lowest level since the mid-1960s, but not as low as in the early 1960s when large year classes were produced. There is no clear relationship between spawning stock size and the resultant recruitment. To maintain F in 1980 at the 1979 level would involve only a small reduction in the TAC compared with 1979. A 20% reduction in F from the 1979 level in 1980 would require a TAC in 1980 of 66 000 tonnes. Greater reductions in F will involve correspondingly higher reductions in TAC, and as there is no clear evidence of recruitment overfishing such severe measures could not be easily justified.

It was agreed to recommend a 20% reduction in F in 1980 compared to the 1979 level in order to bring the current exploitation rate, in steps, towards F_{max} and to rebuild the spawning stock to a more satisfactory level. ACFM therefore recommends a TAC of 66 000 tonnes for North Sea haddock in 1980.

North Sea whiting

143. Catch predictions were prepared for the same range of options as for cod. For whiting in the North Sea there is less directed fishing than for cod or haddock. Discarding of both legal and undersized fish is heavy and a large proportion of the total landings is accounted for by by-catches in the industrial fisheries. The 1979 TAC would require a severe reduction in F. Since ACFM's intention when it recommended the 1979 TAC was to reduce F by 10% from the 1978 level, ACFM recommends a revised TAC for 1979 of 111 000 tonnes which would represent a 10% reduction in F from the 1978 level, and a TAC of 100 000 tonnes for 1980, which would correspond to a further reduction of 10% from the 1979 level of F.

D.3.2 Sub-area VI

144. Recent catches (see Tables 52-57) and recommended TACs in thousand tonnes:

Year	1975	1976		1977		1978	
Species	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch x)
Cod	13	14	19	19	13	12.2	16
Haddock	64	23	62	18	22	12	21
Whiting	20	13	25	22	17	17	16

x) Preliminary.

Year	1979	1980
Species	Rec. TAC	Rec. TAC
Cod	10.4	12.1
Haddock	11.0	11.5
Whiting	12.0	10.5

D.3.2.1 State of exploitation

145. For cod and haddock analytical assessments have been done for the stocks in Division VIa, but for whiting the assessment was for the whole of Sub-area VI.

Compared with the North Sea, fishing mortality rates west of Scotland are not at such a high level but for cod and haddock they are still in excess of F_{max} on the yield per recruit curve, calculated using the exploitation pattern expected in 1980, when it is assumed that the minimum mesh size will be 80 mm. For whiting the corresponding yield per recruit curve is asymptotic and does not reach a maximum over the range of F values used in the calculation.

Estimates of current (1978) values of F (on age groups subject to maximum exploitation) and values of F_{max} are as follows:

Species	F in 1978	F_{max}
Cod VIa	0.70	0.36
Haddock VIa	0.61	0.50
Whiting VI	0.70	>1.50

D.3.2.2 Catch predictions for 1979 and 1980

146. No data on year class strengths were available from pre-recruit surveys in Sub-area VI. For haddock, abundances of the 1977 and 1978 year classes were determined from a correlation with North Sea year classes, and average recruitment was assumed for the 1979 year class. For cod and whiting average recruitment was assumed for year classes 1977-79.

147. Input F values used for 1978 in the assessments were average values for the period 1973-75.

No mesh change had been introduced in Sub-area VI by mid-1979, and it was assumed in the assessments that the mesh size would be unchanged in 1979 but that there would be an increase to 80 mm in 1980.

Catch predictions for cod, haddock and whiting were prepared for a range of options. For 1979 two options were considered: in Option A the F value was that required to take the TAC, in Option B the F value was 10% lower than the value in 1978. For 1980 three options, for each 1979 option, were calculated:

1. Fishing mortality continues at the 1979 level
2. Fishing mortality reduced by 20% compared with 1979
3. Fishing mortality at F_{max} level.

Division VIa cod

148. In recent years the spawning stock biomass has been increasing and for all the options considered the predictions are for the spawning stock biomass in 1981 to remain at the current level, or increase further. There therefore appears to be no need to reduce fishing mortality below the levels considered to safeguard the spawning stock. The most recent assessment indicates that the stock in 1979 is larger than was previously estimated and that if the 1979 TAC (9 200 tonnes) is adhered to, fishing mortality, on age groups subject to maximum exploitation, will have to be reduced to 0.41 compared with 0.70 in 1978. The objective of a 10% reduction in F in 1979 would yield landings of 13 000 tonnes in that year.

ACFM recommends keeping an F of 0.41 for both 1979 and 1980. Therefore the 1979 TAC of 9 200 tonnes in Division VIa should be maintained, and the 1980 TAC in Division VIa should be 10 900 tonnes. To both of these TACs 1 200 tonnes should be added for the cod stock in Division VIb which cannot be analytically assessed. Therefore the Sub-area VI TACs are 10 400 tonnes in 1979 and 12 100 tonnes in 1980.

Division VIa haddock

149. The current exploitation pattern differs from that determined last year and as a consequence of the changed shape of the yield per recruit curve the value of F_{max} is now 0.5 compared with the previous value of 0.32. To take the 1979 TAC of 8 500 tonnes would require a fishing mortality, on age groups subject to maximum exploitation, of 0.49 which is a 20% reduction from the 1978 level. A 10% reduction of F in 1979 would give a catch of 9 300 tonnes. The current spawning stock biomass appears low, compared with the period around 1970, but high levels of spawning stock biomass tend to follow the recruitment of exceptionally abundant year classes. There is no clear relationship between stock and recruitment. Within the range predicted for 1981 there is no reason to assume that recruitment would be adversely affected.

No catch prediction was made for 1980 for a 20% reduction of the 1979 level in F as fishing mortality for this option would be less than F_{max}. For the options considered the range of predicted catches is very small and a TAC for 1980 in the 9 000 - 10 000 tonnes range would be appropriate for Division VIa. Following the same approach as for cod in Division VIa ACFM recommends an unchanged 1979 TAC of 8 500 tonnes and a 1980 TAC of 9 000 tonnes. This requires an F of 0.49 throughout 1979 and 1980. As for cod, an addition to these TACs has to be made for the stock in Division VIb, which cannot be analytically assessed. This addition should be 2 500 tonnes in both years. Accordingly ACFM recommends TACs for Sub-area VI of 11 000 tonnes in 1979 and 11 500 tonnes in 1980.

Division VIa whiting

150. The exploitation pattern used in the 1979 assessment has changed the shape of the yield per recruit curve, which is now asymptotic. With such a yield per recruit curve F_{max} is an unrealistic management objective and this option has not been considered. For the range of options the spawning stock predicted for 1981 will change very little from the present average level. For 1980, catch predictions have been calculated for a range of management options for the whole of Sub-area VI.

ACFM recommends an unchanged 1979 TAC of 12 000 tonnes and a 1980 TAC of 10 500 tonnes. These recommendations will lead to keeping an F of 0.56 for both 1979 and 1980, which represents a 20% reduction in F from the 1978 level.

D.3.3 Sub-area VII (except Division VIIa)

151. No analytical assessments were possible for these areas. TACs for 1980 are accordingly recommended on a precautionary basis from past catch levels (see Tables 58-66). These would be:

Cod in Divisions VIIb,c,d,e,f,g-k = 9 000 tonnes

Haddock in Divisions VIIb,c,d,e,f,g-k = 9 000 tonnes

Whiting in Divisions VIIb,c,d,e,f,g-k = 18 000 tonnes

D.3.4 Skates and rays

152. No data were available for skates and rays other than quantities landed. These are summarised in Table 67, for Sub-area IV, and in Table 68, for Sub-area VI. These catches are for all species combined. There are no directed fisheries for skates and rays so the catches are by-catches of fisheries for other species. Landings from Sub-area VI have been very stable at about 3 500 tonnes. In the North Sea there has been a slight downwards trend during the 1970s. From these data no recommendations can be made on management but general comments on management considerations for skates and rays, given in para. 186, in relation to the Irish Sea, are also applicable to skate and ray stocks in Sub-areas IV and VI.

D.4 Flatfish Stocks in the North Sea (Sub-area IV) and the English Channel (Divisions VIId and VIIe)

153. The North Sea Flatfish Working Group met from 14-18 May 1979 with the following terms of reference:

a) to assess TACs for sole and plaice in the North Sea and the Channel for 1980,

b) to advise on the desirability of extending the current prohibition on fishing for flatfish by larger vessels within 12 miles of the coast of Belgium, Netherlands, Federal Republic of Germany, and Denmark, beyond 12 miles or to other coastal areas,

c) to assess the effect of by-catch in the Crangon fishery on the exploitation of flatfishes.

D.4.1 North Sea sole

154. Recent catches and recommended TACs, in thousand tonnes:

1976	1977			1978			1979	1980
Actual catch	Rec. TAC	NEAFC TAC	Actual catch	Rec. TAC	EEC TAC	Actual catch	Rec. TAC	Rec. TAC
17.3[x)]	6.7	12.5	18.2[x)]	8	10	20.4[xx)]	13	10

x) Including estimates of non-reported landings

xx) Preliminary and including estimated non-reported landings.

No major changes occurred in the fleets fishing for North Sea sole in 1978. The amount of unreported catches was, as in former years, very high (see Table 69). The 1978 TAC was exceeded by about 100% due to unreported catches, and the fact that these could only be roughly estimated further increased the uncertainty of the assessments. It is clear that under these conditions the concept of management by means of catch quota has failed in the case of North Sea sole.

155. The steady decline in the spawning stock biomass since the mid-1960s has halted and has been stable since 1975. The good year classes 1975 and 1976 were, however, followed by a below average 1977 year class.

156. Firm advice on a 1980 TAC cannot be given for the following reasons:

(i) Sole are known to be vulnerable to very cold winters. Natural mortality during 1963 was of the order of 0.8 to 1.0. The number of days in which the surface water temperature has been below 3.5°C can be used to assess this natural mortality. The 1979 recordings from light vessels showed that the surface temperatures were below average, but slightly above the 1963 temperature. In 1963, the natural mortality did not occur until May-June. Accordingly, at present, the effect of the 1979 winter on the stock cannot be quantitatively assessed.

(ii) The year class 1978 was estimated, from pre-recruit surveys, as above average. Future management of the stock will depend on how many of this year class have survived the 1979 winter.

(iii) A strong 1979 year class may be expected, as strong year classes have followed preceding cold winters.

157. Different options for forecasting the 1980 TAC were used, taking into account the possible strength of the 1978 year class, for values of M on older fish ranging from 0.1 to 0.5. In these assessments the fishing mortality rate was assumed to remain at the 1978 level in 1979 and two options were considered a): with this F maintained in 1980, and b): with a 20% reduction in 1980.

Two possible short-term management options were also considered leading to a): a total stock biomass of 55 000 tonnes at the beginning of 1981, which was the stock level in 1978 which produced the good 1978 year class and b): a spawning stock biomass of 46 000 tonnes, the average level over the last 9 years,at the beginning of 1981. The results of these assessments are given in Tables 70 and 71. In view of the very wide range of values resulting from different assumptions of natural mortality rate, ACFM is unable to give a firm recommendation at this stage. It would recommend that if for management purposes some level must be set now, this should be 10 000 tonnes. Later in the year when the effects of the winter on both adult stock and recruitment have been assessed, a revised recommendation will be supplied.

158. In the previous report, it was pointed out, in relation to sole, that mesh assessments could not be carried out because no selectivity data were available for beam trawls, which take a major proportion of the sole catch. Selectivity experiments are planned using beam trawls in a number of ICES member countries. Until the results of these are available, no statement can be made on this subject. The absence of such data for a component of the sole fishery should not be considered as justification for further delay in implementing ACFM's previous, more wide-ranging, recommendations regarding increases in minimum mesh sizes in Region 2.

D.4.2 North Sea plaice

159. Recent catches and recommended TACs, in thousand tonnes:

1976	1977			1978			1979	1980
Actual catch	Rec. TAC	NEAFC TAC	Actual catch	Rec. TAC	EEC/Norway TAC proposed	Actual catch	Rec. TAC	Rec. TAC
111[x)]	71	99.9	118[x)]	115	115	112[xx)]	120	112

x) Including estimates of non-reported landings

xx) Preliminary and including estimated non-reported landings.

The 1978 catch of plaice in the North Sea was 112 000 tonnes, roughly 5% less than both the 1978 TAC and the catch in the previous year (Table 72). Total fishing effort declined in the Dutch and the United Kingdom fisheries.

As no firm relationship was found between effort data and mean F values from VPA, the same terminal F input was used as in the 1978 assessment.

The trend in the plaice spawning stock has shown a steady decline. From 1-group surveys, the recruiting 1977 year class was estimated to be of average strength.

The yield curve shows that the stock is fully exploited, as the fishing mortality rates are at the maximum of the female curve and a little below the asymptote on the male curve.

160. Table 73 gives the results of the assessments which were done for two options: Option 1 in which the present F is maintained unchanged in 1980, and Option 2 in which fishing mortality was reduced by 20% in 1980.

ACFM would recommend that the management objective should be to maintain the present spawning stock level, and to prevent further increase in fishing mortality. This would be achieved by adopting a 1980 TAC of 112 000 tonnes.

D.4.3 Sole in Division VIId

161. The reported catch increased from 840 tonnes in 1975 to 1 350 tonnes in 1978 (Table 74). Furthermore, some additional United Kingdom and French catches are known to have been taken, but were not reported, and could not be included in the assessment.

No correlation could be found between the effort and the mean Fs from the VPA. The same procedure as last year was used, namely taking the mean values for the period 1973-75 as input F values.

The recruiting year classes are strong, the 1975 one being about four times the average, and the 1976 one also being above average, although weaker than the 1975 year class.

On the yield per recruit curve, the F_{max} had a value of about 0.8 times the 1978 F level. As the current level of F is slightly in excess of F_{max}, it is considered advisable that the fishing mortality rate should not be allowed to increase in 1980.

On this basis, ACFM recommends that the 1980 TAC should be 1 380 tonnes. This will give a spawning stock biomass in 1981 of 5 600 tonnes, which is slightly in excess of that estimated for 1978. The results of the assessments are given in Table 75.

D.4.4 Sole in Division VIIe

162. Catches have risen from 490 tonnes in 1975 to 750 tonnes in 1978 (Table 74). Spawning stock biomass has increased slightly from 1977 to 1978. The United Kingdom fishing effort was about 30% higher in 1978 than in the period 1973-75. On this basis, input Fs at age for 1978 were derived from values for the period 1973-75.

The recruiting year class 1975 is about twice the average and the 1976 year class is also above average.

The yield per recruit curve is essentially flat-topped and $F_{0.1}$ is approximately at a value of F which is 20% less than the current F. Last year, a TAC of 500 tonnes was recommended for 1979. To take this, fishing effort in that year would have to be reduced by about 35%. Past experience, however, has shown that the recommended TAC has always been exceeded. It was therefore assumed that there will be no change in fishing mortality rate in 1979. This will produce a catch in that year of 730 tonnes. It is recommended that F should be kept at that level also in 1980. This will produce a recommended TAC of 780 tonnes for 1980. The results of the assessments are given in Table 75.

D.4.5 Plaice in Divisions VIId and VIIe

163. It was decided to make a single assessment for plaice in Divisions VIId and VIIe combined because there is considerable exchange of fish between the two areas, and with mature North Sea plaice.

A slight increase in plaice landings of the combined Divisions has taken place from 1976 onwards (Table 76). The 1975 year class is twice the average strength.

The input data for VPA for the period 1971-74 are poor and therefore the exploitation pattern was determined from the average Fs in 1975-77. For the final VPA, the terminal F used produces a pattern of fishing mortality for 1975-78 which is similar to the trend in effort for the same period.

The yield curve is flat-topped with $F_{max} = 0.8\ F_{78}$. For both F_{max} and F_{78}, the long-term yield is about 2 200 tonnes, which is nearly 700 tonnes below the present level of landings.

ACFM recommends that the fishing mortality rate should be reduced in 1980 to the F_{max} level. This would result in a TAC for that year of 2 000 tonnes.

The results of the assessments are given in Table 77.

D.4.6 Areas closed to large vessels fishing for plaice and sole

164. ICES was asked by the EEC Commission to provide advice on the desirability of extending the present prohibition on fishing for flatfish by larger vessels within 12 miles of the coasts of Belgium, Netherlands, Federal Republic of Germany, and Denmark to further from these coasts, and to other coastal areas. The original prohibition in these areas was not based on scientific advice and it is assumed that it was agreed for socio-economic reasons which are not within the competence of ICES. There are no reasons why this probibition should be maintained, or extended, in the context of stock conservation or optimal utilisation provided current management regulations, which should apply to vessels of all sizes, are adequately enforced for vessels of both categories.

D.4.7 By-catch in Crangon fisheries

165. The results of consideration of by-catch in Crangon fisheries are reported in paras. 237-239.

D.5 Irish Sea and Bristol Channel Stocks

166. The Irish Sea and Bristol Channel Working Group met from 6-14 June 1979, with the following terms of reference:

(a) to assess TACs for cod, haddock, whiting, plaice and sole in Divisions VIIa, VIIf, and VIIg,

(b) to continue the examination of interactions between fisheries. In view of the importance of taking account of as many species as possible, Nephrops experts as well as other fish experts should attend the meeting,

(c) to assess the current exploitation status of stocks of skates and rays in these Divisions and advise on any regulatory measures which are considered desirable.

Irish Sea (Div. VIIa) and Bristol Channel (Div. VIIf)

Recent catches and recommended TACs, in thousand tonnes:

Stock or Fishery	1976			1977			1978			1979		1980
	Rec. TAC	NEAFC TAC	Actual catch	Rec. TAC	NEAFC TAC	Actual catch	Rec. TAC	EEC TAC	Actual catch x)	Rec. TAC	EEC TAC	Rec. TAC
Cod, VIIa	-	-	10.25	-	-	8.05	8.60	8.60	6.27	7.3	7.3	5.0
Whiting, VIIa	-	-	11.65	-	-	10.20	-	-	10.40	10.0	10.0	10.0
Plaice, VIIa	4.00	4.15	3.47	4.00	4.15	2.90	4.00	4.00	3.23	2.5	2.5	2.5
Plaice, VIIf	0.50	0.64	0.31	0.40	0.64	0.33	0.40	0.39	0.39	0.4	0.4	-
Plaice, VIIf+g	-	-	0.87	-	-	0.76	-	-	0.92	-	-	0.7
Sole, VIIa	1.60	1.67	1.46	1.40	1.67	1.15	1.40	1.39	1.09	1.4	1.4	1.3
Sole, VIIf	0.70	0.70	0.52	0.40	0.70	0.37	0.60 1)	0.59	0.35	0.4	0.4	-
Sole, VIIf+g	-	-	1.35	-	-	0.96	-	-	0.79	-	-	1.0

x) Preliminary

1) Reduced to 350 tonnes.

D.5.1 Irish Sea cod

167. The catch of cod in 1978 decreased further to 6 270 tonnes (Table 78) and the catch rate by Northern Ireland, England & Wales and France, which together account for 46% of the catch, fell by 47%, 27% and 8%, respectively. Northern Irish fishing effort increased by 43% and although both the French and England & Wales effort decreased, it is likely that the total fishing effort on cod was higher than in 1977, particularly in the western Irish Sea.

In last year's catch forecast, it was assumed, in the absence of any indication to the contrary, that the recruiting 1977 and 1978 year classes would be of average strength. The 1978 data on catch per unit effort, however, suggest that the 1977 brood will be only about half the average. This has led to a rather steeper decline in the stock biomass in 1978 than had been anticipated; the total stock is now estimated to be 13 000 tonnes compared with a peak of almost 32 000 tonnes in 1973 and an average of almost 26 000 tonnes during the period 1968-75. There is still no reliable indication of the size of the 1978 year class. It has been assumed to be average, using a calculating procedure (the geometric mean) which gives a slightly lower figure than the straightforward arithmetic mean.

168. The significance of the problem created by uncertainty about the strength of the recruiting year classes is that in the Irish Sea cod fishery the 1-year old and 2-year old fish together make up about half

the total catch weight, and these are the age groups whose numerical strength can only be assumed at this stage.

Catch forecasts for 1980 are given below for three options of fishing mortality in that year.

Option 1	No change from 1978	6 500 tonnes
Option 2	Fishing mortality corresponding to that giving the maximum yield per recruit (about 50% of the 1978 fishing mortality)	3 700 tonnes
Option 3	Reduction of 20% on the 1978 fishing mortality	5 000 tonnes

169. A reduction in fishing mortality would benefit the fishery in terms of yield, stability and catch rate. Moreover, if fishing on 1-year old cod were to be eliminated then greater benefits would be obtained than by a large reduction in overall fishing mortality. Since this age group is caught almost entirely during the last three months of the year, and tends to be concentrated in discrete areas, this reduction in the exploitation of 1-year olds could be achieved by a ban on directed cod fishing, or a limit on the proportion of cod in any landings, during the last quarter of the year, or by a higher minimum landing size of 45 cm throughout the year. It appears likely that the 1979 quotas will have been filled by the end of the third quarter, so that fishing on cod will have to stop then in 1979 in any case. If this results in no fishing taking place on the 1978 year class during 1979 the catch possibilities for 1980 will be slightly higher.

One way of reducing the uncertainty which surrounds the catch forecast would be to wait until the 1978 year class can be forecast accurately and until the 1979 catch is known, but this would mean waiting until the early months of 1980 and the bulk of the cod fishery takes place before April. Furthermore, if fishing by United Kingdom vessels has to stop in the autumn of 1979, because their quota is reached, then the information used to estimate year class strength, United Kingdom catch per effort in the fourth quarter, will no longer be available.

170. ACFM is concerned at the decline in the spawning stock biomass of Irish Sea cod. Since a 20% reduction of fishing mortality from the 1979 level would not bring it below that of 1978, a 20% reduction in the 1978 level is advised. This will bring the level of exploitation closer to that currently calculated to give the maximum yield per recruit. If no adjustment for the size of the 1978 year class is possible at the beginning of 1980 then the TAC recommended for 1980 should be 5 000 tonnes.

In view of the apparent rapid increase in fishing effort, particularly in the western Irish Sea, and in view of the difficulty of adjusting fishing mortality by means of a TAC, serious consideration should be given

to direct limitation of the growth in fishing effort by stopping increases in existing fleets, whether these increases are by new building, diversion, or increased engine power. This limit should be in addition to a TAC.

Since significant reductions in the fishing mortality on cod may be difficult to achieve, in the short term, and since the benefits of reducing fishing mortality are in any case less than could result from an improved exploitation pattern, it is recommended that an increase in the minimum landing size to 45 cm should be implemented as soon as possible.

D.5.2 Irish Sea whiting

171. At 11 200 tonnes, the 1978 catch was approximately the same as in 1977 (Table 79). Landings for reduction amounted to 927 tonnes, an increase of 22% over the 1977 figure. No information on discards, in the small-mesh fisheries (Nephrops and Crangon), was available. Catch rates by French vessels (whitefish fishery) and Northern Ireland vessels (by-catch of marketable whiting in the Nephrops fishery) showed an increase of 15% and 8% respectively, following a decrease in 1977.

As also estimated last year, the 1976 year class is very strong, and contributed more than 50% to the catch in 1978. Although total stock biomass appears to be stable, having fluctuated between 16 000 tonnes and 19 000 tonnes since 1972, the stock is currently overexploited in that the present level of fishing mortality is about double that corresponding to the maximum yield per recruit on the current exploitation pattern.

172. Catch forecasts for 1980 are given below for three options of fishing mortality in that year:

Option 1	No change from 1978	11 000 tonnes
Option 2	Fishing mortality corresponding to that giving the maximum yield per recruit (about 50% of the 1978 fishing mortality)	6 400 tonnes
Option 3	Reduction of 20% on the fishing mortality necessary to take the 1979 TAC	10 000 tonnes

Options 1 and 3 will result in total stock biomasses at the end of 1980 which are slightly higher than current levels.

These forecasts assume average strength of the 1978 and 1979 whiting year classes, using the geometric mean.

173. In order to reduce the level of overexploitation on this stock, fishing mortality should be reduced by 20%. For 1980, the recommended TAC is 10 000 tonnes. If the expected benefits accrue from the increased mesh size for Nephrops, and if the landings of whiting for fish-meal are stopped, it might be possible to recommend a higher TAC in future.

D.5.3 Irish Sea plaice

174. The 1978 catch was 3 230 tonnes, which was slightly higher than the 1977 total of 2 900 tonnes, but below the 1978 TAC of 4 000 tonnes (Table 80). The 1977 and 1978 catches thus amounted to 70% and 80% respectively of the TACs for those years, and are the lowest in the past ten years. There was a 60% increase in the England & Wales catch rate in 1978, and a reduction of 7% in total England & Wales fishing effort. Total Belgian fishing effort fell by 20%. These two countries accounted for 55% and 3% respectively of the total 1978 plaice catch.

175. Assuming that the strength of the 1977, 1978 and 1979 year classes will be equal to the geometric mean, catch forecasts are given for three options of fishing mortality in 1980. Adherence to the 1979 TAC of 2 500 tonnes implies a reduction of over 35% on the 1978 level of fishing mortality.

Option 1	No change from 1979	2 900 tonnes
Option 2	Fishing mortality corresponding to that giving maximum yield per recruit (30% of the 1978 fishing mortality)	1 500 tonnes
Option 3	Reduction of 20% on the 1979 fishing mortality	2 400 tonnes

176. The Irish Sea plaice stock is overexploited, and a further reduction of 20% in the 1979 fishing mortality rate in 1980 is necessary. In achieving this, the TAC can be kept at the same level as in 1979 by taking advantage of the good 1975 year class. The recommended TAC for 1980 is 2 500 tonnes.

D.5.4 Celtic Sea plaice (Divisions VIIf and VIIg)

177. The area basis previously employed for assessment and quota management, using the Bristol Channel (Division VIIf) as a unit, is unsatisfactory because there is no evidence that the populations in Divisions VIIf and VIIg are separate stocks, and because the fishing grounds extend across the Divisions VIIf/VIIg boundary. For these reasons Divisions VIIf and VIIg have now been assessed as a unit. Together they correspond closely to the area termed the Celtic Sea in the management of other fisheries, and so this name is used in this instance also.

178. Total annual nominal catches for the years 1970-78 are given in Table 81. These show a decline from 1 181 tonnes in 1971 to 757 tonnes in 1977. The preliminary figure for 1978 is 920 tonnes. Since 1975 France has accounted for the largest national component of the catch, and in 1978 there was an 11% increase in total French fishing effort in Division VIIf, compared with 1977. There was a small decrease in French effort in Division VIIg.

Total stock biomass declined from 11 000 tonnes in 1970 to around 6 500 tonnes in 1975, and the estimate for the beginning of 1978 is just over

2 000 tonnes. The 1969 and 1970 year classes showed a decline in strength from that of 1968, but since 1970 the recruitment has remained stable.

179. Using the geometric mean to estimate recruitment in 1979 and 1980 catch forecasts are given below, for three options of fishing mortality in that year:

Option 1	No change from 1978	800 tonnes
Option 2	Fishing mortality corresponding to that giving the maximum yield per recruit (20% of the 1978 fishing mortality)	200 tonnes
Option 3	Reduction of 20% on the 1979 fishing mortality	700 tonnes

If the mortality generated by the fishery in 1979 remains at the 1978 level, the total catch in 1979 will be 880 tonnes. The mean ratio of Division VIIf catches to Divisions VIIf+g catches in recent years (1974-78) is 0.45. This ratio applied to this anticipated 1979 Celtic Sea catch gives a yield of 396 tonnes for Division VIIf, corresponding to the Division VIIf TAC of 400 tonnes for that year.

Compared with the estimated total stock biomass for 1978 of just over 2 000 tonnes, the three options listed above will result in 1981 stock biomasses of 1 800 tonnes, 2 400 tonnes and 1 900 tonnes, respectively.

180. In order to reduce fishing mortality towards that giving the maximum yield per recruit, with the current exploitation pattern, it is recommended that fishing mortality should be reduced by 20% in 1980 and that the 1980 TAC should be 700 tonnes.

D.5.5 Irish Sea sole

181. The 1978 catch of 1 090 tonnes was somewhat lower than the 1977 figure of 1 146 tonnes, and continues the gradual decline from the 1971 catch level of almost 1 900 tonnes (Table 82). As was the case in 1977, effort in 1978 would have had to increase for the TAC to be met, but this did not occur. Higher catch rates of sole in the North Sea than in Division VIIa resulted in a smaller Belgian fleet fishing for sole in the Irish Sea. Dutch fishing effort in Division VIIa did not increase for the same reason.

Total stock biomass has shown a decline from almost 9 000 tonnes in 1970 to an estimated 6 500 tonnes in 1978. There has been no downward trend in recruitment.

If the level of exploitation in 1979 remains the same as in 1978 the catch in 1979 will be 1 145 tonnes, which is lower than the TAC for that year (1 400 tonnes). Fishing mortality will have to increase by 20% above the 1978 level to take the 1979 TAC. On the assumption of a recruitment estimate equal to the geometric mean, the results of maintaining either of these levels of fishing mortality into 1980 are estimated to be catches of 1 140 tonnes and 1 300 tonnes, respectively.

182. At the level of fishing mortality corresponding to the 1979 TAC, the Irish Sea sole stock is already fully exploited, and fishing mortality should not be allowed to rise further. The recommended TAC for 1980 is therefore 1 300 tonnes.

D.5.6 Celtic Sea sole (Divisions VIIf and VIIg)

183. For the reasons given in para. 177, Divisions VIIf and VIIg have been assessed together as the Celtic Sea. The total catch in 1978 was 785 tonnes. Catches have fluctuated between this level and 1 900 tonnes during the years 1970-78 (Table 83), depending largely on the amount of Belgian fishing effort. The latter showed a decrease of about 30% in 1978. A 5% increase in United Kingdom effort at the same time resulted in a net fall in total fishing effort of 20% relative to 1977.

The steady decline in total stock biomass, which is calculated to have been around 6 000 tonnes in 1978 compared to almost 13 000 tonnes in 1970, has resulted from the decreasing influence of the strong year classes of 1959, 1960 and 1963. The 1975 and 1976 year classes, however, are believed to be strong, and should stop this decline when they recruit to the fishery.

184. If the level of exploitation in 1979 remains the same as in 1978 the catch in 1979 will be 900 tonnes. This is lower than the catch for the grouped Divisions (1 250 tonnes) which would correspond to the 1979 TAC set for Division VIIf alone (400 tonnes). Fishing mortality will have to increase by 40% of the 1978 level to take the catch equivalent of the 1979 TAC. On the assumption of recruitment equal to the geometric mean, the result of maintaining either of these levels of fishing mortality into 1980 are estimated to be catches of 1 000 tonnes and 970 tonnes, respectively. From the yield per recruit curve it may be seen that there is little long-term benefit to be gained from an increase in fishing mortality. Current catch levels correspond to about 15% of the spawning stock biomass. The latter, as calculated for 1981, will not be seriously altered by a relatively large range of possible fishing mortalities in 1980.

185. The current position on the yield per recruit curve, with the 1978 exploitation pattern, approximates to $F_{0.1}$. To maintain this situation the TAC recommended for 1980 is 1 000 tonnes.

D.5.7 Skates and rays in the Irish Sea and the Bristol Channel

186. Since no species breakdown is available for any of the national catches (Tables 84-86), and since no biological data are available, it is not possible to carry out any assessments. Caution should be exercised in the long-term exploitation of skate and ray stocks, because of their low fecundity and the decline in catch rates shown in Figure 3. Furthermore, because of their shape, and consequent inability to escape easily through the meshes of a trawl, it is difficult to conserve skate and ray stocks which are exploited in a mixed fishery. Figure 3 (Brander, 1977) shows how catch per unit effort of skates and rays, as a group, has declined in the Irish Sea and the Bristol Channel during a period of steadily rising total demersal fishing effort.

It is recommended that individual species of skates and rays should be identified in national fisheries statistics systems, and reported to Bulletin Statistique.

D.5.8 Total demersal fish production in the Irish Sea and the Bristol Channel

187. Figure 4 shows the trend in fishing effort, and in total demersal catch per unit effort since 1954. It can be seen that there has been a steady rise in the former, and a decline in the latter. The total yield curves derived from two different models are given in Figure 5, together with annual values of catch and of standardised effort.

The estimates of maximum sustainable yield thus lie between 47 000 tonnes and 49 000 tonnes, depending on which model is used, corresponding to about 12 000 or 10 700 standard units of effort respectively. On either of these models, the total effort has been higher than is needed for total demersal maximum sustainable yield since 1973. The 1978 level (14 700 standard units of effort, 45 500 tonnes total demersal catch) is between 23% and 38% above this level. This supports the conclusions drawn from most of the single species assessments. With the exception of sole, the single species assessments show current levels of fishing mortality to be beyond F_{max} on their respective yield per recruit curves. The possibility of limiting the total demersal fishing effort in the Irish Sea and Bristol Channel, whether by a second tier quota system or by some other method, ought to be given serious consideration.

D.6 Norway Pout and Sandeel Stocks

188. The Working Group on Norway Pout and Sandeels in the North Sea met from 23-25 April 1979 in order to enlarge its data base and to re-assess the state of the Norway pout and sandeel stocks in the North Sea.

D.6.1 Norway pout

189. According to preliminary data the landings of Norway pout from the North Sea decreased to about 270 000 tonnes in 1978 from 390 000 tonnes in 1977 and 435 000 tonnes in 1976 (Table 87). As data on effort in 1978 were only available for the first six months, it is not possible to decide whether this further decline is mainly due to the increased restrictions on the Norway pout fisheries in the second half of 1978, or to poor recruitment by the 1977 year class.

190. Estimates of total mortality in 1974-78 are at about the same level as estimates from the early 1960s. This means that the undoubted increase in effort which took place in the late 1960s and early 1970s has not had a measurable effect on the total mortality, as estimated by the data available at present. In view of the predominance of 1-year old fish in landings of Norway pout, and the fluctuations in year class strength, it seems unlikely that any long-term management of Norway pout is possible. Management by yield per recruit considerations is based on the assumption of constant recruitment, and is very sensitive to variations in natural mortality of which little is known for Norway pout.

191. Indices of abundance from 0-group surveys seem to predict the following year's catch with some accuracy. Provided that additional indications of abundance as 1-group fish, from the International Young Herring Surveys, are made available, and acted upon rapidly, it should be possible to adjust annual landings on a year to year basis.

At present, however, no estimates of the likely catch level in 1980 can be made, as the strength of the main component of the catch in that year, that is the year class 1979, is completely unknown. Furthermore, the likely catch level will depend on whether the restrictions on the Norway pout fishery, enforced in 1978/79, will be continued in 1980.

D.6.2 Sandeels

192. Landings in 1977 increased to 786 000 tonnes, the highest on record. Preliminary catch data for 1978 amount to 787 000 tonnes, exactly the same high level as in the previous year (Table 88). The distribution of catches, however, shows a clear difference between the two years. In 1977 46% was taken in the northern part of the North Sea and 50% in the southern part. In 1978 the proportions were 21% and 75%, respectively. This change is in agreement with an increase in abundance, and an increase in effort in the southern region.

193. New estimates of mortality in the period 1972-78 are in reasonable agreement with the calculated total effort, both for the northern North Sea and the southern North Sea. In the case of the Shetland sandeel fishery, which should probably be regarded as a separate management unit, the data base covers too short a time period to provide useful indications of the developments in this stock. From the data available it would be concluded that, at least until 1977, the sandeel stocks in the North Sea show no sign of overexploitation.

194. Catch data indicate that two very strong year classes (1977 and 1978) have entered the fishery. It is, however, uncertain to what degree of accuracy the commercial fishery data allow an estimate of recruiting year class strength. Having no other means of obtaining such an estimate it must be concluded that even short-term advice on management is without any firm basis at present.

ACFM, however, reiterates the view expressed in the 1978 report, that it is not advisable to increase effort on sandeel in the North Sea above the 1977 level.

E. STOCKS IN REGIONS 2 AND 3

E.1 Eastern and Western Mackerel Stocks

195. The Mackerel Working Group met from 23-27 April 1979 to:

(a) assess the mackerel stocks in Sub-areas III, IV, VI, VII and VIII,

(b) re-examine the need for an appropriate level of minimum landing size in Sub-areas III, IV, VI, VII and VIII.

196. Recent tagging experiments have shown a greater degree of intermixing, and of possible exchange, between the two mackerel stocks than previously assumed. It was decided, however, to assess the stocks separately, as done previously, and afterwards to determine TACs by area.

E.1.1 Eastern areas (Sub-area IV, Divisions IIa and IIIa)

197. Recent catches and recommended TACs, in thousand tonnes:

1976		1977		1978		1979	1980
Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch[x)]	Rec. TAC	Rec. TAC
249[1)]	316	220	261	145[2)]	154	145[2)]	0 (50?)

x) Preliminary

1) 167 000 tonnes of this to be taken north of 60°N

2) 100 000 tonnes of this to be taken north of 60°N and west of 2°E.

The total landings in 1978 were 154 000 tonnes (see Tables 89 and 90), a reduction from 1977 of 107 000 tonnes, due mainly to restricted catches by Norway and Faroes. The TAC for 1978 was exceeded by less than 10%, but only about 34 000 tonnes were taken in the area north of 60°N and west of 2°E, as opposed to the 100 000 tonnes recommended by ACFM in 1978.

198. Tag returns from Norwegian experiments were used to split the catch into component stocks and to estimate the fishing mortalities on the North Sea stock in recent years. A value of 0.15 for the natural mortality was used as in last year's assessment.

The fishing mortality in 1978 was around 0.19 compared to 0.31 in 1977. The new estimates of the spawning stock biomass are at a somewhat higher level than previously reported. They demonstrate, however, the same clear declining trend. The spawning stock has decreased from about 650 000 tonnes at 1 January 1978 to about 500 000 tonnes at 1 January 1979. The stock has continued to decline, although the fishing mortality has been reduced, due to very low recruitment.

No relationship could be found between spawning stock size and the resulting recruitment over the range of stock sizes observed. The large majority of year classes have been very weak, whether they were produced by a large or a small spawning stock.

199. The data available would point to both the 1976 and 1977 year classes being very weak. For calculations of the prognosis, the 1977 and 1978 year classes were assumed to be equal to the poorest on record. It was assumed that, of the total TAC of 145 000 tonnes, 85 000 tonnes would be taken from the Eastern stock in 1979.

On this basis the spawning stock biomass will decrease to about 400 000 tonnes by 1 January 1980. Rebuilding of the stock is entirely dependent on the recruitment of one or more strong year classes. At present, there seems to be no alternative but to manage the stock on the basis that recruitment will remain poor in the short term.

200. A prognosis to 1981 was made on two alternative assumptions:

1) No catch from the stock in 1980. This would be tantamount to a complete closure of the North Sea mackerel fishery.

2) Applying the same F of 0.15 in 1980, as used for the Western stock.

In either case the spawning stock would fall below its 1980 level, unless recruitment is stronger than assumed. No catch (Option 1) would result in a spawning stock size of about 380 000 tonnes by 1 January 1981. An F of 0.15 (Option 2), corresponding to a catch of 53 000 tonnes from the stock in 1980, gives a spawning stock size of about 330 000 tonnes by 1 January 1981.

These low stock sizes give rise to serious concern. Due to uncertainties about the critical spawning stock level, it is preferable that no catches of the North Sea stock are taken in 1980.

Any TAC taken from the Eastern areas (Sub-area IV, Divisions IIa and IIIa) must be considered in relation to the TAC for the Western stock.

E.1.2 Western areas (Sub-areas VI, VII and VIII)

201. Recent catches and recommended TACs, in thousand tonnes:

1976		1977		1978		1979	1980
Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch[x)]	Rec. TAC	Rec. TAC
295	507	250	326	450	507	435	330

x) Preliminary.

In the Western areas the total landings in 1978 were 507 000 tonnes (see Tables 91 and 92), an increase of 35% compared to 1977. The United Kingdom landings represent more than 60% of the international total. There was a marked increase in catches made in Sub-area VI. In this area the catches have, until the winter of 1978/79, been taken in summer-autumn, while most of the catches in Sub-area VII are taken in winter.

It seems possible that an appreciable proportion of the catch from the Western area may be discarded at sea. If discards are not taken into account they will introduce a bias in the mortality and stock size estimates. The mean discarding figure is probably equal to 10% of the total international landings.

202. During the winter of 1978/79 a fishery for mackerel took place in the northern part of Division VIa. Analyses of tag returns give conflicting results, but biological parameters indicate that this winter fishery in Division VIa was mainly based on mackerel from the North Sea stock. The fishery in this area, in the period November-April, must therefore be taken into consideration in any management proposals for the North Sea mackerel stock.

203. As in previous years the Western stock was assessed from a cohort analysis, with the constraint that the stock of 3 year olds and older in 1977 should be the same as that estimated by the 1977 egg survey. In previous analyses mackerel were assumed to be fully recruited to the fishery at 3 years old. There are indications of a changed exploitation pattern, and it now appears that recruitment is complete at 2 years of age.

The results indicate that the fishing mortality rate in 1978 was higher than that previously advocated: 0.18 compared to 0.15. The 1976 year class appears to be strong, while the first estimate of the 1977 year class indicates that it may be weak. The spawning stock biomass has remained at a reasonably constant level, of about 3.3 million tonnes, in recent years.

204. In doing the catch prognosis for the Western stock the recruitment, as 1-group, was assumed to be approximately the same as the second lowest observed in the period, for which data are available. The F in 1980 was set at 0.15 for the 2 year olds and older.

Two alternative assumptions about the catch from the Western stock in 1979 were made:

(a) that it will be 660 000 tonnes, corresponding to a total catch in the western areas of 575 000 tonnes. This figure was based on the assumption that there will be no agreed national quotas in 1979 and that the increasing trend in Danish, Federal Republic of Germany, Irish, and United Kingdom national catches will continue. It also includes 10% discards;

(b) that the catch in 1979 will be equal to the stock TAC of 520 000 tonnes, corresponding to an area TAC of 435 000 tonnes.

205. On the first assumption F on the 2-group and older fish in 1979 will be 0.24. Applying an F of 0.15 ($F_{0.1}$) to the stock in 1980 will then generate a stock TAC of about 350 000 tonnes. On the second assumption F in 1979 will be 0.185 and using an F of 0.15 in 1980 will generate a TAC of about 370 000 tonnes. These stock TACs must be considered together with those of the North Sea stock to calculate the area TACs.

E.1.3 Area TACs for 1980

206. TAC options for the Eastern (Sub-area IV, Divisions IIIa and IIa) and Western (Sub-areas VI, VII and VIII, including Division Vb) fishing areas have been calculated on the basis of the assumptions outlined above. From expected mixing rates of North Sea and Western stock mackerel in Division IVa, it is calculated that a North Sea stock TAC of 53 000 tonnes in 1980 would be associated with a catch of 47 000 tonnes from the Western stock, if one maintains the same distribution of fishing in the North Sea as in 1978.

The resulting TAC combinations are:

Options	Assumptions	1980 area TAC	
		North Sea area	Western area
1980 TAC North Sea stock 0	1979 catch Western stock 660 000 t	0	354 000 t
	1979 catch Western stock 520 000 t (TAC)	0	373 000 t
1980 TAC North Sea stock 53 000 t	1979 catch Western stock 660 000 t	53 000 t +47 000 t =100 000 t	307 000 t
	1979 catch Western stock 520 000 t (TAC)	53 000 t +47 000 t =100 000 t	326 000 t

In view of the very reduced spawning stock in the Eastern areas, and the fact that there is at present no evidence of a strong year class recruiting to this stock, ACFM would recommend that no mackerel fishing be allowed in the Eastern areas in 1980. If this is considered as impracticable, ACFM would stress that a catch of 100 000 tonnes from these areas in 1980 would entail too large a withdrawal from the North Sea stock, and would recommend that the catch taken in these areas in 1980 should not be greater than 50 000 tonnes. This would consist of about 25 000 tonnes from each of the Eastern and Western stocks, and this removal has been taken into account in specifying the recommended TAC for the Western areas.

207. As commented in para. 202, the development of a winter fishery in Division VIa, which is based predominantly on North Sea mackerel, must also be taken into consideration in the management of that stock. In the light of the very depleted state of the North Sea stock, and the fact that a winter fishery on this stock results in catching them when they are in poor condition, ACFM would recommend a prohibition on mackerel fishing in Division VIa north of 56°N in the period from 1 November to 30 April.

208. As regards the Western areas ACFM considers that the catch in 1979 will certainly be much in excess of the TAC it recommended for that year, and that the estimate of 660 000 tonnes from the stock given above, is the best estimate which can be made. On this basis, and deducting from the stock TAC this entails for 1980 the 25 000 tonnes estimated to be taken from this stock in the Eastern areas, ACFM recommends a TAC of 330 000 tonnes of mackerel in 1980 for Sub-areas VI, VII and VIII.

If ACFM's recommendation of a complete prohibition of mackerel fishing in Sub-area IV and Divisions IIa and IIIa, and a seasonal prohibition in the period from 1 November to 30 April in Division VIa, are accepted for 1980, the TAC for Sub-areas VI, VII and VIII could be increased to 355 000 tonnes.

E.1.4 Minimum landing size

209. Previous studies of North Sea mackerel have shown that the seasonal pattern of the fishery has a considerable effect on the yield and spawning stock per recruit, especially when the fishing mortality is high and the younger age groups are unprotected. The gain obtained in yield per recruit by increasing age at first capture is rather small at low levels of fishing mortality. It does, however, have a large effect on the spawning stock. Theoretically the spawning stock would be increased by nearly 50% by increasing the age at first capture from 1 to 3 years, at the present fishing mortality level of 0.2.

The North Sea

210. The present seasonal distribution of catch, that is a summer and autumn fishery, appears reasonably close to the optimum for stock and yield.

The existing regulation, prohibiting catching mackerel smaller than 30 cm for industrial purposes, should be maintained. There is no biological justification for restricting this regulation to the industrial fishery, and to obtain full protection for the youngest age groups the present exemption of 20% for undersized fish should be reduced.

The Western area

211. The Western mackerel stock is exploited in winter in Sub-area VII, and in summer in Divisions VIa and IVa. Catches in Sub-area VII include a high proportion of small fish, less than 3 years of age. Mackerel from Division VIa are older, and represent a faster growing part of the stock.

A preliminary analysis of the yield and spawning biomass per recruit indicates that these can be improved if the present pattern of exploitation is regulated to protect the young fish.

In Sub-area VII 3 year old mackerel are about 30 cm. If the number of fish less than 30 cm caught is significantly reduced, there will be a slight gain in yield in the fishery from this Sub-area of 3-6% over the range of Fs recently estimated. There will, however, be a gain of 30-50% in the spawning stock biomass, and a significantly higher gain in the yield from the fishery on the stock as a whole.

212. Several means of protecting mackerel less than 30 cm were considered. It was concluded that the introduction of a minimum landing size, without other supporting regulation, would merely increase discarding, and consequently not result in an increased yield or spawning stock. Mackerel less than 3 years old form only a very small proportion of the catches taken from this stock in Division VIa. Although it is not practicable to take all of the catch of this stock in this area, the yield from the stock as a whole, and its spawning stock biomass, would be increased by taking a higher proportion of the TAC in Division VIa. A seasonal restriction, applied to part of Sub-area VII, might also reduce catches of young fish.

In the winter fishing area off southwest England, although catches of fish less than 30 cm are high in the non-selective pelagic trawl and purse seine fisheries, the proportion of small fish is lowest in the period mid-December to mid-February and increases both before and after this period. The area where these small fish are dominant, outside this period, is found north of 49°30'N and west of 5°W in Division VIIe, and south of 50°30'N in Division VIIf. Consideration should therefore be given to restricting the fishery in this area to the period mid-December to mid-February for the non-selective pelagic trawl and purse seine fleets.

E.2 Hake Stocks in Sub-areas IV, VI, VII, VIII and IX

213. The Hake Working Group met from 28-31 May 1979, to assess:

(a) TACs for hake,

(b) the effects of changes in mesh size on the catches of hake and other associated species.

Two stocks were considered, as was done previously: the 'Northern Stock' and the 'Southern Stock'. The Northern Stock is distributed in Divisions IVa, VIa, VIIIa,b and Sub-area VII, the Southern Stock in Divisions VIIIc and IXa.

E.2.1 Northern stock

214. Recent catches and recommended TACs, in thousand tonnes:

Years	Actual catch	Rec. TACs
1975	74	-
1976	68	-
1977	50	-
1978	47	-
1979		43
1980		30

The landings in 1977 were about 50 000 tonnes (see Table 93), a reduction of about 18 000 tonnes from 1976, due mainly to restrictions imposed by EEC on Spanish fishing in the area, but also to decreased landings by France. In 1978 the landings of 47 000 tonnes showed a slight decrease from the previous year.

Due to the lack of detailed landings and effort statistics, and also because of inadequate data on length composition of the catches, it was not possible to apply age cohort analysis to assess the stock.

215. The changing pattern of fishing in recent years, and the declining trend of the landings, also make it difficult to apply assessment methods which assume an equilibrium situation, such as length composition cohort analysis.

However, to obtain a general indication on the state of exploitation and on the effects of the mesh size changes and reductions in fishing effort, yield per recruit curves were drawn for minimum trawl mesh sizes of 60 mm and 80 mm, in addition to the analysis done during the last meeting of the Working Group.

Length cohort analysis indicates that values of F have been around 0.85 for young hake (smaller than 25 cm) and 0.30 for older fish. These results agree with a high level of fishing effort in Division VIIIa,b, Bay of Biscay, and with the use of small trawl mesh sizes, probably about 40 mm. There has been some reduction in the fishing mortality in recent years, but the level is still very high, especially on young hake.

Yield per recruit curves, assuming lengths at first capture approximating to trawl mesh sizes of 60 mm and of 80 mm, gave F_{max} values of 0.20 and 0.21 respectively.

216. Large reductions in fishing effort result in long-term gains in yield, which are relatively small compared with those obtained from increases in mesh size. A minimum mesh size of 80 mm could give long-term gains of the order of 60% of the average 1973-76 catches. Larger increases in mesh size would produce even larger long-term gains.

The effective enforcement of a minimum mesh size of 80 mm seems to be urgent in this fishery. No firm conclusions are possible on the effects of increased mesh size on associated species. It appears that, except in the case of the directed small mesh Nephrops trawl fisheries, which will be in conflict with the increase of mesh size to 80 mm or more, there will be no significant effects on the other main species.

In order to avoid an expected increase in fishing effort to compensate for the immediate losses, if a minimum mesh size of 80 mm is adopted, a precautionary TAC for hake would be advisable. It is recommended that this should be at a level of 30 000 tonnes in 1980. It must be stressed that if no action is taken to introduce a mesh increase to 80 mm in this area quickly, it would seem likely that a prohibition on directed hake fishing will be necessary in the near future. The TAC given above has been estimated from the catch in 1978, and deducting from it short-term losses which would be expected from the recommended increase in mesh size.

E.2.2 Southern stock

217. Recent landings and recommended TACs, in thousand tonnes:

Year	Actual catch	Rec. TAC
1975	30.1	-
1976	26.7	-
1977	15.6	-
1978	14.2	-
1979		20.0
1980		10.0

Landings have declined continuously in recent years (Table 94); the catch in 1978 is about 50% of that reported for 1975. The Portuguese trawl catch rates during 1977 and 1978 were 4.4 and 4.3 kg/hour, less than half of the catch rates in the years 1974, 1975, and 1976. The Spanish trawl catches of very young hake have drastically decreased during 1977 and 1978, and research vessel observations also indicate a sharp drop in the abundance of young hake in these years. The fishing effort has remained at the same level in recent years. The trawl mesh sizes in use are 40 mm or less.

218. There is a serious lack of data for assessing this stock. Landings and effort statistics are incomplete, routine biological sampling data and age determinations are not available, and selectivity information is scarce. In spite of this, it was decided to use the best assessment methods for the available information, and to adopt parameter values for the Northern stock where appropriate values for the Southern stock were not available.

The yield per recruit curves show F_{max} = 0.15 and 0.20 for mesh sizes of 40 mm and 60 mm respectively.

The results indicate significant long-term gains in yield for increases in mesh size to 60 mm and higher. They also indicate significant yield increases from a reduction of fishing effort, whether associated with a mesh size increase or not.

219. It is clear that this stock is overexploited, and probably in a state of recruitment overfishing. Any management option adopted should take these features into consideration.

The consequences of not enforcing effectively the recommended management actions will be a further decline in the catches, and catches per unit effort, and probably complete depletion of the stock. These consequences could not be assessed with any precision, but must be pointed out.

Immediate losses for an increase in trawl mesh size up to 60 mm were calculated as 7-27%, for the fishery as a whole, varying with the different methods and assumptions used. Long-term gains were 26-65%.

220. The TAC recommended for 1979 was 20 000 tonnes. The landings in 1978 were 14 202 tonnes and it is not expected that the 1979 TAC will be caught. Taking the estimated immediate losses from an increase in mesh size and the 1978 catch into consideration, a precautionary TAC for 1980 would be 10 000 tonnes.

ACFM would therefore recommend an increase in mesh size for Recommendation 1 species in Divisions VIIIc and IXa to 80 mm, and a TAC for hake in these Divisions of 10 000 tonnes in 1980.

F. NORTH ATLANTIC SALMON

221. At the request of the Canadian Government and the EEC Commission, the Working Group on North Atlantic Salmon met from 30 April to 3 May 1979 to review the status of the North Atlantic salmon stocks in relation to fisheries, and in particular to assess the impact of Greenlandic and Norwegian Sea fisheries on home-waters fisheries and stocks. In addition, it was asked to describe the regulations for the control of commercial and sports fisheries for North Atlantic salmon. In view of the origin of the meeting of the Working Group, the report by it will be made available, in full, to those bodies which formulated the request. ACFM therefore considered it necessary, in this report, only to give a brief summary of the main conclusions.

Origin of Salmon at West Greenland

222. The results of previous analyses on this topic showed that the stock exploited at West Greenland, up to 1973, contained fish originating from North America and Europe in proportions which varied from year to year (Anon., 1974). The results of a more detailed study of both these and new data, would suggest higher proportions of North American fish than previously reported. Since 1972, the proportions have, on average, been about equal. They would also suggest that the proportions of North American and European salmon do not change with latitude along the West Greenland coast, although there may be clustering of certain river stocks in the West Greenland area.

Biological Characteristics of West Greenland Stock

223. Earlier analysis had shown that the exploited stock at West Greenland was almost entirely composed of one-sea-winter fish, of which 75% were females. The present analysis confirmed these earlier

results; but also showed a decline in the proportion of fish which have spent more than one winter in the sea, from about 10% in 1969 to 3% in 1978. A similar trend is also shown in Scottish and Newfoundland home-water catches. It is also evident from these recent data that fish of European origin caught at Greenland are significantly larger, and heavier, than those of North American origin. A similar feature is shown by tag recoveries.

Effects of West Greenland Fishery on Home Water Stocks and Catches

224. The assessments in the previous report (Anon., 1974) indicated that a catch of 2 000 tonnes at West Greenland resulted in a direct loss of 1 800 to 2 550 tonnes in the stock in home waters, and in catches from home waters of between 1 080 and 1 530 tonnes. The corresponding losses from the present permitted catch of 1 191 tonnes would accordingly be 1 070 - 1 520 tonnes of stock and 640 - 910 tonnes of catch.

The parameters used in making these earlier assessments were reviewed, with particular attention to three factors which could have seriously biased the estimates:

(a) the mortality generated by the Greenlandic fishery which was not reflected in the catch (non-catch fishing mortality);

(b) the natural mortality rate during the sea phase of the life cycle;

(c) differences in weight of fish of North American and European origin.

As regards (a), the conclusion was that this almost certainly occurs, but its magnitude cannot be assessed on data currently available. In respect of (b), more recent work might suggest the values used in the previous assessment were likely to be overestimates; but the applicability of these new estimates to the current assessment was not clear. In respect of (c), the new data available would suggest that the values previously used, in relation to the European losses, were still valid but the losses to North American catches may have been underestimated. On these bases, although the new data are not adequate to revise the previous estimates of losses in stock and catch in home waters produced by the Greenlandic fishery, they would suggest that the losses are unlikely to have been overestimated, and that the true losses are more likely to be near the upper limits of the ranges given. They would also suggest that the losses to North American home waters, per tonne of Greenlandic catch, are likely to be higher than for European home waters.

It should be noted that these estimates of home-water losses take no account of any management measures for regulating exploitation rate in home waters which are aimed at maintaining smolt production. As this is one of the cardinal principles in regulating home-water catches, the real effect of the Greenlandic fishery is likely to be more truly reflected in the loss of stock than in the loss of catch. The loss of catch is estimated on a constant exploitation rate, irrespective of the stock, and any reduction in exploitation rate, made in the interests of maintaining optimum spawning stock escapement, is therefore not taken into account.

Norwegian Sea Long-Line Fishery

225. After reaching peak catches of over 900 tonnes in 1969/70, the salmon catch from this fishery decreased sharply in subsequent years, in response to NEAFC recommendations on closed areas and closed

seasons. Subsequent Norwegian national regulations, and the extension of national fisheries jurisdiction, resulted in further reductions in catch. As a result, by 1978, the total catch was less than 20% of those of 1969-70.

Biological sampling and tagging data would suggest that the catches taken in the main Norwegian fishery were predominantly two-sea-winter fish returning to Norwegian Sea and USSR rivers. The smaller fishery in the vicinity of the Faroes would appear to be based on fish of mixed sea-age and origin. Previous assessments of the losses to home-water stocks arising from these fisheries were almost equal to the long-line fishery catches. The situation since the extension of fisheries jurisdiction cannot be assessed in the absence of data on the age of the catches. But it is unlikely that the losses per tonne of fish caught can be greater than those previously estimated.

Home-Water Fisheries

226. Reported catch statistics of home-water fisheries show a sharp decline since 1975 in all of the main European salmon fisheries. This was not a feature of the Canadian fishing up to 1977. In 1978, the catches declined in all home-water fisheries considered. In 1978, the catch at West Greenland was also low. These features would suggest low survival of the 1977 smolt year class.

Salmon Fishery Regulations

227. The main regulatory measures enforced in home waters are based on controls of the type and quantities of gears used, and limitations of areas and seasons of capture. No detailed examination of national regulations was made but the following general conclusions were drawn in respect of their biological implications:

(1) maintenance of optimal spawning escapement becomes more difficult as the rates of home water to mixed stock exploitation decrease. This may result in serious depletion in stocks from rivers of low productivity;

(2) losses due to non-catch fishing mortalities are higher in fisheries on feeding grounds than in home-water fisheries;

(3) mixed fisheries reduce the accuracy of catch statistics, and hence of assessment of individual river stocks;

(4) exploitation of salmon during a period when they are growing rapidly is likely to reduce the yield which can be taken per recruit.

G. INVERTEBRATES IN THE NORTH-EAST ATLANTIC

G.1 Nephrops Stocks

228. In its previous report ACFM recommended minimum mesh sizes for Nephrops fisheries. In the context of these recommendations ICES was asked by the EEC Commission to: "consider the area where by-catches of protected species during each trip in Nephrops fisheries could be up to 50% of total catches, in Regions 2 and 3, taking into account that the minimum landing size and mesh size should be respectively 86 mm and 70 mm in Region 2, and 71 mm and 60 mm in Region 3". In response to this request the Nephrops Working Group met from 12 to 14 March 1979. The results of their consideration of this question show that the data

available only allowed estimates of by-catches in Nephrops fisheries to be made over rather large areas. Within these areas, the by-catch proportion of the total catch could only be estimated from a relatively small number of samples of commercial catches, or from occasional research vessel samples. The results available would suggest that in the majority of the Nephrops fisheries, the by-catches of protected species are likely to be in excess of the 50% level specified, on a high proportion of the trips. There may be small areas within which Nephrops fisheries can be conducted with by-catches below the level specified, but the data available do not allow these to be defined.

G.2 Crangonid Shrimps

229. The Working Group on Crangonid Shrimps met from 2-4 May 1979: to consider whether stock assessments can be made and, if so, to advise on regulatory measures needed for Crangonid fisheries.

G.2.1 Biology, fisheries

230. Common shrimp (Crangon crangon), also known as 'brown shrimp', is the only Crangonid shrimp of economic importance in Europe. It is used mainly for human consumption, but also for industrial purposes. This shrimp inhabits sandy or muddy areas in coastal and estuarine regions. Nearshore waters are very important for the larvae and juveniles of this species. Common shrimp is fast growing; it reaches maturity within approximately 1 year, and is able to reproduce more than once per year. It is fished mainly by Belgium, Denmark, France, Federal Republic of Germany, Netherlands and United Kingdom (see Table 95), with selective or non-selective beam- and ottertrawls of small mesh size.

G.2.2 Population assessments

G.2.2.1 Stock assessment models

231. The Leslie method has been applied to the shrimp population in the coastal area north and south of Den Oever (Netherlands). Several assumptions were made in order to adapt the method to this special case. The data needed to use this model are monthly landings in numbers, and monthly effort (e.g. fishing days). The average stock estimates from the model were in agreement with direct estimates from stock sampling surveys. The shortcomings of the model are that the assumptions are not fully met in practice. Nevertheless trends in fishing mortality and stock size can be followed by this model.

Cohort analysis using length data was applied to the shrimp fisheries in the Federal Republic of Germany coastal waters. The data required to perform this analysis are catch in numbers per length group for a number of years. Parameters needed are L_∞, M/K and F/Z. Over the periods under consideration fishing mortality decreased, particularly for the foddershrimp component of the catches (25-55 mm). For consumption shrimps, (> 55 mm), F remained relatively stable. The stock size of consumption shrimps decreased from 1965-69 to 1970-74 by about 15%, followed by an increase of about 30%. The recent reduction of the foddershrimp landings has resulted in a situation in which the size of the stock and the fishing mortality are at a level which does not require regulatory measures aimed at further improvements. In order to maintain this situation any substantial increase of fishing effort in the German shrimp fishery should be avoided.

G.2.2.2 Ecological models

232. Ecological models describe the trophic relations between the shrimp population and the other components of the coastal ecosystem. These models may contain estimates of the abundance and biomass of the population and of the fluxes of energy and carbon which pass through it. Until now ecological models have only been developed for the benthic stages of shrimp.

The first modelling of the shrimp population studied the relationship between the shrimp stock in the German Bight and the populations of demersal predatory fishes. Predation mortality of shrimp in the period 1954-73 averaged 110 x 10^9 individuals/year and was 0.9 to 4.5 times larger than fishing mortality. There is a negative correlation between the predation in one year and the catch of the German shrimp fishery in the following year.

An ecological model for the shrimp population in Belgian coastal waters has been developed, including estimates of abundance, biomass, consumption, production by growth, turnover, production of eggs, mortality of eggs, production of larvae, production available to higher trophic levels, predation mortality due to demersal fishes, and fishing mortality. Predation mortality for 1973-76 averaged 16 x 10^9 individuals/year, and was 12.4 times larger than fishing mortality. Only 0.2% of the larvae which are produced annually are caught by the Belgian shrimp fishery.

At this stage ecological models still require large-scale sampling programmes for measurement of the basic parameters, abundance, biomass and length composition of shrimp, and of predator populations. As a consequence the usefulness of such models for management purposes is still restricted. They may however provide information on the processes determining population dynamics of the common shrimp.

G.2.3 Regulatory measures

G.2.3.1 Proposal for management units

233. On the basis of present knowledge of migration and local distribution patterns of common shrimp it was concluded that a large number of unit stocks can be distinguished. For all practical purposes the various stocks or stock complexes considered can be regarded as management units which are independent of each other, except in respect of larval movement with the residual tidal currents. The proposed management units are:

1) the Esbjerg-Sylt coast;
2) the Schleswig-Holstein coast (Sylt-Cuxhaven);
3) the Niedersachsen coast (Cuxhaven-Ems);
4) the Dutch coast from Dollart-Ems to Terschelling;
5) the Dutch coast from Terschelling to IJmuiden;
6) the Easter Scheldt;
7) the Western Scheldt and Belgian coast.

Since most of the fisheries are conducted in coastal waters, the management of shrimp fisheries may be considered on a local basis. International management may be required for the shrimp fisheries in waters outside national limits. The French, and United Kingdom, artisanal shrimp fisheries in estuarine areas can also be considered separately.

234. Regulatory measures may be considered in order to:

1) protect undersized shrimp;
2) protect adult breeding shrimp from overfishing;
3) protect undersized commercial fish species.

G.2.3.2 Protection of undersized shrimp

235. No landings of foddershrimp, that is undersized shrimp, were made in Belgium, Denmark, France and United Kingdom. The landings of foddershrimp in the Netherlands virtually ceased in 1970. The Federal Republic of Germany landings have declined since 1975. It is expected that the German foddershrimp landings will soon cease.

Also in catches of consumption shrimp undersized shrimp are unavoidably present due to poor size selection in trawls. Desiccation on deck, after sieving, is the main cause of mortality of undersized shrimp caught. The prompt return to the sea of this component, using water transport, would reduce mortality of discarded shrimp.

The effect of a minimum landing size for consumption shrimp would be very restricted if no measures are taken to improve survivals of discards.

The appropriateness of closed areas and seasons is considered to be very limited, since common shrimp has an extended reproduction period, and no clear-cut nursery areas.

Nets with mesh sizes up to 24 mm stretched catch considerably less undersized shrimps than nets with smaller meshes, without decreasing the catch of consumption shrimp. In most shrimp fisheries mesh sizes of 20-23 mm are used at present.

The rotating sieve improves the survival of undersized shrimp considerably. This machine is widely used now in Belgium, and the Netherlands. One Danish vessel uses it. It is not in use in the Federal Republic of Germany and United Kingdom, due to the small size of the vessels. However, since natural mortality caused by predation exceeds fishing mortality considerably, and may reach a level of 80% of total mortality, a reduction of fishing mortality may be matched by a corresponding increase of natural mortality, particularly for small shrimps.

G.2.3.3 Protection of adult breeding stock

236. Considerable annual fluctuations in the landings of consumption shrimp are a normal feature of shrimp fisheries. These are mainly due to recruitment fluctuations and are associated with climatic differences and changing predation. Both of these are likely to exceed the effects of exploitation on the stocks.

Seasonal fluctuations in catch per unit effort are also a normal feature and are caused by the rapid growth of larvae and juveniles during summer. The majority of commercial landings are made during autumn.

Common shrimp carry their eggs until hatching (3-14 weeks). For this reason heavy exploitation of berried females can affect recruitment potential.

Landing restrictions on consumption shrimps, for conservation reasons, are not applied in any country. In Denmark and the Netherlands effort is limited by a licensing scheme. In the Federal Republic of Germany a reduction in the number of vessels has been encouraged. Effective effort, however, tended to remain at about the same level. In United Kingdom beam length is restricted to a total of 8 metres.

The breeding stock is not concentrated in clearly defined spawning areas, reproduction is spread over the whole year. Therefore control of the shrimp fishery by closed areas or seasons may not be generally applicable.

G.2.4 Protection of undersized fish

237. Due to the small mesh size of shrimp nets, and the occurrence of consumption shrimps in the nursery areas of several fish

species, the catch of undersized protected fish by shrimp fisheries is unavoidable, but considerable. The numbers of undersized fish caught by the shrimp fishery vary considerably from year to year, according to year class strength of the fish species.

As a rough indication of the quantities involved, the by-catches of the more important species in 1963 were: plaice 1 320 x 10^6, sole 124 x 10^6, cod 11 x 10^6, whiting 26 x 10^6. These are likely to be minimal estimates for this year as not all countries involved in the shrimp fishery provided estimates for all species.

Causes of mortality of undersized fish associated with shrimp fishing include:

1) meshing in the net;
2) trawling for extended periods combined with large catches;
3) effects of the sorting of the shrimp catch, especially when sorting is performed by a 'shaking' sieve;
4) exposure on deck, especially at high air temperatures.

Closed seasons for shrimp fishing to protect undersized fish would interfere severely with the shrimp fisheries.

Selective trawls with a separating panel permit, to a large extent, selective fishing for shrimp. Up to 85% of flatfishes escape from such trawls. In Denmark the whole fleet uses this type of net. Part of the Dutch and Federal Republic of Germany fleet also use selective trawls. They are not in use in Belgium and United Kingdom. Clogging of the separating panel by seaweeds and hydroids can obstruct the trawl, especially in shallow waters.

Rotating sieves improve the survival of undersized fish. This improvement is increased when the rotating sieve is used with an automatic transporter.

G.2.5 Conclusions

238. (1) Since natural mortality due to predation is the dominating factor in generating total mortality, management measures aimed at reducing fishing mortality on adult shrimp will not increase the abundance of shrimps available for the human consumption fishery.

(2) Reduction of fishing mortality on small shrimps might improve the abundance of adult shrimps during that season as well as in the following year. This can be achieved by (a) fishing with a minimum mesh size of 24 mm (stretched mesh), (b) improving the survival rate of small discarded shrimps by careful treatment during the sorting operation on deck before discarding.

(3) Protection of undersized fish in the shrimp fishery areas can be achieved by (a) using selective trawls with a separating panel, (b) increasing survival rates of undersized discarded fish by careful treatment on deck before discarding.

G.2.6 Recommendations

239. (a) In order to increase the rate of survival of small discarded shrimps, as well as undersized fish in the shrimp catches, ACFM recommends that all shrimps not intended for human consumption and all by-catch of undersized fish should be returned promptly to the sea and that they should be immersed in sea water throughout the sorting operation.

(b) To reduce the catch of small shrimps ACFM recommends a minimum mesh size of 24 mm for trawls used for fishing for Crangon.

(c) To reduce the by-catch of undersized fish in the shrimp fishery ACFM recommends that selective shrimp trawls with separating panels should be enforced whenever practicable.

G.3 Pandalid Shrimps

240. The Working Group on Pandalus Stocks met from 24 to 26 April 1979 to consider regulatory measures for Pandalus stocks.

241. The management of Pandalus fisheries by mesh regulations, closed seasons, closed areas (nursery grounds), control of fishing effort and TACs were considered. Experience from the ICNAF area indicates that regulating mesh sizes alone may not be sufficient to maintain catch levels in a heavily exploited stock, and that control of catches or effort may also be required. The present management measures in the Greenland area include TACs, and a minimum mesh size of 40 mm.

242. With regard to European stocks (except in Division Va) there have been no major improvements in data inputs, so the assessment carried out at the 1977 meeting of the Pandalus Working Group (ICES, 1978. Coop.Res.Rep., No.83) is still the best available. Although the Beverton and Holt dynamic pool model, used in that assessment, may not be ideal, it did enable certain management measures to be suggested. This year the need to control fishing effort was discussed. The catch per unit effort data available do not suggest that catch rates are falling appreciably. It was considered that TACs could not be estimated at present.

243. The prime objective of management of the Pandalus stocks, in the NEAFC area, must be to increase the mesh size and so increase the size at first capture above the size at first maturity in order to protect the breeding stock. As a first step towards this goal, it is recommended that the minimum mesh size should be 35mm in Division IIIa and Sub-area IV when fishing for Pandalus. The Cooperative Research Report quoted above provides the basis for the regulatory measures recommended.

G.4 Homarus Stocks in the North-East Atlantic

244. At the 66th Statutory Meeting in 1978 the Council decided that the Homarus Working Group should be convened to make stock assessments with a view to providing management strategies for lobster fisheries. The Group met from 21 to 24 May 1979.

245. In several lobster fisheries, especially within the Scandinavian area, a serious drop in the reported lobster landings has been observed.

A total of 13 lobster stocks, in Europe as well as in Canada and America, were subjected to a cohort analysis by length. The effects of a minimum landing size, and of fishing mortality reductions, on yield per recruit were assessed. The data analysis indicated the advantages, or necessity, of increased minimum landing size limits, and of decreased fishing mortalities.

As well as increasing yield per recruit such management action would provide considerable increases in stock biomass, and therefore recruitment potential, which would reduce the risk of fishery-induced recruitment failure which in some stocks may be imminent.

246. It is recommended that immediate attention be given to modelling of lobster growth, with special reference to the effect this has on yield assessments.

In order to increase the yield per recruit, it is recommended to increase the minimum carapace length to 85 mm (= 235 mm total length) of the lobster landed in all regions except Region 3.

The minimum carapace length of lobsters caught in Region 3 should be 80 mm, pending the results of further research into lobster growth.

G.5 Scallop Stocks in the North-East Atlantic

247. The Scallop Working Group met from 4 to 6 April 1979, with the following terms of reference:

(a) to determine the stocks of Pecten maximus and Chlamys opercularis on which assessments could be carried out;

(b) to carry out such assessments and to make recommendations for rational management of these stocks;

(c) to consider the possible effects of the introduction of cultured pectinids on such assessments of wild stocks.

248. Seven management units were identified by the Working Group (Figure 6):

1. Shetland
2A. West Scotland
2B. Isle of Man
3A. West Channel
3B. East Channel
4. West Ireland
5. French Atlantic.

These groupings are based on both biological and economic criteria. At present information on fishing effort is collected only in Units 2A, 3A, and 3B. Assessments should therefore be attempted for Pecten maximus in these units and for Chlamys opercularis in 2A. The necessary data for carrying out these assessments, however, were not available. On the evidence available, it appears that yield per recruit of Pecten maximus in 2A (West of Kintyre) and 3A (Baie de St. Brieux) might be increased by introducing, or adjusting, minimum size regulations to raise the age at first capture from 3 years (93 mm) to 4 years (102 mm) West of Kintyre, and from 2 years (81 mm) to 3 years (105 mm) in the Baie de St. Brieux.

249. It was found that significant discrepancies appear in the official catch statistics reported by all countries, in that Chlamys opercularis is often included with Pecten maximus figures.

250. Regarding the possible effects of pectinid culture on wild stocks, and their assessment, present knowledge is insufficient to make any firm statements. In Japan, the culture of the native scallop has been seen to bring about increased spatfall to the wild stocks, and this may occur in other species.

The spat collection activities of pectinid culture projects appear to have potential in monitoring the abundance and timing of the main settlement, which can vary from April to October. This information can give a good forecast of subsequent recruitment, and is already used for this purpose in the management of the Baie de St. Brieux fishery.

It is recommended that countries should improve the collection of effort data from their pectinid fisheries, and should take more care to separate Pecten maximus (common scallop) and Chlamys operularis (queen scallop) in their catch figures reported to ICES.

G.6 Cephalopod Stocks

251. The Working Group on Assessment of Cephalopod Stocks met from 6-7 March 1979 with the following terms of reference: (1) to examine the possibilities of cephalopod stock assessments and offer management advice; (2) to assess the appropriateness of making Sepia a protected species.

252. In the ICES area the most important commercially exploited species of Decapoda are Sepia officinalis (common cuttlefish) and the squid Loligo vulgaris, L. forbesi and Todarodes sagittatus. Todaropsis eblanae and Illex spp. are exploited to a lesser extent. Landings during the 1970s appear to have fluctuated, although collection, and reporting, of statistics leave much to be desired (see Tables 96-98).

The life history of Decapoda is incompletely understood, but it appears to be basically similar in many species. All have a short life span, 1 to 2 years, at the end of which spawning is followed by mass mortalities. The basic pattern is of two breeding groups, one of spring and one of summer spawners, although in some species, in some areas, one or the other may be absent. There is need for work on ageing by means of statoliths, and more information on abundance should be gathered by means of research surveys and by sampling commercial catches.

253. The catch is mainly taken by trawl, and more information is required on selectivity. The by-catch of fish, in directed cephalopod fisheries, appears to be low, but more information is required.

254. It was not possible, with the available data, to carry out a stock assessment of any species. Since, for most species, fishing is mainly on spawning concentrations, fishing mortality generally applies only to fully-grown adults, so that growth overfishing is unlikely to occur. The yield would be largely determined by the strength of the recruiting broods. Recruitment overfishing might occur if the spawning biomass was reduced too far. Consideration should be given to investigating the possibility of a stock/recruitment relationship. Virtual population analysis might be carried out, using available data suitably prepared, in an attempt to obtain estimates of numbers of recruits in each year and fishing mortality. Alternative methods of obtaining estimates of abundance, such as using data from fish and larval surveys, might also be considered. To facilitate population studies attempts should be made to obtain better catch and effort and biological data for cephalopods, and sampling procedures should be standardised. More information on by-catch is also required.

255. A mesh size smaller than the current minimum mesh sizes in fisheries for Recommendation 4 species is not required to catch Sepia. Although there is no evidence that smaller mesh sizes than

these are used in Sepia fisheries, and that the by-catch of protected species is large, it would seem advisable to remove any loophole in the present minimum mesh size regulations. Accordingly ACFM would recommend that the minimum mesh sizes used in Sepia fisheries should be the same as those for Recommendation 4 species. There would, however, seem to be no need to establish a minimum landing size for Sepia.

H. MESH ASSESSMENTS IN SUB-AREAS VI AND VII

256. In its previous report, to the 16th Annual Meeting of NEAFC (Anon., 1979), ACFM recommended that the minimum mesh size for Recommendation 1 fisheries in Sub-areas VI and VII, excluding Division VIIa, should be increased to 80 mm for all trawls and Danish seines irrespective of the type of twine used. In response to this recommendation ICES received a request for further clarification, worded as follows: "We understand that the recommendations for ICES Sub-areas VI and VII (with the exception of the Irish Sea) were made solely on the basis of research work done in the North Sea. It would be desirable to have corroborative evidence from studies carried out in areas VI and VII, which would stress the long-term gains as assessed on the basis of empirical evidence rather than on the more theoretical basis contained in the ACFM Report.

Secondly we would like to see the effects of the change of mesh size envisaged tabled not only for major stocks in Sub-areas VI and VIId, as done in Table 66, but for other divisions for Sub-area VII as well".

257. The wording of the first paragraph of this request would suggest a lack of appreciation of the methods used in assessing the effects of changes in mesh size; and in responding to it it would seem desirable to give a brief, simple, description of the processes involved. It must be stressed, however, that the only truly empirical way of assessing the effects of a mesh change on the yields from an area would be to enforce it within that area whilst keeping all other factors, including the distribution of fishing effort between national fleets, constant over a prolonged period so that the effects on the total and national yields could be compared with those of an earlier period when the previous mesh size was in use. This would be an interesting experiment but it does not seem to be one which could be envisaged in practical terms.

258. The principle behind regulating the minimum mesh size to be used in a fishery is that there is an optimum size for each species, dependent on its growth and natural mortality rates, at which it should be caught to maximise the yield. Since, however, in the majority of fisheries the catch is a mixture of species, with differing escape capabilities from a net with meshes of a given size, and with different optimum sizes of capture, the mesh size in use has to be a compromise between the requirements of the different species.

The first step in assessing the mesh requirements for any species is to get a measure of the length at which it is first retained by a net with meshes of a given size, the length at which all of the fish entering the net are retained by that net, and the length at which 50% of the fish entering the net are retained and 50% released. The 50% retention length divided by the mesh size of the net, when both are expressed in the same units, is known as the selection factor and is, for all practical purposes, a constant for that species for different mesh sizes. The main factor controlling the selection factor would seem to be the length to maximum girth relationship of the fish. Thus the selection factor, for a given species, is likely to vary seasonally in response to variations in the

condition of the fish, and its physiological state. This is probably the main reason for the wide range of selection factors reported, for the same species, from different experiments. Other factors such as netting material, twine type, and differences between areas do not seem to play a significant role.

259. The only 'empirical' evidence used in mesh assessment is the estimation of selection factors for the different species. Because of the rather wide variation in experimental estimates of selection factors, mentioned above, it is desirable to use ones from areas where a considerable number of reliable experiments have been conducted. The number of such experiments done in Sub-areas VI and VII is very small, but the results do not suggest significant differences from those conducted in other areas, such as the North Sea, where many more experiments have been carried out. If this were to be so it would be most likely to result from differences in length to maximum girth ratios between Sub-areas. ICES has, on several occasions, asked, in relation to mesh assessments, for data on this from countries with fisheries in the relevant areas, without response.

260. Having established the selection parameters for the species concerned the only data required to estimate the gains from any specified increase in minimum mesh size are the length distributions of the catches landed with the present mesh size, the weight/length relationship for the species and stock under consideration, the fishing and natural mortality rates, and its growth rate. In the mesh assessments referred to above all of these were obtained from the best data available for the species and stocks considered. If these data are considered unsatisfactory, by some of the countries fishing in these areas, it is incumbent on them to provide more reliable data for their fisheries. Such data cannot be supplied by ICES, or by any empirical approach; they must be collected, by an adequate sampling system, from the landings of the national fisheries.

261. Provided the data mentioned in paragraphs 258-260 are reliable the overall gain in yield to the fisheries can be estimated with an adequate degree of reliability. The assessment of gains and losses to individual national fleets is inherently less reliable, as it demands not only a knowledge of how the fish which will be released by the increased mesh size will be distributed up to the time of capture by the new mesh size; but also how the areas fished by the different national fleets will change in response to the new fishing conditions brought about by the mesh increase. The data available for forecasting either of these are inadequate, and accordingly the estimates of the distribution of the total gain between national fleets should be considered as little more than very rough indicators.

However ACFM must stress that the assessments of the effects of mesh changes given in its previous report for Divisions VIa and VIId were based on the best data available for all of the required parameters, and are of an acceptable level of reliability, at least in relation to overall gains and losses.

262. Finally it should be stressed that any area which has been subjected to a very high exploitation rate, with small effective mesh sizes, will suffer rather large short-term losses from a change to a more desirable mesh size, provided this is effectively enforced. The losses will be higher for those fleets which had been fishing with below average effective mesh sizes prior to the increase. The long-term gains, however, will be correspondingly large, and the short-term losses are the price which must be paid if the fishery is to be conducted on a more rational basis.

263. With regard to the second question, ACFM would point out that in its previous report it was recommended that no increase in mesh size should be introduced in Division VIIa until the results, for protected species, of increasing the mesh size for Nephrops fisheries in the area had been stabilised and assessed. Assessments of the effects of a mesh increase in Division VIId have already been provided. In the remaining Divisions of Sub-area VII, other than VIIe, the effects of a mesh increase to 80 mm have been fully justified in paragraphs 215 and 216, in relation to the fisheries for hake, which is potentially the most valuable species in these Divisions which will be affected by a mesh increase of the size recommended. With respect to other species in these Divisions which are likely to be affected no assessments have been done because no data are available on size composition of catches or fishing mortality rates. As pointed out, in relation to the first question, an essential parameter in assessing the effects of mesh increases is the current fishing mortality rate on the stock. As no assessments have been done for these species in the relevant Divisions, this parameter is unknown.

264. With regard to Division VIIe, due to the short period available between receiving the question and the date of the ACFM meeting, the requisite data on the length composition of catches with the current mesh size, could be obtained only from English fisheries for whiting. This is the only species of any importance in this Division which is likely to be affected by short-term losses arising from a mesh increase from 75 mm to 80 mm, and it would seem unlikely that French catches from this Division would differ appreciably in size composition from English ones, if both fleets are using nets of the minimum mesh size. The results of the assessment of the English data are that the short-term loss would be 12.2%, and there would be no long-term gain. The yield per recruit after one year of initial losses would return to the same level in about 4 years. It should be pointed out, however, that there would be serious enforcement difficulties in having mesh differentials in a small area like the Channel, and the results of the assessment given last year show major gains for whiting fisheries from a mesh increase to 80 mm in Division VIId. ACFM would therefore reiterate its recommendation that an 80 mm mesh should be applied in the whole of Sub-areas VI and VII, apart from Division VIIa.

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Table 1. Nominal catch (in 000's tonnes) by Sub-areas and main species in NEAFC Region 1, 1970-1977.

	1970	1971	1972	1973	1974	1975	1976	1977
Total Nominal Catch in Region 1*)	4 357	4 255	4 153	4 313	4 516	4 592	5 739	6 303
Sub-areas I and II (North-East Arctic)								
Pelagic Fish								
Herring	62	22	13	7	8	5	1	18
Capelin	1 314	1 392	1 593	1 336	1 147	1 416	2 546	2 940
Others	4	3	4	26	12	40	16	8
Total Pelagic Fish	1 380	1 417	1 610	1 369	1 167	1 461	2 563	2 966
Demersal Fish								
Cod	956	729	643	831	1 143	886	908	943
Haddock	86	80	188	294	231	182	139	112
Polar cod	243	348	167	82	124	63	12	8
Saithe	265	241	214	212	264	233	242	183
Redfish	29	44	37	60	97	278	318	186
Flatfish	102	111	65	48	57	53	55	48
Others	81	95	68	79	92	77	66	104
Total Demersal Fish	1 762	1 648	1 382	1 606	2 008	1 772	1 740	1 584
Total Catch of all Species	3 142	3 065	2 992	2 975	3 175	3 233	4 303	4 550
Sub-area V (Iceland and Faroes)								
Pelagic Fish								
Herring	19	14	+	9	9	13	20	29
Capelin	192	183	277	442	462	461	430	761
Others	-	+	+	4	+	-	1	1
Total Pelagic Fish	211	197	277	456	471	474	451	791
Demersal Fish								
Cod	506	482	423	407	401	410	390	377
Haddock	66	66	56	64	57	66	69	65
Saithe	146	168	157	168	144	129	115	97
Redfish	80	84	81	79	77	79	75	69
Flatfish	48	32	23	19	17	14	16	26
Others	55	64	60	75	79	63	131	181
Total Demersal Fish	901	896	800	812	775	761	796	815
Total Catch of all Species	1 112	1 093	1 077	1 267	1 246	1 235	1 247	1 606
Sub-area XIV (East Greenland)								
Total Catch of all Species	44	68	56	33	49	53	148	100

*) Including non-teleost fish, unsorted and unidentified species.

+ = less than 500 tonnes.

Table 2. Nominal catch (in 000's tonnes) by Sub-areas and main species in NEAFC Region 2, 1970-1977.

	1970	1971	1972	1973	1974	1975	1976	1977
Total Nominal Catch in Region 2*)	4 078	4 000	4 043	4 330	4 901	5 062	5 088	3 999
Sub-area IV (North Sea) and Division IIIa (Skagerrak & Kattegat)								
Pelagic Fish								
Herring	834	735	715	740	427	416	250	157
Mackerel	322	243	188	327	298	263	304	259
Sprat	58	100	97	270	376	758	658	385
Horse mackerel	12	32	8	42	31	10	9	4
Others	7	4	3	3	6	6	2	4
Total Pelagic Fish	1 233	1 114	1 011	1 382	1 138	1 453	1 223	809
Demersal Fish								
Cod	239	339	368	258	238	219	251	227
Haddock	673	260	216	199	198	180	214	160
Whiting	195	126	123	165	217	160	209	201
Norway pout	290	385	510	461	833 1)	662 1)	572 1)	446
Saithe	222	251	240	216	270	267	307	190
Sandeels	195	404	366	307	532	445	517	803
Plaice	145	133	144	144	128	124	132	144
Sole	20	24	21	20	18	19	15	15
Other Flatfish	18	22	24	27	28	28	26	29
Others	27	32	36	45	39	42	37	64
Total Demersal Fish	2 024	1 976	2 048	1 842	2 501	2 146	2 280	2 279
Total Catch of all Species	3 257	3 090	3 059	3 224	3 639	3 599	3 503	3 088
Sub-areas VI and VII (West and South of United Kingdom and Ireland)								
Pelagic Fish								
Herring	230	295	290	324	277	226	179	91
Mackerel	65	87	134	184	249	431	419	307
Sprat	14	9	13	19	19	16	21	21
Horse mackerel	74	51	102	121	119	121	181	30
Others	8	8	13	9	7	14	15	17
Total Pelagic Fish	391	450	552	657	671	808	815	466
Demersal Fish								
Cod	29	32	33	29	33	33	39	31
Haddock	41	54	58	44	78	72	67	26
Whiting	28	32	30	38	45	53	59	46
Hake	14	21	18	21	45	44	41	17
Flatfish	31	32	35	34	37	40	43	36
Others	77	99	106	134	177	193	233	162
Total Demersal Fish	220	270	280	300	415	435	482	318
Total Catch of all Species	611	720	832	957	1 086	1 243	1 297	784

*) Including non-teleost fish, unsorted and unidentified species.

1) Includes by-catches of several other species taken by Norway.

Table 3. Nominal catch (in 000's tonnes) by main species in NEAFC Region 3, 1970-1977.

	1970	1971	1972	1973	1974	1975	1976	1977
Total Nominal Catch in Region 3*)	785	838	891	869	625	641	681	723
Pelagic Fish								
Pilchard	136	184	173	170	127	164	146	130
Mackerel	82	46	42	77	78	52	61	34
Horse mackerel	163	85	156	190	130	134	181	191
Others	107	80	141	94	92	124	116	157
Total Pelagic Fish	488	395	512	531	427	474	504	512
Demersal Fish								
Hake	100	38	71	86	48	54	47	46
Others	108	84	142	88	57	77	93	135
Total Demersal Fish	208	122	213	174	105	131	140	181
Total Catch of all Species	696	517	725	705	532	605	644	693

*) Including non-teleost, unsorted and unidentified species.

Table 4. Recent catches and recommended TACs for fisheries regulated by calendar year (in '000 tonnes).

Fishery	1975	1976			1977		1978		1979	1980
	Actual Catch	Recom. TAC	NEAFC TAC	Actual Catch	Recom. TAC	Actual Catch	Recom. TAC	Actual Catch[1]	Recom. TAC	Recom. TAC
NORTH-EAST ARCTIC										
Cod	829	700-800	850	867	850	905	850)	690	600	390
Haddock	176	100	-	137	110	110	150)	94	206	50
Saithe	233	190	-	242	200	183	160	147	153	129
Greenland halibut	38	-	-	36	-	29	40	24	25	14
Golden redfish	39	-	-	49	-	40	20	29	22	19
Beaked redfish	239	-	-	269	-	146	130	93	135	81
SUB-AREAS V & XIV										
Greenland halibut	23	-	-	6	-	17	-	14	15	15
Golden redfish	61	-	-	94	-	53	-	47	58)	58
Beaked redfish	43	-	-	95	-	31	-	17	12)	7
ICELAND										
Saithe	88	75	-	82	60	62	58[2]	48	58	54
FAROES										
Cod } Bank										3.3)
Cod } Plateau	39	28	-	42	32	37	30[2]	32	28	20)
Haddock	21	17	-	26	17	26	23[2])	19	20	20
Saithe	42	50	-	33	40	35	32[2])	28	31	34
DIVISION IIIA										
Herring	121	-	-	92	-	112	-	85	-	12)
Sprat[3]	112	-	-	62	80	79	80	79	70[2]	70
Cod	32	-	-	38	-	42	-	44	26[2]	30
Haddock	6	-	-	9	-	10	-	6	6.6	6.6
Whiting	20	-	-	19	-	19	-	49	22	22
Plaice	16	-	-	24	-	37	-	27	-	25

For footnotes, see page 103.

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Table 4. (continued)

Fishery	1975	1976			1977		1978		1979	1980
	Actual Catch	Recom. TAC	NEAFC TAC	Actual Catch	Recom. TAC	Actual Catch	Recom. TAC	Actual Catch[1]	Recom. TAC	Recom. TAC
NORTH SEA										
Herring[4]	313	0[2]	160	190	0[2]	84	0	30[11]	0	0
Sprat	641	650[6]	650	622	450[2]	304	400[7]	378	400[7]	400
Mackerel[5]	298	249[6]	-	316	220[2]	261	145[2]	154	145[7]	0(50?)
Cod	186	130-210	236	214	220[2]	185	210[2]	260	183	200
Haddock	174	106-155	206	208	165[2]	151	105[2]	90	83	66
Whiting	140	160	189	197	165[2]	120	111[2]	100	85	100
Saithe[8]	268	200	-	307	210	195	200[2]	145	200	129
Plaice	109	85	100	111	71	118	115[2]	112	120	112
Sole	18	8	12.5	17.3	6.7	18.2	8	20.4	13	10[10]
SUB-AREA VI										
Cod	13	14	-	19	19[2]	13	12.2[2]	16	10.4	12.1
Haddock	64	23	-	62	18[2]	22	12	21	11	11.5
Whiting	20	13	-	25	22[2]	17	17[2]	16	12	10.5
Saithe	31	30	-	42	20	29	32[2]	31	32	31
DIVISION VIA										
Herring	141	66	136	111	48[2]	48	0[2]	32	0	0
Clyde herring	3.7	-	-	4.1	-	4.8	-	3.9	2.0	2.0
SUB-AREA VII (excl. Division VIIa)										
Cod	10.4	-	-	9.4	-	10.4	-	13.8	8[9]	9
Haddock	8.3	-	-	5.1	-	2.7	-	3	8[9]	9
Whiting	22.7	-	-	21.9	-	18.3	-	16.3	17[9]	18

For footnotes, see page 103.

... ctd.

Table 4. (continued)

Fishery	1975	1976			1977		1978		1979	1980
	Actual Catch	Recom. TAC	NEAFC TAC	Actual Catch	Recom. TAC	Actual Catch	Recom. TAC	Actual Catch[1)]	Recom. TAC	Recom. TAC
IRISH SEA										
Herring	30	-	-	21	12[2)]	15	9[2)]	11	11	10
Cod	10	-	-	10.3	-	8.1	8.6	6.3	7.3	5.0
Whiting	10	-	-	11.7	-	10.2	-	10.4	10	10
Plaice	4.06	4.0	4.15	3.47	4.0	2.90	4.0	3.23	2.5	2.5
Sole	1.44	1.6	1.67	1.46	1.4	1.15	1.4	1.09	1.4	1.3
DIVISION VIIB,C										
Herring	17	-	-	21	10	12	7	8	7	7
DIVISION VIIJ										
Herring	>5	-	-	>5	-	>5	-	8	-	6
ENGLISH CHANNEL										
Plaice VIId	2.82	3.26	3.34	2.57	2.0	2.17	2.5	2.14	2.2	(2.0
Plaice VIIe					0.45	0.72	0.6	0.76	0.72	(
Sole VIId	1.33	1.36	1.45	1.82	1.0	1.28	1.15	1.35	2.2	1.38
Sole VIIe					0.45	0.61	0.35	0.75	0.5	0.78
BRISTOL CHANNEL										
Plaice	0.47	0.5	0.64	0.31	0.4	0.33	0.4	0.39	0.4	
Sole	0.57	0.7	0.7	0.52	0.4	0.37	0.35[2)]	0.35	0.4	

For footnotes, see page 103.

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Table 4. (continued)

Fishery	1975	1976			1977		1978		1979	1980
	Actual Catch	Recom. TAC	NEAFC TAC	Actual Catch	Recom. TAC	Actual Catch	Recom. TAC	Actual Catch[1]	Recom. TAC	Recom. TAC
DIVISIONS VIIF AND VIIG										
Plaice	0.9	-	-	0.9	-	0.8	-	0.9	-	0.7
Sole	0.9	-	-	1.4	-	1.0	-	0.8	-	1.0
SUB-AREA VII AND DIVISIONS IVA, VIA AND VIIIA,B										
Hake	74	-	-	68	-	50	-	47	43	30
DIVISIONS VIIIC AND IXA										
Hake	30	-	-	27	-	16	-	14	20	10
SUB-AREAS VI, VII AND VIII										
Mackerel	491	295	-	507	250[2]	326	450[2]	507	435	335

1) Preliminary.
2) Revised.
3) Including Norwegian fjords south of 62°N.
4) Including Divisions VIId and VIIe.
5) Including Divisions IIIa and IIa.
6) 167 000 tonnes of this to be taken north of 60°N.
7) 100 000 tonnes of this to be taken north of 60°N and west of 2°E.
8) Including Division IIIa.
9) Excluding Division VIIf.
10) Subject to revision at a later stage.
11) Including Skagerrak.
12) Advice to be provided after the 67th Statutory Meeting of ICES in October 1979.

Table 5 COD. Nominal catch (tonnes, whole weight) by countries (landings of Norwegian coastal cod not included). (Sub-are I and Divisions IIa and IIb combined)

(Data provided by Working Group members)

Year	Faroe Islands	France	German Dem.Rep.	Germany Fed.Rep.	Norway	Poland	United Kingdom	USSR	Others	Total all countries
1960	3 306	22 321		9 472	231 997	20	141 175	213 400	351	622 042
1961	3 934	13 755	3 921	8 129	268 377	-	158 113	325 780	1 212	783 221
1962	3 109	20 482	1 532	6 503	225 615	-	175 020	476 760	245	909 266
1963	-	18 318	129	4 223	205 056	108	129 779	417 964	-	775 577
1964	-	8 634	297	3 202	149 878	-	94 549	180 550	585	437 695
1965	-	526	91	3 670	197 085	-	89 962	152 780	816	444 930
1966	-	2 967	228	4 284	203 792	-	103 012	169 300	121	483 704
1967	-	664	45	3 632	218 910	-	87 008	262 340	6	572 605
1968	-	-	255	1 073	255 611	-	140 387	676 758	-	1 074 084
1969	29 374	-	5 907	5 343	305 241	7 856	231 066	612 215	133	1 197 226
1970	26 265	44 245	12 413	9 451	377 606	5 153	181 481	276 632	-	933 246
1971	5 877	34 772	4 998	9 726	407 044	1 512	80 102	144 802	215	689 048
1972	1 393	8 915	1 300	3 405	394 181	892	58 382	96 653	166	565 287
1973	1 916	17 028	4 684	16 751	285 184	843	78 808	387 196	276	792 686
1974	5 717	46 028	4 860	78 507	287 276	9 898	90 894	540 801[1]	38 453	1 102 434
1975	11 309	28 734	9 981	30 037	277 099	7 435	101 834	343 580[1]	19 368	829 377
1976	11 511	20 941	8 946	24 369	344 502	6 986	89 061	343 057[1]	18 090	867 463
1977	9 167	15 414	3 463	12 763	388 982	1 084	86 781	369 876[1]	17 771	905 301
1978*	9 057	8 773	3 029	5 434	350 070	453	35 448	267 138[1]	4 777	684 179

*Provisional figures

1) Murman cod included

Table 6 HADDOCK. Nominal catch (tonnes) by countries.
(Sub-area I and Divisions IIa and IIb combined)

(Data provided by Working Group members)

Year	Faroe Islands	France	German Dem.Rep.	Germany Fed.Rep.	Norway	Poland	U.K.	USSR	Others	Total
1960	172	-	-	5 597	47 263	-	45 469	57 025	125	155 651
1961	295	220	-	6 304	60 862	-	39 650	85 345	558	193 234
1962	83	409	-	2 895	54 567	-	37 486	91 940	58	187 438
1963	17	363	-	2 554	59 955	-	19 809	63 526	-	146 224
1964	-	208	-	1 482	38 695	-	14 653	43 870	250	99 158
1965	-	226	-	1 568	60 447	-	14 345	41 750	242	118 578
1966	-	1 072	11	2 098	82 090	-	27 723	48 710	74	161 778
1967	-	1 208	3	1 705	51 954	-	24 158	57 346	23	136 397
1968	-	-	-	1 867	64 076	-	40 129	75 654	-	181 726
1969	2	-	309	1 490	67 549	-	37 234	24 211	25	130 820
1970	541	-	656	2 119	36 716	-	20 423	26 802	-	87 257
1971	81	-	16	896	45 715	43	16 373	15 778	3	78 905
1972	137	-	829	1 433	46 700	1 433	17 166	196 224	2 231	266 153
1973	1 212	3 214	22	9 534	86 767	434	32 408	186 534	2 501	322 626
1974	925	3 601	454	23 409	66 164	3 045	37 663	78 548[1]	7 348	221 157
1975	299	5 191	437	15 930	55 966	1 080	28 677	65 015[1]	3 163	175 758
1976	537	4 459	348	16 660	49 492	986	16 940	42 485[1]	5 358	137 265
1977	213	1 510	144	4 798	40 118	-	10 878	52 210[1]	287	110 158
1978*	32	1 075	369	1 518	39 275	2	5 767	45 895[1]	93	94 026

* Provisional figures.

1) Murman haddock included.

Table 7 Best estimate of effective mesh sizes and the maximum estimate of effective mesh sizes in the fisheries for North East Arctic COD and Haddock. The basic data are the average length and age compositions for 1967-77.

Fishery	COD				HADDOCK	
	Best estimate of effective mesh size		Maximum estimate of effective mesh size		Maximum estimate of effective mesh size	
	From length comp.	From age comp.	From length comp.	From age comp.	From length comp.	From age comp.
Sub-area I						
USSR trawl	90	103	93	107	92	105
Norway trawl	119	123	133	136	146	127
UK trawl	113	120	122	128	131	124
Sub-area II						
USSR trawl	111	122	114	127	142	153
Norway trawl	120	126	138	142	166	144
UK trawl	113	123	127	136	161	157
Sub-areas I + II						
Germany, Fed.Rep. trawl	113	109	116	113	155	146
Other countries' trawl	98	113	106	115	101	138
Danish seine	107	97	119	108	131	120
Gill-net	218	214	239	244	no fishery	no fishery
Long-and Handline	162	169	192	~ 200	147	126

Table 8 Nominal catch of Redfish (in tonnes) by countries (Sub-area I, Divisions IIa and IIb combined)

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium							30	28	2	2	-
Faroe Isl.			60		9	32	6	67	137	8	10
France							1 116		-	660	289
German Dem.Rep.	852	1 069	7 149	14 786	9 972	11 756	28 275	28 020	22 636	17 614	16 165
Germany, Fed.Rep.	3 258	5 573	2 416	3 076	1 697	3 479	6 597	5 182	7 894	7 231	11 461
Netherlands		20							127	-	-
Norway	4 024	3 904	3 832	4 644	6 776	7 714	7 055	4 966	7 305	7 381	7 765
Poland		5 973	4 631	2 532	1 112	215	1 269	4 711	4 137	175	2 957
Portugal								331	3 463	1 480	419
Spain								1 194	3 398	-	151
U.K.	5 058	5 224	4 554	4 002	4 379	4 791	3 509	2 746	4 961	6 330	2 272
USSR	5 477	9 144	13 091	29 839	22 647	31 829	48 787	230 950	263 546	144 993	78 092
Total	18 669	30 907	35 733	58 879	46 592	59 816	96 644	278 195	317 606	185 874	119 581**

* Provisional data

** The total figure used by the Working Group for assessments (including catches by non-members) is 121 759 tonnes.

Table 9 Nominal catch of Redfish (in tonnes) by countries in Sub-area I.

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium							30		2	1	-
Faroe Islands						6	6				-
France							26				-
German Dem. Rep.	25	23	4 912	78	36		358	201	90	-	-
Germany Fed.Rep.			133	148	7	76	1 086	483	635	786	-
Netherlands											
Norway	464	365	141	316	1 000	1 917	194	482	739	1 181	1 868
Poland		5 973	6	1	22			93	47	-	
Portugal								331	478	55	
Spain								820	301	-	
U.K.	1 163	1 385	1 384	1 406	1 363	1 894	1 320	1 048	1 392	1 686	707
USSR	1 076	3 647	2 281	3 743	4 403	4 885	9 318	30 750	12 411	13 154	2 575
Total	2 728	11 393	8 857	5 692	6 831	8 778	12 338	34 208	16 095	17 012	5 150

* Provisional data

Table 10 Nominal catch of Redfish (in tonnes) by countries in Division IIa

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Faroe Isl.			60		9	22		67	137	8	10**
France							980			478	282**
German Dem.Rep.		812	2 212	12 339	8 963	11 474	27 153	22 778	16 921	12 688	12 933
Germany, Fed.Rep.	3 258	5 573	2 165	1 188	1 466	2 207	4 167	4 263	6 722	4 764	11 460
Netherlands		20							127	-	-
Norway	3 518	3 510	3 679	4 277	5 720	5 564	6 837	4 444	6 515	6 050	5 853
Poland			269	1 605	784	156	869	920	217	47	2 477
Portugal									2 849	1 249	394**
Spain								153	2 082	-	88**
U.K.	3 820	3 578	2 741	2 463	2 680	2 125	1 991	1 621	2 919	4 064	1 524
USSR	3 779	14	142	209	291	131	14	39 138	20 307	94 639	31 783
Total	14 375	13 507	11 268	22 081	19 913	21 679	42 011	73 384	58 796	123 987	66 804

* Provisional data

** As reported to Norwegian authorities

Table 11 Nominal catch of Redfish (in tonnes) by countries in Division IIb

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium								28		-	
Faroe Isl.						4				-	
France							110			33	7**
German Dem.Rep.	827	234	25	2 369	973	282	764	5 041	5 625	4 926	3 232
Germany, Fed.Rep.			118	1 740	224	1 196	1 344	436	537	1 681	1
Norway	42	29	12	51	56	233	24	40	51	150	44
Poland			4 356	926	306	59	400	3 698	3 873	128	480
Portugal									136	176	25**
Spain								221	1 015	-	63**
U.K.	75	261	429	133	336	772	198	77	650	580	41
USSR	622	5 483	10 668	25 887	17 953	26 813	39 455	161 062	230 828	37 200	43 734
Total	1 566	6 007	15 608	31 106	19 848	29 359	42 295	170 603	242 715	44 874	47 627
Non-members											296

* Provisional data

** As reported to Norwegian authorities

Table 12 Nominal catch of Sebastes marinus and Sebastes mentella in Sub-area I and Divisions IIa and IIb combined (in tonnes)

Year	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
S. marinus	17 703	13 256	24 071	12 817	13 816	17 730	21 436	27 272	39 125	48 584	39 509	29 019
S. mentella	6 239	5 413	6 836	22 916	45 063	28 862	38 380	69 372	239 070	269 022	146 365	92 740
Total	23 942	18 669	30 907	35 733	58 879	46 592	59 816	96 644	278 195	317 606	185 874	121 759

* Provisional data

Table 13 Nominal catches of Redfish (in tonnes) by countries in Division Va (Iceland).

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*)
Belgium	4 117	3 360	2 204	2 798	2 484	1 622	2 114	1 945	1 522	1 395	1 549
Faroe Isl.	2	8		35	9	243	254	82	211	292	202
German Dem. Rep.	419	656	827	238	135		11		-	-	-
Germany, F.R.	62 521	55 831	48 907	46 580	43 963	38 358	36 398	33 602	32 948	31 632	-
Iceland	24 716	24 321	23 807	29 118	26 973	26 470	27 799	32 659	34 028	28 119	33 318
Netherlands		2							-	-	
Norway	20			1	1	4	15	22	31	87	82
Poland			259	17	35		18		-	-	
UK	3 871	2 302	2 948	3 552	3 697	2 951	2 519	2 424	1 124	+	-
USSR	809	1 256	10	31	28	2			-	-	-
Total	96 475	87 736	78 962	82 370	77 325	69 650	69 129	70 734	69 864	61 525	35 151

Table 14 Nominal catches of Redfish (in tonnes) by countries in Division Vb (Faroe Islands).

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*)
Faroe Isl.	1	5				121	28	9	33	54	1 525
France							300	800	-	1 368	332
German Dem.Rep.	45						1	1	-		
Germany, F.R.	6 358	1 293	1 914	2 328	4 034	9 490	7 328	7 628	5 255	5 854	7 769
Netherlands								105	-	-	-
Norway							10	7	17	10	9
UK	53	28	33	24	53	85	98	41	59	116	161
Total	6 637	1 326	1 947	2 352	4 087	9 696	7 765	8 591	5 364	7 402	9 796

*)provisional data.

Table 15 Nominal catch of Redfish (in tonnes) by countries in Sub-area XIV (East Greeland). Total nominal catch in ICNAF Sub-area I (West Greenland).

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*)
Canada									420	-	-
Greenland									129	1	3
Faroe Isl.						13	43	1	3	19	-
German Dem.Rep.		154	409	611	703	841	1 275	4 490	-		
Germany, F.R.	17 552	26 289	16 316	17 062	7 287	4 491	2 632	4 979	4 403	13 347	19 086
Iceland	5 527	3 906	1 001	2 380	5 490	2 144	9 777	5 632	7 410	81	151
Norway								63	5	112	3
Poland			436	312	464	281	6	276	-	-	-
UK			+	+	5	65	127	56	286	622	13
USSR		18		71	21	64	118	9 830	101 000	251	-
Total SA XIV	23 079	30 367	18 162	20 436	13 970	7 899	13 978	25 329	113 656	14 433	19 256
Total ICNAF SA I	9 606	4 252	4 101	2 756	2 988	3 319	3 324	8 629	13 698	31 808	10 000**)

Table 16 Nominal catch (in tonnes) of Redfish in Sub-area XIV, Divisions Va and Vb, and by species for Sub-area XIV and Sub-area V combined.

Year	Div. Va	Div. Vb	Sub-area XIV	Total	S. marinus	S. mentella
1965	114 100	5 862	36 513	156 475	97 006	59 469
1966	107 068	3 297	23 290	133 655	80 347	53 308
1967	95 083	5 013	33 198	133 294	85 249	48 045
1968	96 475	6 637	23 074	126 191	68 712	57 479
1969	87 736	1 326	30 367	119 429	79 467	39 962
1970	78 962	1 947	18 162	99 071	62 020	37 051
1971	82 370	2 352	20 436	105 158	68 374	36 784
1972	77 325	4 087	13 970	95 382	50 961	44 421
1973	69 650	9 696	7 899	87 245	41 818	45 347
1974	69 129	7 765	13 978	90 872	49 845	41 027
1975	70 734	8 591	25 329	104 654	60 980	43 674
1976	69 864	5 364	113 656	188 884	93 605	95 279
1977	61 525	7 402	14 433	83 360	52 752	30 608
1978*)	35 151	9 796	19 256	64 203	46 860	17 343

*) provisional data. **) estimate.

Table 17 Greenland halibut. Total nominal catch by main fishing areas (tonnes).

Year	Sub-area I	Div. IIb	Div. IIa	Div. Va	Div. Vb	Sub-area XIV	Total catch
1967	2 198	6 712	15 357	30 657	442	200	55 566
1968	2 488	8 935	14 745	21 036	647	189	48 040
1969	8 393	25 010	10 386	23 141	906	280	68 116
1970	4 011	70 523	14 950	30 001	-	3 822	123 307
1971	5 413	62 764	10 857	15 049	11	13 913	108 007
1972	8 549	18 873	15 633	10 666	417	15 389	69 527
1973	5 667	16 081	8 190	7 386	358	12 719	50 401
1974	5 251	24 660	7 852	7 866	325	28 089	74 043
1975	6 495	28 511	3 166	3 308	560	19 627	61 667
1976	2 479	29 610	3 985	5 448	324	273	42 119
1977	2 164	15 492	11 231	15 679	658	241	45 465
1978*	1 280	10 090	13 078	11 452	596	2 160	38 656

* Preliminary

Table 18 Greenland halibut. Nominal catch (tonnes) in Sub-areas I and II, 1968-78.
(Data for 1968-77 from Bulletin Statistique)

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Faroe Islands	-	-	44	-	-	-	-	-	2	21	-
German Dem.Rep.	257[1]	3 788[1]	18 729[1]	2 949[1]	1 633[1]	3 954	5 914	8 472	8 955	8 176	4 611
Germany,Fed.Rep.	-	71	-	3	3	59	88	94	31	148	321
Norway:											
trawl catch[1]:	-	-	1 638	2 309	9 656	10 217	4 656	1 686	4 030	2 526	2 300
long-line catch and gill net[1]:	22 514	14 856	14 233	7 157	6 327	3 772	4 135	3 172	1 975	1 688	1 780
Poland	-	5 314	19 262	12 277	7 981	2 140	5 146	3 645	3 566	224	544
UK(Engl.&Wales)	-	-	-	-	1 262	1 235	866	731	935	1 059	241
USSR	3 397[1]	19 760	35 578	54 339	16 193	8 561	16 958	20 372	16 580	15 045	14 651
Total	26 168	43 789	89 484	79 034	43 055	29 938	37 763	38 172	36 074	28 887	24 448

* Preliminary.
1) From national statistics.

Table 19 Greenland halibut. Nominal catch (tonnes) in Sub-areas V and XIV, 1968-78.
(Data for 1968-77 from Bulletin Statistique)

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Faroe Islands	-	-	4 122	1 316	1 180	188	48	8	375	1 251	252
German Dem.Rep.	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	2 019	1 686	-	1 163	1 529	1 120	1 949	1 388	2 219	5 207	2 727
Greenland	2	+	-	2	3	4	2	1	1	4	...
Iceland	1	5 880	7 345	5 020	4 640	2 118	2 843	1 212	1 689	10 090	11 187
Norway	-	-	338	369	186	-	-	7	7	7	20
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	19	22
USSR	13 535[1]	8 006[1]	2 220	5 486	1 333	1 066	1 772	1 634	74	-	-
Total	21 872	24 237	33 823	28 973	26 473	20 463	36 280	23 494	6 045	16 578	14 208

* Preliminary. 1) From national statistics.

Table 20 Faroe Plateau (Sub-division Vb_1) Cod. Nominal catches by countries, 1968-78 (tonnes).

Year	Faroe Islands	France	Germany Fed.Rep.of	Norway	Poland	UK England	UK Scotland	Others	Total
1968	13 763*)	1 260	1 556	686*)	-	5 620	7 394	-	30 279
1969	15 718*)	2 557*)	395	483	-	5 286	11 231	-	35 670
1970	15 245	2 616*)	443	238*)	-	2 236	8 259	-	29 037
1971	12 754	1 426*)	580	881*)	-	2 753	7 757	-	26 151
1972	12 143	1 462*)	451	266*)	-	2 159	5 175	-	21 656
1973	10 434	1 752*)	310	115	419*)	3 935	5 675	-	22 640
1974	12 541	465	292	446	320	2 879	7 516	20	24 479
1975	22 608	1 531	408	1 353	432	2 538	7 815	90	36 775
1976	28 502	1 535	247	1 282	496	2 179	5 491	67	39 871
1977	28 177	1 450	332	864	-	809	3 292	2	34 926
1978**)	24 078	168	71	243	-	515	1 460	-	26 535

*) Vb_2 included. **) Preliminary data.

Table 21 Faroe Bank (Sub-division Vb_2) Cod. Nominal catches by countries, 1968-78 (tonnes).

Year	Faroe Islands	France	Germany Fed.Rep. of	Norway	Poland	UK England	UK Scotland	Others	Total
1968	*	1 259	6	-	-	1 476	1 130	-	3 871
1969	*	*	8	-	-	1 431	1 018	-	2 457
1970	-	*	-	*	-	1 471	1 531	-	3 002
1971	-	*	-	*	-	732	1 345	2	2 079
1972	-	*	-	*	-	860	1 308	-	2 168
1973	2 842	*	-	-	*	1 144	1 081	-	5 067
1974	696	86	-	-	-	829	503	40	2 154
1975	378	81	50	-	-	749	804	55	2 117
1976	457	72	+	1	-	877	912	11	2 330
1977	851	219	-	99	-	9	780	-	1 958
1978**)	4 194	28	-	160	-	2	1 071	-	5 455

*) Catches included in Vb_1. **) Preliminary data.

Table 22 Faroe Plateau Haddock. Nominal catches by countries, 1968-78 (tonnes).

Year	Faroe Islands	France	Germany Fed.Rep. of	Norway	Poland	UK England	UK Scotland	Others	Total
1968	6 751*)	1 143	36	-	-	2 158	5 783	-	15 871
1969	11 122*)	3 314*)	73	-	-	1 549	6 392	-	22 450
1970	11 791	2 006*)	14	-	-	769	5 428	-	20 008
1971	10 488	790*)	19	-	-	1 896	4 949	-	18 142
1972	8 314	2 660*)	24	-	-	844	2 842	-	14 690
1973	4 931	3 508	46		1 190*)	1 510	3 665	-	14 850
1974	4 538	1 242	70	5	685	1 044	5 572	30	13 186
1975	8 625	2 173	120	56	544	1 505	4 896	383	18 302
1976	12 670	2 472	22	20	448	1 551	6 671	181	24 035
1977	19 806	623	49	46	5	705	3 278	26	24 538
**) 1978	15 783	72	7	74	-	46	367	-	16 349

*)Catches including Vb_2. **)Preliminary estimates.

Table 23 Faroe Bank Haddock. Nominal catches by countries, 1968-78 (tonnes).

Year	Faroe Islands	France	Germany Fed.Rep. of	Norway	Poland	UK England	UK Scotland	Others	Total
1968	*	1 143	-	-	-	287	556	-	1 986
1969	*	*	-	-	-	427	423	-	850
1970	-	*	-	-	-	368	993	-	1 361
1971	-	*	-	-	-	427	813	29	1 269
1972	-	*	1	-	-	527	1 267	-	1 795
1973	1 087	*	-	-	*	916	1 123	-	3 126
1974	273	209	-	-	-	573	500	22	1 577
1975	132	125	53	-	-	921	1 182	-	2 413
1976	44	70	+	-	-	733	1 329	-	2 176
1977	273	77	-	11	-	4	650	-	1 015
1978**)	2 544	5	-	36	-	-	394	-	2 979

*) Catches are included in Vb_1. **) Preliminary estimates.

Table 24 Summary of total landings of Saithe from the main fishing areas (in tonnes, whole weight). This table is based on the biological data supplied to the Working Group and used in the assessments. These figures differ to some extent from the official Bulletin Statistique data, which are used for Tables 25, 26, 27, 28 and 29.

(IV + IIIa includes industrial fishery by-catch by Denmark and Norway)

Year	Fishing area					Total
	I + II	IV+IIIa	Va	Vb	VI	
1960	136 006	31 515	48 120	11 845	8 349	235 835
1961	109 821	35 489	50 826	9 592	6 723	212 451
1962	122 841	24 559	50 514	10 454	7 159	215 527
1963	148 036	30 300	48 011	12 693	6 609	245 649
1964	198 110	58 669	60 257	21 893	13 596	352 525
1965	184 548	73 274	60 177	22 181	18 395	358 575
1966	201 860	95 025	52 003	25 563	18 534	392 985
1967	191 191	76 759	75 712	21 319	16 034	381 015
1968	107 181	98 179	77 549	20 387	12 787	316 083
1969	140 379	115 550	115 853	27 437	17 214	416 433
1970	260 404	222 100	116 601	29 110	14 538	642 753
1971	244 732	252 619	136 764	32 706	19 246	686 067
1972	214 386	245 801	111 301	42 186	29 225	642 899
1973	214 153	225 771	110 888	57 574	35 812	644 198
1974	261 223	272 944	97 568	47 188	36 298	715 221
1975	233 453	278 126	87 954	41 578	30 949	672 060
1976	242 486	319 758	82 003	33 067	41 432	718 746
1977	182 808	194 858	62 026	34 835	28 467	502 994
1978*	146 997	145 022	47 852	28 138	31 158	399 167

* Preliminary

Table 25 Nominal catch (tonnes) of Saithe in Sub-area I and Divisions IIa and IIb, 1969-78.
(Data for 1969-77 from Bulletin Statistique)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium	-	-	-	-	-	5	47	1	-	-
Faroe Islands	20	1 097	215	109	7	46	28	20	270	615
France	193	-	14 536	14 519	11 320	7 119	3 156	5 609	5 658	3 571
German Dem.Rep.	6 744	29 200	16 840	7 474	12 015	29 466	28 517	10 266	7 164	6 484
Germany,Fed.Rep.	4 355	23 466	12 204	24 595	30 338	33 155	41 260	49 056	19 985	18 179
Netherlands	23	-	-	-	-	-	-	64	-	-
Norway	115 140	151 759	128 499	143 775	148 789	152 699	122 598	131 675	139 705	114 588
Poland	-	-	6 017	1 111	23	2 521	3 860	3 164	1	35
Portugal	-	-	-	-	-	-	6 430	7 233	783	183
Spain	-	-	13 097	9 247	2 115	7 075	11 397	21 661	1 327	210
Sweden	-	-	-	-	-	-	8[a)]	-	-	-
UK (Engl.&Wales)	13 585	15 469	10 361	8 223	6 503	3 001	2 623	4 651	6 853	2 790
UK (Scotland)	-	221	106	125	248	103	140	73	82	37
USSR	-	43 550	39 397	1 278	2 411	28 931	13 389	9 013	989	305
Total	140 060	264 762	241 272	210 456	213 769	264 121	233 453	242 486	182 817	146 997

* Preliminary.

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

Table 26 Nominal catch (tonnes) of Saithe in Sub-area IV and Division IIIa, 1969-78.
(Data for 1969-77 from Bulletin Statistique)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium	135	36	44	59	55	33	81	127	107	23
Denmark	5 566	4 600	11 500	17 000	10 100	8 388	10 149	15 111	17 334	10 243
Faroe Islands	2	-	18	182	552	581	287	425	318	213
France	24 631	38 873	38 330	26 696	32 961	28 619	24 396	32 552	41 022	38 103
German Dem.Rep.	5 998	4 250	6 398	10 674	7 668	5 816	5 882	2 088	2 430	2 404
Germany Fed.Rep.	7 242	6 022	4 217	8 665	12 003	20 589	18 622	38 698	26 860	25 889
Iceland	2	18	97	4	23	5	1	-	-	-
Ireland	-	-	-	-	-	-	-	119	126	-
Netherlands	18 214	20 460	18 136	12 532	9 232	14 504	8 917	6 101	7 270	5 134
Norway	8 159	11 201	15 184	23 256	15 219	9 246	12 483	17 856	14 949	21 483
Poland	-	-	4	186	7 512	22 203	35 304	35 819	12 378	5 661
Spain	-	-	-	190	108	308	249	-	-	-
Sweden	4 322	1 921	4 523	3 899	1 876	1 187	913	1 271	1 275	369
UK(Engl.+Wales)	3 819	2 664	3 162	3 744	3 378	4 353	3 472	6 300	6 822	8 454
UK (Scotland)	3 838	5 293	6 106	10 797	10 834	10 956	8 898	13 034	11 366	14 319
USSR	32 830	68 062	110 200	99 883	83 333	104 500	110 743	83 669	46 385	10 161
Sub-total	114 758	163 400	217 919	217 767	194 854	231 288	240 397	253 170	188 642	142 456
By-Catch from Industrial Fisheries:										
Denmark[a)]		58 700	34 700	22 600	24 400	38 800	27 800	53 684	1 805	72
Norway[a)]				5 434	6 517	3 469	9 878	13 082	4 392	2 494
TOTAL	114 758	222 100	252 619	245 801	225 771	273 557	278 075	319 936	195 377	145 022

* Preliminary.

a) Data for by-catch from industrial fisheries from national laboratories.

Table 27 Nominal catch (tonnes) of Saithe in Division Va, 1969-78.
(Data for 1969-77 from Bulletin Statistique)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium	3 995	4 153	3 490	2 250	2 131	2 371	1 638	1 615	1 448	1 068
Faroe Islands	119	2 386	2 046	857	1 467	1 712	1 366	3 267	3 013	4 250
France	8 122	2 046	3 987	-	-	94	32	51	-	-
German Dem.Rep.	357	3 527	2 637	3 471	-	-	-	-	-	-
Germany, Fed.Rep.	34 732	27 806	40 628	30 918	38 565	18 627	13 820	13 785	10 575	-
Iceland	53 988	63 882	60 080	59 945	56 567	65 169	61 430	56 811	46 973	42 531
Netherlands	52	-	-	-	-	-	-	-	-	-
Norway	-	-	-	-	-	-	6	5	4	3
Poland	-	-	113	150	-	-	-	-	-	-
Spain	-	-	59	-	-	-	-	-	-	-
UK (Engl. + Wales)	13 665	10 634	21 767	13 152	11 874	8 845	8 643	6 024	13	-
UK(Scotland)	1 605	2 402	1 743	545	509	731	1 021	443	-	-
USSR	65	-	5	-	-	-	-	-	-	-
Total	116 700	116 836	136 555	111 288	111 113	97 549	87 956	82 001	62 026	47 852

* Preliminary

Table 28 Nominal catch (tonnes) of Saithe in Division Vb, 1969-78.
(Data for 1969-77 from Bulletin Statistique)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium	-	-	-	-	-	-	-	6	-	-
Faroe Islands	4 835	2 694	5 653	5 646	2 973	3 726	2 517	2 560	5 153	15 892
France	7 899	11 036	12 394	24 006	22 676	20 457	23 980	15 367	17 038	8 128
German Dem.Rep.	-	-	-	-	-	130	26	-	-	-
Germany,Fed.Rep.	4 676	2 211	2 254	3 440	9 329	6 661	5 229	2 605	3 086	1 088
Netherlands	-	-	63	-	-	-	491	232	58	-
Norway	378	1 495	1 839	470	355	1 660	486	2 232	1 279	1 124
Poland	-	-	-	-	4 050	1 925	815	1 007	-	-
Spain	-	-	-	423	390	500	654	117	-	-
UK(England & Wales)	4 303	3 066	3 305	2 453	7 527	3 827	2 428	3 063	2 613	557
UK(Scotland)	5 346	8 608	7 198	6 225	10 131	8 302	4 950	5 860	5 608	1 349
USSR	-	-	-	-	-	-	-	16	-	-
Total	27 437	29 110	32 706	42 663	57 431	47 188	41 576	33 065	34 835	28 138

* Preliminary.

Table 29 Nominal catch (tonnes) of Saithe in Sub-area VI, 1969-78.
(Data for 1969-77 from Bulletin Statistique)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium	40	34	29	125	191	209	21	95	-	-
Denmark	-	-	-	-	-	-	-	3	-	-
Faroe Islands	-	-	-	-	4	6	6	7	11	-
France	8 109	5 140	12 017	17 718	18 970	22 802	19 946	29 216	19 686	21 316
German Dem.Rep.	-	-	-	-	-	-	8	3	-	-
Germany,Fed.Rep.	1 988	545	1 068	350	52	16	481	511	254	756
Ireland	-	-	-	-	-	-	-	375	240	243
Iceland	-	1	1	-	+	-	+	-	-	-
Netherlands	14	7	32	638	67	124	702	547	527	633
Norway	-	-	-	-	2	22	10	17	91	11
Poland	-	-	2	-	394	125	164	91	-	-
Spain	-	-	-	1 302	1 980	1 862	1 882	1 012	346	-
UK(Engl.&Wales)	4 015	3 615	1 965	2 268	2 138	1 333	1 571	1 560	2 758	3 240
UK (N.Ireland)	13	19	24	6	14	3	12	13	9	27
UK(Scotland)	3 035	5 175	4 620	6 706	11 330	9 527	6 131	5 807	4 628	5 181
USSR	-	-	105	112	670	269	15	2 550	-	-
Total	17 214	14 536	19 863	29 225	35 812	36 298	30 949	41 807	28 550	31 407

* Preliminary.

Table 30. Herring.
Catch in tonnes 1968-78.
North Sea (Sub-area IV and Divisions VIId and e) by country.
Skagerrak (Division IIIa excl. Kattegat) total catch.
(Data provided by Working Group members)

Country/Year	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium	134	468	1 200	681	1 337	2 160	603	2 451	1 430	57	-
Denmark	163 100	180 260	133 331	185 393	213 738	174 254[a]	61 728	115 616	34 841	12 769	2 806
Faroe Isls.	49 995	40 640	58 365	45 524	48 444	54 935[b]	26 161[b]	25 854	14 378	8 070	40
Finland	-	-	-	-	-	-	-	-	1 034	-	-
France	12 852	15 307	11 482	11 408	12 901	22 235	12 548	20 391	14 468	1 613	2 016
German Dem.R.	-	-	290	475	127	1 728	3 268	2 689	2 624	2	-
Germany,F.R.	21 216	12 798	7 150	3 570	3 065	10 634[c]	12 470	6 953	1 654	221	-
Iceland	44 489	19 997	22 951	37 171	31 998	23 742[d]	29 017	16 286	9 412	-	-
Netherlands	22 306	29 769	46 218	32 479	24 829	34 070	35 106	38 416	20 146	4 134	-
Norway	211 904	114 938	193 102	125 842	117 501	99 739	40 975	34 183	27 386	4 065	1 189
Poland	11 954	9 221	5 057	2 031	2 235	5 738	9 850	7 069	7 072	2	-
Sweden	88 061	33 109	34 670	36 880	7 366	4 222[e]	3 561	6 858	4 777	3 616	-
UK(England)	5 128	6 666	9 702	4 113	394	2 268	5 699	6 475	9 662	3 224	2 652
UK(Scotland)[f]	16 477	22 053	21 885	25 073	17 227	16 012	15 034	8 904	15 015	8 159	431
USSR	70 029	61 549	18 078	9 500	16 386	30 735	18 096	20 653	10 935	78	4
Total North Sea	717 645	564 775	563 481	520 140	497 548	484 012	275 116	312 798	174 834	46 010	9 138
Skagerrak	280 036	113 279	71 071	61 570	67 021	84 566	55 512	51 911	15 550	37 618	21 227
GRAND TOTAL	997 681	660 054	634 552	581 710	564 569	568 578	330 628	364 709	190 384	83 628	30 365

* Preliminary.

a) Total includes 2 107 tonnes for human consumption unspecified as to area.

b) Supplied by Fiskirannsóknarstovan.

c) From Federal Republic of Germany national statistics compiled by Federal Research Board of Fisheries, Hamburg.

d) Excludes 15 938 tonnes caught on Skagerrak border and allocated to that area on the basis of age analysis.

e) Swedish catches in Danish ports reported by area (North Sea, Skagerrak) used for area allocation of Swedish landings reported as Skagerrak and North Sea in Swedish statistics.

f) Catches from Moray Firth not included.

Table 31. Herring landings. Skagerrak 1970-78 (in tonnes).
(Working Group data)

Year	Denmark	Faroe Isl.	Germany Fed.Rep.	Iceland	Norway	Sweden	Total	Norwegian fjords	Grand total
1970	30 107	-	-	6 453	7 581	26 930	71 071	1 830	72 901
1971	26 985	5 636	-	3 066	6 120	19 763	61 570	3 166	64 736
1972	34 900	4 115	-	7 317	1 045	19 644	67 021	4 222	71 241
1973	42 098	5 265	-	15 938	836	20 429	84 566	1 680	66 246
1974	35 732	7 132	36	231	698	11 683	55 512	1 720	57 214
1975	29 997	8 053	108	1 209	196	12 348	51 911	1 459	53 370
1976	7 363	1 553	6	123	-	6 505	15 550	2 304	17 854
1977	19 382	10 064	32	-	-	8 109	37 587	1 837	39 424
1978[x)]	6 425	1 041	28	-	1 860	11 551	20 905	2 271	23 176

x) Preliminary.

Table 32. Herring landings. Kattegat 1968-78 (in tonnes).
C = landed for human consumption. I = industrial landings.
(Working Group data)

Year	Sweden		Denmark		Total		Grand Total
	C	I	C	I	C	I	
1968	27 400	14 400	9 030	58 422	36 430	72 822	109 252
1969	21 400	10 300	7 912	31 137	29 312	41 437	70 749
1970	31 400	9 053	10 562	28 872	41 962	37 925	79 887
1971	36 586	13 174	10 588	39 589	47 174	52 763	99 937
1972	26 214	13 758	12 740	40 015	38 954	53 773	92 727
1973	27 969	12 449	8 713	69 412	36 682	81 861	118 543
1974	22 356	17 423	7 705	46 835	30 061	64 258	94 319
1975	20 074	3 695	8 619	40 355	28 693	44 050	72 743
1976	27 652	2 611	7 820	33 929	35 472	36 540	72 012
1977	31 502	5 658	5 190	33 015	36 692	38 673	75 365
1978x)	31 766	3 427	20 042	9 199	51 808	12 626	64 434

x) Preliminary.

Table 33. Annual Celtic Sea herring catches 1965-78.

(Data provided by Working Group members)

Year	France	German Dem.Rep.	Germany Fed.Rep.	Ireland	Netherlands	Poland	UK	USSR	Total
1965	1 742	-	353	3 980	7 198	-	1 054	-	14 327
1966	5 506	-	1 143	6 891	16 605	112	197	-	31 454
1967	3 825	-	910	11 133	13 184	300	398	-	29 750
1968	2 637	-	1 662	9 480	15 679	130	598	-	30 186
1969	7 038	-	5 906	18 712	16 256	252	400	-	48 164
1970	3 629	-	1 481	24 702	7 015	1 191	220	-	38 236
1971	3 393	-	974	12 602	9 672	881	65	-	27 587
1972	7 327	-	393	20 109	6 758	751	-	618	35 956
1973	5 553	7	294	13 105	5 834	1 125	-	334	26 375[a]
1974	2 261	-	433	13 991	2 105	954	-	-	19 744
1975	1 924	-	361	8 430	2 825	512	24	1 054	15 130
1976	1 919	147	28	3 705	1 627	324	-	826	8 258
1977	106	-	96	1 394	1 455	-	-	-	3 051
1978*)	4	-	220	2 725	1 002	-	-	-	3 951

*) Preliminary. a) Including 123 tonnes for Bulgaria.

Table 34. Celtic Sea herring catches by season (1 April to 31 March).

(Data provided by Working Group members)

Year	France	German Dem.Rep.	Germany Fed.Rep.	Ireland	Netherlands	Poland	UK	USSR	Total
1965/6	1 742		353	3 482	13 071	-	1 054		19 702
1966/7	5 506		1 143	8 061	11 459	112	197		26 478
1967/8	3 825		910	10 736	10 204	425	398		26 498
1968/9	2 637		1 662	11 996	12 191	130	598		29 214
1969/70	7 038		5 906	16 712	13 111	261	400		43 428
1970/1	3 627		1 481	19 106	4 667	778	220		29 879
1971/2	3 383		974	13 757	10 600	880	65		29 659
1972/3	7 327		393	18 846	6 852	751	-	618	34 878
1973/4	4 143	7	294	11 317	5 834	1 139	-	334	23 191[a]
1974/5	2 150	-	435	11 683	2 462	954	-	-	17 684
1975/6	2 451	-	399	6 524	2 441	579	24	1 054	13 472
1976/7	1 371	147	36	2 970	1 324	257	-	826	7 019
1977/8	95	-	96	1 322	1 378	-	-	-	2 891
1978/9*)	3	-	220	2 656	1 002	-	-	-	3 881

* Preliminary. a) Including 123 tonnes for Bulgaria.

Table 35. Total catches of herring (tonnes) in Division VIa, 1969-78.
(Data provided by Working Group members)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium	-	-	-	-	-	-	-	12	-	-
Denmark	-	-	554	150	932	-	374	249	626	-
Faroe Islands[a]	-	15 100	8 100	8 094	10 003	5 371	3 895	4 017	3 564	-
France	966	1 293	2 055	680	2 441	547	1 293	1 528	1 548	1 409
German Dem.Rep.	416	207	330	935	2 507	2 037	1 994	929	-	-
Germany, Fed.Rep.of	15 805	16 548	7 700	4 108	17 443	14 354	9 099	4 980	221	126
Iceland	-	5 595	5 416	2 066	2 532	9 566	2 633	3 273	-	-
Ireland[b]	11 895	11 716	12 161	17 308	14 668	12 557	10 417	8 558	7 189	10 208
Netherlands	1 514	1 102	9 252	23 370	32 715	19 635	19 360	20 812	8 515	5 929
Norway	-	20 199	76 720	17 400	36 302	26 218	512	5 307	1 098	4 462
Poland	3 188	3 709	-	-	5 685	6 368	2 934	3 085	6	-
Sweden	-	-	-	-	-	-	-	2 206	261	-
UK (England)	3	1	-	-	-	45	125	20	301	134
UK (N.Ireland)	3	1	-	-	-	3	6	1	1	6
UK (Scotland)	90 222	103 530	99 537	107 638	120 800	107 475	85 395	53 351	25 238[c]	10 097[c]
USSR	-	3	-	?	2 052	5 388	3 232	3 092	-	-
Total	124 012	179 004	221 825	181 749	248 080	209 564	141 269	111 420	48 568	32 371
Scottish juvenile herring and sprat fisheries in Moray Firth	3 100	1 385	5 666	10 242	7 219	13 003	2 454	313	205	276

*) Preliminary figures.
a) Figures supplied by Fiskirannsoknarstovan.
b) Catches prior to 1976 mainly taken in Division VIIb and landed in Division VIa.
c) Including by-catch in local sprat fishery (16 tonnes in 1977; 157 tonnes in 1978).

Table 36. Herring in Division VIIb,c. Nominal catches (tonnes) 1967-78. (Data for 1967-75 from Bulletin Statistique; for 1976-78 the Working Group data).

Year	France	German Dem.Rep.	Germany Fed.Rep.	Ireland	Nether-lands	Poland	UK	USSR	Total
1967				108					108
1968	713			30	525				1 268
1969			71	145	355				571
1970	733		180	1 518	179			2	2 612
1971	42		52	1 646	61				1 801
1972	312		23	3 154	71			347	3 907
1973			5	5 036	200				5 241
1974	10		-	4 412	51		25	1 266	5 764
1975	20		914	5 576	9 815			646	16 971
1976		240	28	5 537	12 306	83		118	18 312
1977*				8 727	4 194			-	12 921
1978*				7 057	475				7 532

* Preliminary.

Table 37. Monthly landings (tonnes) of herring from the Firth of Clyde (all fishing methods combined).

(Data provided by Working Group members)

Month	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
Jan	506	446	272	*	*	*	*	*	*	4*)
Feb	1 820	1 569	491	52*)	71*)	91*)	68*)	7*)	*	6*)
Mar	232	263	495	82*)	36*)	168*)	85	69*)	*	7*)
Apr	510	526	406	400	316	398	369	521	530	246
May	760	325	305	569	385	280	283	436	544	245
Jun	700	793	111	657	468	607	203	281	640	238
Jul	1 266	1 249	260	416	688	690	354	332	494	376
Aug	960	680	385	700	593	543	240	473	601	586
Sep	894	404	519	263	668	310	515	541	559	581
Oct	1 329	824	461	410	711	451	811	598	556	653
Nov	1 204	283	193	463	464	245	571	595	560	647
Dec	380	342	190	166	248	91	120	236	328	267
NK	33	59		48	67	189	44	50	35	
Total	10 594	7 763	4 088	4 226	4 715	4 063	3 663	4 139	4 847	3 857

*) Subject to closure of directed herring fishery.

Table 38. Herring. Total catches in North Irish Sea (Division VIIa), 1967-78 (includes industrial catch).

Country	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*)
France	-	-	-	558	1 815	1 224	254	3 194	813	651	85	174
Ireland	118	68	2 328	3 933	3 131	2 529	3 614	5 894	4 790	3 205	3 331	2 371
Netherlands	-	-	-	-	-	260	143	1 116	630	989	500	98
UK	7 145	8 389	9 821	17 912	21 861	23 337	18 587	27 489	18 244	16 401	11 498	8 432 1)
USSR	-	-	-	-	-	-	-	945	26	-	-	
Total	7 263	8 457	12 149	22 403	26 807	27 350	22 598	38 638	24 503	21 246	15 414	11 075

*) Preliminary. 1) Includes 68.5 tonnes of spring-spawned herring.

Table 39. Herring. Total catch by stock in North Irish Sea, 1967-78.
(Working Group data)

Country	1967		1968		1969		1970		1971		1972	
	1	2	1	2	1	2	1	2	1	2	1	2
France	-	-	-	-	-	-	558	-	1 815	-	1 224	-
Ireland	-	118	-	68	-	2 328	-	3 933	-	3 131	-	2 529
Nether-lands	-	-	-	-	-	-	-	-	-	-	260	-
UK	5 885	1 260	7 645	744	9 139	682	15 629	2 283	18 758	3 103	19 308	4 029
USSR	-	-	-	-	-	-	-	-	-	-	-	-
Total Manx	5 885		7 645		9 139		16 187		20 573		20 792	
Total Mourne	1 378		812		3 010		6 216		6 234		6 558	

(ctd.)

Country	1973		1974		1975		1976		1977		1978 *)	
	1	2	1	2	1	2	1	2	1	2	1	2
France	254	-	3 194	-	813	-	651	-	85	-	87	87
Ireland	-	3 614	1 783	4 111	2 406	2 384	1 816	1 389	2 009	1 322	610	1 761
Nether-lands	-	143	1 116	-	630	-	989	-	500	-	98	-
UK	13 071	5 516	23 639	3 850	15 408	2 836	12 831	3 570	9 837	1 661	7 663	700
USSR	-	-	945	-	26	-	-	-	-	-	-	-
Total Manx	13 325		30 677		19 283		16 287		12 431		8 458	
Total Mourne	9 273		7 961		5 220		4 959		2 983		2 548	

Note

1 = Manx stock
2 = Mourne stock
*) Preliminary

(Data provided by Working Group members)

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978[a]
IVa West											
Denmark	-	-	-	-	-	-	5.3	0.5	0.6	0.1	-
Faroe Islands	-	-	-	-	-	-	0.2	12.9	2.5	0.4	-
France	-	-	-	-	-	-	-	-	-	+	-
German Dem.Rep.	-	-	-	-	-	-	-	-	-	+	-
Germany, Fed.Rep. of	-	-	-	-	-	+	-	-	+	0.6	-
Netherlands	+	+	+	+	+	+	+	+	+	+	-
Norway	-	-	-	0.9	2.2	-	-	1.5	29.9	16.0	1.3
Poland	-	-	-	-	+	+	-	0.3	-	-	-
Sweden	-	-	-	-	-	1.0	2.2	11.0	+	0	-
UK (England)	-	-	-	+	-	0.2	-	-	-	0	-
UK (Scotland)	13.0	12.4	3.8	15.0	29.8	49.4	41.2	9.4	12.7	26.9	16.9
USSR	-	-	-	-	-	-	1.0	1.3	1.2	+	-
Total	13.0	12.4	3.8	15.9	32.0	50.6	49.9	36.9	46.9	44.0	18.2
IVa East (North Sea stock)											
Denmark	-	-	-	-	-	-	-	-	0.2	0.1	-
Norway	-	-	-	-	-	-	-	-	1.9	0.7	0.1
UK (Scotland)	-	-	-	-	-	-	-	-	+	0	-
Total	-	-	-	-	-	-	-	-	2.1	0.8	0.1
IVb West											
Belgium	-	-	-	-	-	-	-	-	+	0	-
Denmark	...	...	8.6	9.9	14.4	47.0	55.4	106.6	104.4	57.5	44.1
Faroe Islands	-	-	-	-	-	-	4.0	30.0	42.9	1.8	-
France	1.0	-	-	-	-	-	-	-	-	+	-
German Dem.Rep.	-	-	-	-	-	-	1.7	4.5	6.4	0.7	-
Netherlands	+	2.0	+	+	+	-	-	-	-	0	-
Norway	-	-	-	-	4.1	3.4	9.5	145.7	73.0	5.5	56.2
Poland	+	-	-	-	+	-	-	9.1	10.5	0	-
Sweden	-	-	-	-	-	-	-	-	7.9	0	-
UK (England)	2.6	3.3	11.2	25.5	21.8	34.6	25.5	32.5	49.7	51.9	53.9
UK (Scotland)	13.4	22.0	9.5	7.2	3.6	2.9	8.6	4.9	18.1	10.9	14.8
USSR	-	-	-	1.2	0.8	17.9	32.9	47.8	50.4	1.6	-
Total	17.0	27.3	29.3	43.8	44.7	105.8	137.7	381.1	362.3	123.9	169.0

a)Preliminary figures as reported. + = less than 0.1. ... = No data available. - = Magnitude known to be nil.

/Cont'd.

Table 40 (ctd)

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978[a)]
IVb East											
Denmark	18.1	18.5	16.2	19.9	28.8	93.9	104.0	215.2	201.1	126.8	161.0
German Dem.Rep.	-	-	-	-	-	-	-	0.4	-	0.7	-
Germany, Fed.Rep.of	16.7	6.3	7.6	5.1	1.7	11.0	17.5	0.5	1.7	4.3	-
Norway	-	-	-	-	-	-	-	-	5.1	0	29.8
Sweden	-	-	-	-	-	-	-	-	-	1.5	-
Total	34.8	24.8	23.8	25.0	30.5	104.9	121.5	216.1	207.9	133.3	190.8
IVc											
Belgium	0.4	0.4	0.6	0.1	0.1	0.2	+	+	-	0	-
Denmark	-	-	-	-	-	-	0.9	3.9	0.3	1.4	-
France	+	0.1	+	+	-	+	0.3	0.1	-	+	-
German Dem.Rep.	-	-	-	-	-	-	-	-	0.1	+	-
Germany, Fed.Rep.of	-	-	+	-	+	-	-	-	-	0.4	-
Netherlands	1.0	1.6	1.5	1.0	0.4	+	+	0.2	-	0	-
Norway	-	-	-	-	-	-	-	-	-	-	0.2
UK (England)	6.2	4.2	3.9	0.2	+	0.8	3.4	2.9	0.7	0.2	0.0
USSR	-	-	-	-	-	-	+	+	0.2	-	-
Total	7.6	6.3	6.0	1.3	0.5	1.0	4.6	7.1	1.3	2.0	0.2
Total North Sea											
Belgium	0.4	0.4	0.6	0.1	0.1	0.2	+	+	+	+	+
Denmark	18.1	18.5	24.8	29.8	43.2	140.9	165.6	326.2	306.6	179.9	205.1
Faroe Islands	-	-	-	-	-	-	4.2	42.9	45.4	2.2	-
France	1.0	0.1	+	+	-	+	0.3	0.1	-	+	-
German Dem.Rep.	-	-	-	-	-	-	1.7	4.9	6.5	1.4	-
Germany, Fed.Rep.of	16.7	6.3	7.6	5.1	1.7	11.0	17.5	0.5	1.7	5.3	-
Netherlands	1.0	3.6	1.5	1.0	0.4	+	+	0.2	+	+	-
Norway	-	-	-	0.9	6.3	3.4	9.5	147.2	109.9	22.2	87.6
Poland	+	-	-	-	+	+	-	9.4	10.5	+	-
Sweden	-	-	-	-	-	1.0	2.2	11.0	7.9	1.5	-
UK (England)	8.8	7.5	15.1	25.7	21.8	35.6	28.9	35.4	50.4	52.1	53.9
UK (Scotland)	26.4	34.4	13.3	22.2	33.4	52.3	49.8	14.3	30.8	37.8	31.7
USSR	-	-	-	1.2	0.8	17.9	33.9	49.1	51.8	1.6	-
Total	72.4	70.8	62.9	86.0	107.7	262.3	313.6	641.2	621.5	304.0	378.3

Table 41. Landings of sprat in Division IIIa and in Norwegian fjords south of 62°N lat. (in thousand tonnes).
(Data provided by Working Group members)

Year	SKAGERRAK				KATTEGAT			IIIa total	Norwegian fjords south of 62°N	Grand total
	Denmark	Sweden	Norway	Total	Denmark	Sweden	Total			
1969	0.8	1.9	1.7	4.4	0.8	1.6	2.4	6.8	11.8	18.6
1970	1.1	2.4	2.4	5.9	3.1	6.0	9.1	15.0	6.4	21.4
1971	0.7	2.4	2.9	6.0	1.5	9.6	11.1	17.1	4.4	21.5
1972	0.8	3.3	2.4	6.5	1.4	17.9	19.3	25.8	6.9	32.7
1973	19.4	2.5	3.2	25.1	19.3	16.2	35.5	60.6	8.8	69.4
1974	17.3	2.0	1.2	20.5	31.6	18.6	50.2	70.7	3.3	74.0
1975	14.9	2.1	1.9	18.9	69.7	20.9	90.6	109.5	2.9	112.4
1976	12.8	2.6	2.0	17.4	30.4	13.5	43.9	61.3	0.6	61.9
1977	7.2	2.2	1.2	10.6	53.3	9.8	63.1	73.7	5.4	79.1
1978	23.1	2.2	2.7	28.0	36.1	9.4	45.5	73.5	5.2	78.7

Table 42. Cod landings from Division IIIa - Kattegat and Skagerrak.
(Danish and Swedish landings from national sources, other countries from Bulletin Statistique).

Year	Denmark	Norway	Sweden	Others	Total
1966	14 618	1 016	8 186	72	23 892
1967	15 514	1 347	7 881	149	24 891
1968	15 066	1 390	9 292	186	25 934
1969	12 280	903	5 801	59	19 043
1970	13 300	882	5 979	56	20 217
1971	17 662	1 355	6 002	35	25 054
1972	20 410	1 201	5 862	56	27 549
1973	21 566	1 253	5 540	101	28 480
1974	23 737	1 197	6 097	213	31 244
1975	25 920	1 190	4 559	146	31 815
1976	31 833	1 241	4 537	513	38 124
1977	33 475	979	5 137	726	40 317
1978*	31 833	1 442	3 485	67[1)]	36 827

* Preliminary.

1) Only for Jan-Jun.

Table 43. Danish and Swedish cod landings from the Skagerrak 1965-78 (in tonnes).
(Working Group data)

Year	Denmark	Sweden
1965	4 093	2 316
1966	4 445	2 460
1967	6 026	2 592
1968	5 241	2 953
1969	2 505	1 734
1970	3 459	1 964
1971	5 914	2 040
1972	6 959	1 925
1973	6 673	1 690
1974	6 694	1 380
1975	14 171	917
1976	18 847	873
1977	18 618	560
1978*	23 614	592

* Preliminary.

Table 44. Cod landings from the Kattegat, 1960-78 (in tonnes). (Working Group data)

Year	Denmark	Sweden	Total
1960	5 566	4 366	9 932
1961	5 619	4 474	10 093
1962	8 432	5 385	13 817
1963	7 801	4 408	12 209
1964	9 061	4 017	13 078
1965	9 573	4 831	14 404
1966	10 173	5 726	15 899
1967	9 488	5 289	14 777
1968	9 825	5 339	15 166
1969	9 775	4 067	13 842
1970	9 841	4 015	13 856
1971	11 748	3 962	15 710
1972	13 451	3 957	17 408
1973	14 913	3 850	18 763
1974	17 043	4 717	21 760
1975	11 749	3 642	15 391
1976	12 986	3 242	16 228
1977	16 668	3 400	20 068
1978*	10 293	2 893	13 186

* Preliminary.

Table 45. Whiting landings (in tonnes) from Division IIIa, 1966-78 (from Bulletin Statistique).

Year	Denmark	Norway	Sweden	Others	Total
1966	20 263	43	↑	-	20 306
1967	30 131	23		3	30 157
1968	29 467	28		2	29 497
1969	16 525	19		-	16 544
1970	13 115	15	IIIa incl.	-	13 130
1971	13 971	17	in IV a	1	13 989
1972	14 538	24		-	14 562
1973	22 479	67		1	22 547
1974	28 749	89	↓	4	28 842
1975	19 018	57	611	4	19 690
1976	17 870	48	1 002	57	18 977
1977	18 116	46	973	41	19 176
1978*	48 216	60	318	+	48 594

* Preliminary.

Table 46. Nominal catches of plaice in Division IIIa (in tonnes). (Denmark and Sweden from national sources, other countries from Bulletin Statistique).

Year	Denmark	Sweden	Other countries	Total
1966	8 747	351	59	9 157
1967	13 945	466	61	14 472
1968	15 757	580	694	17 031
1969	12 932	587	63	13 582
1970	14 096	438	40	14 574
1971	18 629	395	19	19 043
1972	19 618	418	80	20 116
1973	13 346	311	54	13 711
1974	14 248	325	57	14 630
1975	14 508	446	199	15 153
1976	18 738	385	5 325[1]	23 040
1977	24 323	442	12 295[1]	37 031
1978*	26 034	462	-	-

* Preliminary.

1) See also Table 47 below.

Table 47. Plaice catches from the Skagerrak (in tonnes).

Year	Denmark	Sweden	Other countries
1966	3 284	6	
1967	3 075	42	
1968	3 187	65	
1969	3 262	62	
1970	3 219	57	
1971	3 741	64	
1972	5 095	70	
1973	3 871	80	
1974	3 429	70	
1975	4 888	77	
1976	9 251	81	5 331[1]
1977	12 855	142	12 295[1]
1978*	13 383	94	52[2]

* Preliminary.

1) Including Dutch catches. A large part of these was assumed by the Working Group to have been taken in the North Sea (1976: 4 575 tonnes, 1977: 11 384 tonnes).

2) Dutch catches not included.

Table 48. Plaice landings from the Kattegat, 1960-78 (in tonnes).

Year	Denmark	Sweden	Total
1960	7 146	434	7 580
1961	11 956	477	12 433
1962	15 924	513	16 437
1963	14 197	525	14 722
1964	19 437	498	19 935
1965	9 458	565	10 023
1966	5 900	345	6 245
1967	11 567	424	11 991
1968	13 358	515	13 873
1969	10 316	525	10 841
1970	11 582	381	11 963
1971	15 819	331	16 150
1972	15 504	348	15 852
1973	10 021	231	10 252
1974	11 401	255	11 656
1975	10 158	369	10 527
1976	9 487	271	9 758
1977	11 611	300	11 911
1978	12 685	368	13 053

Table 49. Nominal catch (in tonnes) of COD in Sub-area IV, 1969-78.
(Data for 1969-77 as officially reported to ICES)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium	13 470	8 076	19 334	21 133	11 741	10 253	7 566	7 483	10 346	16 089
Denmark	36 986	40 017	68 179	72 520	47 950	54 207	46 344	53 277	42 582	41 318
Faroe Islands	52	78	123	284	803	416	732	448	260	49
France	10 460	16 058	24 769	24 038	13 247	7 275	8 667	8 079	7 511	12 143
German Dem. Rep.[a]	223	3	18	122	343	132	223	69	21	75
Germany, Fed. Rep. of	20 625[b]	20 093[b]	46 647	49 431	21 410	17 089	16 457	24 445	22 658	37 099
Iceland	+	+	1	-	-	+	-	-	-	-
Ireland	-	-	-	-	-	-	-	98	136	...
Netherlands	19 511	25 212	46 614	47 634	25 758	24 029	23 263	21 835	29 903	48 725
Norway[c]	8 953	5 374	7 732	4 377	4 831	2 481	1 528	1 877	1 449	2 724
Poland	136	219	178	189	1 551	4 750	2 991	2 961	381	115
Spain	-	-	-	91	90	80	63	14	-	...
Sweden[d]	8 401	8 925	9 062	8 769	8 074	8 168	900	597	36	442
UK (Engl.&Wales)	44 263	38 464	55 525	62 503	47 327	39 857	33 615	46 475	35 424	59 127
UK(Scotland)	33 208	30 079	37 229	55 190	48 844	39 887	37 308	39 597	34 406	41 984
USSR	2 970	32 147	5 153	774	2 497	2 667	6 796	6 187	-	9
Total IV	199 258	224 745	320 564	347 055	234 466	211 291	186 453	213 442	185 118	259 899
Total IVa	56 015	79 606	67 370	80 650	69 557	72 406	58 343	68 352	55 623	
Total IVb	122 027	110 271	184 957	215 160	134 953	114 087	107 227	126 218	100 191	
Total IVc	21 216	34 868	68 237	51 245	29 956	24 798	20 883	18 872	29 304	
WG total catch							188 452[e]	214 398[e]	186 654[e]	265 702[e]

* Preliminary. a) 1969-72 includes Div. IIIa. b) Incl. miscellaneous products.

c) Figures from 1969-72 do not include cod caught in Rec.2 fisheries. d) 1969-74 includes Div. IIIa.

e) Includes discards.

Table 50. Nominal catch (in tonnes) of HADDOCK in Sub-area IV, 1969-78.
(Data for 1966-77 as officially reported to ICES)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium	4 753	3 691	971	1 601	2 385	1 137	2 209	2 166	2 293	1 072
Denmark	316 516	158 276	31 043	34 858	13 118	44 342	32 930	46 899	20 069	8 122
Faroe Islands	-	-	-	5	1 198	435	267	183	385	5
France	7 562	10 392	8 738	7 814	4 695	4 020	4 646	5 500	6 914	5 064
German Dem. Rep.[a]	20	2	3	90	22	8	44	20	8	37
Germany, Federal Rep. of	3 376	5 075	3 045	4 020	4 587	3 478	2 396	3 433	3 744	2 573
Iceland	-	+	1	-	-	-	-	-	-	-
Ireland	-	-	-	-	-	-	-	31	53	...
Netherlands	13 233	8 278	6 914	5 188	3 185	3 035	1 901	1 728	1 598	798
Norway[b]	792	963	1 063	1 146	5 611	5 954	331	367	374	546
Poland	4	-	-	38	2 553	3 001	1 485	1 155	485	62
Spain	-	-	-	-	101	210	-	-	-	...
Sweden[c]	5 108	8 704	5 857	5 305	4 550	3 098	2 083	2 455	113	866
UK(Engl.&Wales)	14 090	19 500	16 648	20 827	16 586	10 798	11 499	17 238	17 167	12 200
UK (Scotland)	70 253	112 952	121 539	96 197	88 132	71 679	64 686	80 576	89 465	58 405
USSR	203 488	344 000	62 398	36 467	49 356	42 234	49 686	42 852	8 010	44
Total IV	639 195	671 833	258 220	213 556	196 079	193 429	174 163	204 603	150 678	89 794
Total IVa	271 953	455 649	197 306	135 095	131 819	128 607	110 848	138 591	116 577	
Total IVb	361 836	212 646	58 270	75 325	62 288	63 695	62 761	65 594	34 030	
Total IVc	5 406	3 538	2 644	3 136	1 972	1 127	554	418	71	
WG total catch									178 154[d]	117 977[d]

* Preliminary. a) 1969-72 includes Div. IIIa. b) Figures from 1969-72 do not include haddock caught in Rec. 2 fisheries.

c) 1969-74 includes Div. IIIa. d) Includes discards.

Table 51. Nominal catch (in tonnes) of WHITING in Sub-area IV, 1969-78.
(Data for 1969-77 as officially reported to ICES)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium	2 410	2 799	2 108	2 745	3 387	3 156	3 279	2 640	3 275	3 191
Denmark	142 622	102 698	55 618	50 109	73 928	109 654	61 941	116 973	46 479	15 525
Faroe Islands	-	-	-	-	1 453	1 126	764	1 262	472	-
France	25 602	25 842	16 668	19 822	20 353	19 825	20 079	19 557	17 592	19 868
German Dem.Rep.	-	-	-	-	5	-	3	18	-	22
Germany, Fed.Rep.	542	392	233	264	403	454	446	302	461	348
Iceland	-	-	-	-	-	-	-	4	9	...
Netherlands	15 181	10 115	6 322	7 613	8 811	12 057	14 078	12 274	9 406	...
Norway[a]	32	43	25	28	1 527	4 990	55	71	33	93
Poland	-	-	-	-	7	1 002	888	509	445	8
Spain	-	-	-	107	119	110	65	18	-	...
Sweden[b]	1 090	820	616	596	2 328	2 440	255	153	341	50
UK (Engl.&Wales)	2 268	3 398	4 158	3 789	4 592	5 519	5 246	5 112	6 185	7 541
UK (Scotland)	20 573	21 080	26 755	23 846	20 756	25 274	27 969	26 167	33 017	42 779
USSR	5 509	14 319	541	613	3 522	2 978	5 098	5 612	2 413	-
Total IV	215 829	181 506	113 044	109 532	141 191	188 585	140 166	190 672	120 128	100 066
Total IVa	49 839	32 185	23 451	32 932	31 104	81 693	75 444	100 001	61 499	
Total IVb	157 568	126 024	70 728	66 789	96 678	87 842	41 930	69 908	42 911	
Total IVc	8 422	23 297	18 865	9 811	13 409	19 050	22 792	20 763	15 718	
WG total catch									172 378[c]	170 819[c]

* Preliminary. a) Figures from 1969-72 do not include whiting caught in Rec. 2 fisheries.

b) 1969-74 includes Div. IIIa. c) Includes discards.

Table 52. Nominal catch (in tonnes) of COD in Division VIa, 1969-78.
(Data for 1969-77 as officially reported to ICES)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium	107	61	41	39	75	174	49	71	-	-
Denmark	-	-	-	-	-	-	7	-	-	-
Faroe Islands	-	-	-	-	7	13	3	39	43	-
France	2 496	1 161	1 054	2 360	3 445	3 678	3 546	5 611	3 583	5 904
German Dem. Rep.	-	-	-	-	-	-	2	-	-	-
Germany,Fed. Rep.	209[b]	136[b]	46	3	15	6	12	1	3	32
Iceland	-	-	+	-	-	-	-	-	-	-
Ireland	538	1 135	888	686	583	883	1 141	1 341	984	1 211
Netherlands	10	5	10	21	4	5	5	11	5	
Norway	48	-	-	-	13	14	17	22	29	99[a]
Poland	142	199	154	491	184	175	68	18	-	
Spain	-	-	-	102	208	137	180	15	20[a]	
U.K.(England+Wales)	7 463	2 602	2 414	3 371	2 074	2 467	2 217	2 742	2 434	2 082
U.K. (Scotland)	10 714	7 382	5 732	7 018	5 645	6 084	5 806	7 475	5 513	5 610
U.K. (N. Ireland)	10	1	2	2	3	3	3	13	5	5
U.S.S.R.	-	-	325	606	7	13	107	46	-	-
Total VIa	21 739	12 682	10 666	14 699	12 263	13 652	13 163	17 405	12 619	14 943
Working Group total catch									12 615	14 868

* Preliminary.

a) Includes Div. VIb.

b) Including miscellaneous products.

Table 53. Nominal catch (in tonnes) of COD in Division VIb, 1969-78.
(Data for 1969-77 as officially reported to ICES)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium	-	-	-	-	-	-	-	1	-	-
Faroe Islands						5	3	22	40	10
France	2 372	745	-	1 659	320	1 128	4	4	3	1
Norway	-	-	-	-	-	3	-	8	3	...a
Poland	-	-	-	-	8	-	-	-	-	-
Spain	-	-	-	-	-	-	-	-	...a	
U.K.(Engl.+Wales)	30	28	37	32	1	-	28	77	89	285
U.K. (Scotland)	131	102	57	175	128	39	98	61	33	384
U.S.S.R.	-	-	-	701	26	-	110	1 398	-	-
Total VIb	2 533	875	94	2 567	483	1 175	243	1 571	168	680

* Preliminary.

a) Included in Div. VIa.

Table 54. Nominal catch (in tonnes) of HADDOCK in Division VIa, 1969-78.
(Data for 1969-77 as officially reported to ICES)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*)
Belgium	34	13	9	44	45	98	23	45	-	
Denmark	-	-	-	-	-	-	-	13	-	-
Faroe Islands	-	-	-	-	2	1	-	-	-	-
France	224	785	2 354	5 014	5 141	3 979	2 328	3 026	3 401	3 572
German Dem.Rep.	-	-	10	87	-	-	9	-	-	-
Germany,Fed. Rep.	14	9	15	7	15	18	3	30	+	19
Iceland	-	-	+	-	-	-	-	-	-	-
Ireland	1 618	2 720	4 316	3 982	2 631	1 715	599	1 115	616	443
Netherlands	40	126	78	205	169	63	19	30	28	
Norway	-	-	-	-	-	-	-	3	7	9
Poland	-	-	10	-	402	97	20	-	-	
Spain	-	-	-	101	497	540	-	-		
Sweden	-	-	-	-	-	-	-	-	-	
U.K.(Engl.+Wales)	3 296	1 785	1 491	2 393	2 187	1 512	1 214	1 971	3 827	2 805
U.K.(Scotland)	21 034	28 724	33 087	27 730	17 631	9 583	8 973	11 992	11 422	9 629
U.K.(N. Ireland)	13	12	2	1	-	-	-	-	-	
U.S.S.R.	-	4	4 927	1 480	110	364	495	533	-	
Total VIa	26 273	34 178	46 299	41 044	28 830	17 970	13 683	18 758	19 301	16 477
Working Group Total Catch									19 301	16 925

*) Preliminary

Table 55. Nominal catch (in tonnes) of HADDOCK in Division VIb, 1969-78.
(Data for 1969-77 as officially reported to ICES)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*)
Belgium	-	-	-	-	-	-	-	33	-	-
Faroe Islands	-	-	-	-	-	2	1	8	3	-
France	320	12	182	1 527	600	353	21	4	4	3
Norway	-	-	-	-	-	-	-	-	+	-
Poland	-	-	-	-	54	-	-	-	-	-
U.K.(Engl.+Wales)	262	220	117	27	1	-	5	2 111	2 694	2 365
U.K.(Scotland)	543	608	313	616	72	22	71	640	297	2 059
U.S.S.R.	-	-	9	7 304	3 291	48 911	49 830	40 447	-	-
Total VIb	1 125	840	621	9 474	4 018	49 288	49 928	43 243	2 998	4 427

*) Preliminary.

Table 56. Nominal catch (in tonnes) of WHITING in Division VIa, 1969-78.
(Data for 1969-77 as officially reported to ICES)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*)
Belgium	12	12	9	7	5	10	1	14	-	-
Denmark	-	-	-	-	121	-	-	-	-	-
Faroe Islands	-	-	-	-	5	1	30	2	-	-
France	1 176	1 851	2 507	1 662	2 777	2 983	2 763	3 655	3 395	4 225
German Dem. Rep.	-	-	-	-	-	-	-	31	-	-
Germany, Fed. Rep.	19	-	+	148	127	80	62	1	1	2
Iceland	-	-	-	-	-	-	-	-	-	-
Ireland	1 836	2 420	1 178	1 122	2 117	2 431	2 429	3 255	2 752	2 080
Netherlands	12	24	28	40	57	23	85	255	78	-
Norway	-	-	-	-	-	-	-	1	-	-
Poland	-	-	2	-	10	9	-	-	-	-
Spain	-	-	-	1 397	1 540	1 479	1 871	821	763[a]	949
U.K. (Engl.+Wales)	180	76	66	102	91	112	132	244	520	669
U.K. (Scotland)	8 946	6 839	11 435	10 707	9 796	9 929	12 668	16 658	9 873	8 174
U.S.S.R.	-	-	-	128	-	-	-	-	-	-
Total VIa	12 181	11 222	15 225	15 313	16 646	17 057	20 041	24 937	17 382	16 099
Working Group total catch									17 384	16 196

Table 57. Nominal catch (in tonnes) of WHITING in Division VIb, 1969-78.
(Data for 1969-77 as officially reported to ICES)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*)
Faroe Islands	-	-	-	-	-	1	-	-	+	-
France	364	1 265	800	69	62	-	-	-	- b)	-
Spain	-	-	-	-	-	-	-	-	...	-
U.K. (Engl.+Wales)	-	+	+	+	+	-	-	3	2	5
U.K. (Scotland)	5	12	7	12	1	+	12	15	5	24
Total VIb	369	1 277	807	81	63	1	12	18	7	29

* Preliminary.

a) Includes Div. VIb.

b) Included in Div. VIa.

Table 58. Nominal catch (in tonnes) of COD in Divisions VIIb,c and VIIg-k, 1969-78.
(Data for 1969-77 as officially reported to ICES)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium	196	223	295	77	323	167	116	159	85	53
Faroe Islands	-	-	-	-	256	-	-	-	-	-
France	7 893	4 320	5 570	4 168	2 791	2 302	2 877	3 196	1 972	1 869
Germany,Fed. Rep.	4	2	2	-	1	-	-	-	-	3[a]
Ireland	445	537	347	352	568	283	474	506	315	328
Netherlands	128	38	81	22	14	9	54	46	291	
Norway	-	-	-	-	-	-	1	-	+	-
Poland	45	59	33	130	75	39	19	40	6	
Spain	-	-	-	137	301	232	588	1 140	51	
U.K.(Engl.+Wales)	119	72	13	56	60	26	73	44	33	29
U.K. (Scotland)	-	-	-	-	-	-	-	-	-	2
U.S.S.R.		116	24	139	10	72	134	203	-	
Total VIIb,c,g-k	8 830	5 367	6 365	5 081	4 399	3 130	4 336	5 234	2 753	2 284

* Preliminary.

a) Catch in Div. VIIg only.

Table 59. Nominal catch (in tonnes) of COD in Divisions VIId and VIIe, 1969-78.
(Data for 1969-77 as officially reported to ICES)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium	132	132	213	124	93	67	59	65	53	419
Denmark	-	-	-	-	-	-	2 718	1 506	1 120	2 137
France	3 501	2 139	4 544	2 658	1 425	3 099	2 143	1 646	5 185	7 939
Germany,Fed.Rep.	+	-	+	-	-	-	-	-	-	-
Netherlands	1	3	13	30	2	4	+	2	1	-
Poland	-	-	-	7	13	6	-	-	-	
U.K.(Engl.+Wales)	222	279	662	717	499	260	159	142	581	652
U.S.S.R.				8	45	-	3	4	-	
Total VIId,e	3 856	2 553	5 432	3 544	2 077	3 436	5 082	3 365	6 940	11 147

* Preliminary.

Table 60. Nominal catch (in tonnes) of COD in Division VIIf, 1967-77.
(Data from Bulletin Statistique)

Country	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Belgium	831	950	295	414	512	318	202	30	262	72	23
France	-	341	289	285	...[a]	314	589	421	638	702	437
Netherlands	-	1	-	-	-	-	-	-	-	+	-
Poland	-	3	-	-	-	-	-	-	-	-	-
U.K. (England & Wales)	490	219	272	226	285	276	155	143	68	48	29
U.S.S.R.	-	-	-	-	-	61	30	-	30	1	-
Total ...	1 321	1 514	856	925	797	969	976	594	998	823	489

a) Included in Div. VIIa.

Table 61. Nominal catch (in tonnes) of HADDOCK in Divisions VIIb,c and VIIg-k, 1969-78.
(Data for 1969-77 as officially reported to ICES)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium	22	31	23	45	65	35	33	19	13	4[a]
Faroe Islands	-	-	-	-	3					
France	2 941	3 823	3 652	6 456	5 524	6 057	4 583	3 726	2 244	2 313
Germany, Fed.Rep.	2	1	1	-	1	-	+	3	-	-
Ireland	635	783	947	1 103	1 348	829	507	287	153	127
Netherlands	80	98	66	56	12	2	4	14	1	
Poland	-	-	3	-	62	143	-	-	-	
Spain	-	-	-	733	890	1 100	-	-	294	
U.K.(Engl.+Wales)	44	46	25	107	24	39	46	24	18	16
U.K.(Scotland)	-	-	-	-	-	-	-	-	-	8
U.S.S.R.	-	27	136	253	24	456	1 290	183	-	-
Total VIIb,c and g-k	3 724	4 809	4 853	8 753	7 953	8 661	6 463	4 256	2 723	2 468

*) Preliminary a) Div. VIIg only.

Table 62. Nominal catch (in tonnes) of HADDOCK in Divisions VIId and VIIe, 1976-78.
(Data for 1969-77 as officially reported to ICES)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium	10	3	1	2	1	+	+	+	1	-
Denmark	-	-	-	-	-	-	-	-	2	18
France	736	295	97	224	208	487	868	405	438	364
Germany, Fed.Rep.	-	-	1	-	-	-	+	-	-	-
Ireland	-	-	-	-	-	-	-	-	4	-
Netherlands	-	5	-	9	1	-	1	-	-	-
Poland	-	-	-	-	12	-	-	-	-	-
U.K.(Engl.+Wales)	65	118	71	166	135	113	99	45	29	22
U.S.S.R.	-	-	-	10	2	33	3	-	-	-
Total VIId,e	811	421	170	411	359	633	971	450	474	404

* Preliminary.

Table 63. Nominal catch (in tonnes) of HADDOCK in Division VIIf, 1967-77.
(Data from Bulletin Statistique)

Country	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Belgium	41	23	25	40	28	140	37	29	103	19	5
France	-	3	-	6	...[a]	413	1 707	522	649	394	144
Netherlands	-	1	-	-	-	-	-	-	1	-	5
U.K. (England & Wales)	25	20	25	31	124	124	52	43	30	14	5
U.S.S.R.	-	-	-	-	-	89	8	-	145	1	-
Total ...	66	47	50	77	152	766	1 804	594	928	428	159

a) Included in Div. VIIa.

Table 64. Nominal catch (in tonnes) of WHITING in Divisions VIIb,c and VIIg-k, 1979-78.
(Data for 1969-77 as officially reported to ICES)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*)
Belgium	98	113	54	20	124	75	83	97	60	39
France	7 891	3 066	4 893	5 695	4 035	4 331	3 637	4 731	3 962	3 475
Germany, Fed. Rep.	5	1	-	-	+	-	2	-	1	19
Ireland	985	712	482	1 141	1 894	1 641	2 562	1 980	1 201	1 227
Netherlands	107	73	100	377	2 080	915	66	112	86	
Poland	-	-	-	-	14	-	-			
Spain	-	-	-	1 491	1 121	1 367	2 974	2 772		
U.K. (Engl.+ Wales)	89	80	17	34	21	15	61	21	26	38
U.K. (Scotland)	-	-	-	-	-	-	-	-	2	1
U.S.S.R.	-	-	-	3	16	-	64	2	-	-
Total VIIb,c and g-k	9 175	4 045	5 546	8 761	9 305	8 344	9 449	9 715	5 338	4 799

*)Preliminary.

Table 65 Nominal catch (in tonnes) of WHITING in Divisions VIId and VIIe, 1969-78.
(Data for 1969-77 as officially reported to ICES)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*)
Belgium	32	41	25	19	38	39	70	103	36	80
Denmark	-	-	-	-	-	-	-	18	-	-
France	4 022	4 029	2 999	3 121	5 050	7 917	10 060	8 390	8 886	6 791
Netherlands	5	2	1	21	42	12	14	5	1	
Ireland	-	-	-	-	-	-	-	-	11	
U.K. (Engl.+Wales)	1 007	753	567	515	498	579	1 255	1 504	1 342	1 037
Germany, Fed. Rep.	+	-	+	-	-	25	1	-	-	-
U.S.S.R.	-	-	-	-	19	-	-	-	-	-
Total VIId,e	5 066	4 825	3 592	3 676	5 647	8 572	11 400	10 020	10 276	7 908

*) Preliminary

Table 66. Nominal catch (in tonnes) of WHITING in Division VIIf, 1967-77.

(Data from Bulletin Statistique)

Country	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Belgium	552	548	205	224	140	69	99	12	156	97	45
France	393	823	2 242	1 522	...[a]	529	1 065	1 335	1 488	1 655	2 111
Netherlands	-	+	-	5	-	-	-	-	1	4	4
U.K. (England & Wales)	628	369	409	285	175	130	187	121	107	109	141
U.S.S.R.	-	-	-	-	-	-	15	-	-	-	-
Total ...	1 573	1 740	2 856	2 036	315	728	1 366	1 468	1 752	1 865	2 301

a) Included in Div. VIIa.

Table 67. Nominal catch (in tonnes) of RAYS and SKATES in Sub-area IV, 1969-1977 (as officially reported to ICES)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977
Belgium	1 728	1 255	1 180	1 046	941	659	461	725	769
Denmark	123	104	125	115	97	77	55	48	39
Faroe Islands	-	-	-	-	23	19	3	8	14
France	676	487	270	255	231	353	169	171	162
German Dem. Rep.	-	-	-	-	-	-	-	3	-
Germany, Fed. Rep.	27	16	19	24	159	24	20	14	2
Iceland	-	-	-	-	+	-	-	-	-
Ireland	-	-	-	-	-	-	-	-	1
Netherlands	132	111	139	171	185	283	283	325	287
Norway	351	222	194	206	377	223	454	479	362
Poland[a]	-	-	-	-	-	33	-	-	-
Sweden	-	+	1	1	2	-	-	-	-
U.K. (Engl.+ Wales)	1 861	1 380	1 567	1 516	1 360	1 227	1 235	1 366	1 290
U.K. (Scotland)	2 598	2 092	2 263	2 148	1 826	1 582	1 496	1 594	1 887
U.S.S.R.	220	-	-	-	-	-	-	-	-
Total IV	7 716	5 667	5 758	5 482	5 201	4 480	4 176	4 733	4 813

Table 68. Nominal catch (in tonnes) of RAYS and SKATES in Sub-area VI, 1969-1977 (as officially reported to ICES)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977
Belgium	7	7	8	6	13	10	3	4	-
Faroe Islands	-	-	-	-	109	95	43	43	24
France	527	459	362	587	861	1 330	816	962	663
Germany, Fed. Rep.	3	+	+	+	-	1	+	+	1
Ireland	271	395	453	318	281	336	458	425	342
Netherlands	-	-	-	1	-	-	-	1	-
Norway	27	125	194	49	116	127	193	122	156
Poland	-	-	-	-	64	-	-	-	-
U.K. (Engl.+Wales)	556	477	345	320	275	266	264	373	400
U.K. (N. Ireland)	1	-	-	-	-	-	-	-	-
U.K. (Scotland)	2 397	2 051	2 060	2 585	1 864	1 308	1 700	1 869	1 884
Total VI	3 789	3 514	3 422	3 866	3 583	3 473	3 477	3 799	3 470

a) 1970-1974 includes IIIa

Table 69. Nominal catch (in tonnes) of SOLE in Sub-area IV, 1968-78.

(Data broken down by countries for 1968-77 are from Bulletin Statistique)

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium	3 874	2 703	1 880	2 227	1 834	1 485	1 130	1 383	1 456	1 669	1 629
Denmark	1 590	842	525	1 149	671	957	705	682	574	323	443
France	273	364	265	403	206	250	195	297	598	337	294
Germany, Fed. Rep. of	1 138	692	318	600	258	336	173	233	192	310	467
Netherlands	25 175	22 032	16 024	18 776	17 662	15 883	15 343	15 242	11 044	11 106	7 100
Poland	-	-	-	-	-	-	-	-	5	-	
Sweden[a]	...	-	13	12	13	13	12	+	-	-	
U.K.(Engl.&Wales)	1 129	927	660	485	449	387	340	426	455	491	556
UK (Scotland)	-	-	1	2	+	1	...	-	2	...	
Total	33 179	27 560	19 686	23 654	21 093	19 312	17 898	18 263	14 326	14 236	
Unreported landings[b]								2 500	3 000	4 000	9 900
Grand Total								20 763	17 326	18 236	20 389

* Preliminary.

a) Figures include catches made in Division IIIa. The 1968 catch was included 148 tonnes of Various Pleuconectiforms.

b) Estimated by the Working Group.

Table 70. TACs for North Sea sole for 1980 (in tonnes) to achieve a stock biomass in 1981 = 1978.

M_{79}	Option 1 (average recruitment)	Option 2 (1978 recruit strength)	Option 3 (0.5 x 1978 recruit strength)
0.1	18 200	(23 000)	14 000
0.2	16 200	20 800	12 200
0.3	14 500	19 100	10 300
0.4	13 200	17 100	(8 900)
0.5	11 600	15 400	(7 000)

Catches in brackets are derived from extrapolation of the prognosis results and are thus less accurate.

Table 71. TACs for North Sea sole for 1980 (in tonnes) to achieve a spawning stock biomass in 1981 = average 1970-78.

M_{79}	Option 1 (average recruitment)	Option 2 (1978 recruit strength)	Option 3 (0.5 x 1978 recruit strength)
0.1	18 900	(23 500)	15 000
0.2	17 100	(21 800)	13 100
0.3	15 500	20 000	11 200
0.4	13 900	18 100	(9 800)
0.5	12 500	16 400	(8 000)

Catches in brackets are derived from extrapolation of the prognosis results and are thus less accurate.

Table 72. North Sea PLAICE. Nominal catch (in tonnes) in Sub-area IV, 1968-78.

(Data broken down by countries for 1968-77 are from Bulletin Statistique)

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium	5 576	4 476	4 360	5 073	5 531	6 133	6 202	6 154	4 574	6 547	3 817
Denmark	30 369	35 227	32 807	22 278	24 494	23 266	19 814	22 731	23 724	20 900	20 800
Faroe Islands	-	-	-	-	-	1	-	1	-	1	-
France	1 310	1 330	1 406	1 380	1 062	1 355	519	536	497	598	587
Germany Fed.Rep.of	5 250	5 071	5 519	3 296	4 318	5 451	3 233	4 040	3 654	5 423	4 599
Netherlands	33 236	39 420	46 080	44 502	52 048	57 948	54 438	51 293	46 630	42 307	29 250
Norway	38	26	22	18	19	15	13	13	20	16	12
Poland	-	-	-	-	-	1	-	153	40	-	-
Sweden[a]	776	772	608	588	626	432	431	35	26	-	30
UK (Engl.&Wales)	29 569	30 349	34 839	32 576	31 642	30 400	23 854	20 290	23 789	27 623	27 624
UK (Scotland)	5 810	4 981	4 703	4 210	3 410	4 815	4 002	3 266	3 310	3 623	3 877
USSR	-	-	-	-	-	397	39	-	-	-	-
Total	111 934	121 652	130 344	113 921	123 150	130 214	112 545	108 512	106 264	107 038	
Unreported landings[b]									5 000	11 384	21 150
Grand Total									111 264	118 422	111 746

* Preliminary.

a) 1968-74 includes Div. IIIa.

b) Estimated by the Working Group.

Table 73. North Sea PLAICE. Catch and spawning stock biomass predictions (sexes combined). Whole weight (in thousand tonnes).

Year	Option 1			Option 2		
	F	Catch	Stock	F	Catch	Stock
1978	F_{78}	113.5	276.3	F_{78}	113.5	276.3
1979	F_{78}	112.0	282.0	F_{78}	112.0	282.0
1980	F_{78}	112.0	281.3	$F=0.8\ F_{78}$	92.6	281.3
1981	F_{78}	108.8	270.9	$F=0.8\ F_{78}$	95.3	290.1

Table 74. English Channel SOLE. Nominal catch (in tonnes) in Divisions VIId and VIIe, 1968-78.

YEAR	BELGIUM		FRANCE		NETHERLANDS[2]		U . K .		T O T A L	
	VIId	VIIe	VIId	VIIe	VIId	VIIe	VIId	VIIe	VIId	VIIe
1968	30		520		-		133	114	797	
1969	10	8	606		-		177	138	939	
1970	127	10	753		1		228	125	1 244	
1971	157	3	816		1		254	152	1 383	
1972	147	6	676		8		322	201	1 360	
1973	126	2	775		-		360	194 [1]	1 457	
1974	159	6	706		3		309	181	1 364	
1975	132	3	464	271	1		244	217	841	491
1976	203	4	599	352	-		404	260	1 206	616
1977	225	3	737	331	-		315	272	1 277	606
1978 *	226.4	2	761.5	291.8	-		366	453	1 353.9	746.8

* Preliminary.

1) Figures amended from 1976 Working Group Report.
2) Mainly Division VIId.

Note: Catches for Divisions VIId and VIIe combined were taken from Bulletin Statistique as were separate catches in 1975-77.

The Divisions VIId and VIIe separate catches for previous years were obtained from national statistics.

Table 75. SOLE in Divisions VIId and VIIe.
Selected catch predictions.

	Division VIId		Division VIIe	
Spawning stock biomass 1978 (tonnes x 10^{-3})	5.5		3.8	
Catch 1978 (tonnes x 10^{-3})	1.35		0.75	
Spawning stock biomass 1979 (tonnes x 10^{-3})	3.4		3.8	
Catch 1979 (tonnes x 10^{-3})	1.45		0.73	
Spawning stock biomass 1980 (tonnes x 10^{-3})	6.1		4.0	
F_{80}/F_{78}	Catch 1980	Spawning stock biomass	Catch 1980	Spawning stock biomass
0	0	7.1	0	4.7
0.1	.16	7.9	.08	4.6
0.2	.30	6.7	.17	4.4
0.4	.59	6.5	.33	4.3
0.6	8.5	6.1	.48	4.2
0.8	1.13	5.9	.63	4.1
1.0	1.38	5.6	.78	4.0
1.5	1.94	4.9	1.10	3.7
2.0	2.44	4.4		

Table 76. English Channel PLAICE. Nominal catch (in tonnes) in Divisions VIId and VIIe, 1962-78.

Year	Belgium		France		Netherlands		U.K. (Engl. & Wales)		Total	
	VIId	VIIe	VIId	VIIe	VIId	VIIe	VIId	VIIe	VIId	VIIe
1962		24		874		-	545	373		1 816
1963		32		1 162		-	472	506		2 172
1964		28		1 393		-	616	422		2 459
1965		33		2 130		-	841	445		3 449
1966		25		2 700[1]		-	1 067	681		4 473
1967		11		2 905		-	976	829		4 721
1968		30		1 920		-	713	641		3 304
1969	18	12		1 681		-	521	508		2 740
1970	170	13		2 161		6	1 126	391		3 867
1971	175	4		2 635		-	1 025	440		4 279
1972	163	14		1 866		17	855	327		3 242
1973	139	5		1 735		-	889	367		3 135
1974	148	4		2 180		13	564	248		3 157
1975	153	8	1 802	288		-	293	279	2 248	575
1976	146	5	1 349	388		-	378	306	1 873	699
1977	148	23	1 714	336		-	304	363	2 166	722
1978*	151	-	1 640	291		-	349	465	2 140	756

* Preliminary figures as reported.

1) Figure from 'Révue des Travaux' de l'Institut des Pêches maritimes raised to round fresh weight.

Note: All combined Divisions VIId and VIIe figures and the 1975-77 data are from Bulletin Statistique. All others are from national statistics.

Table 77. English Channel PLAICE. Prediction of catch and spawning stock biomass. Sexes combined.

Year	Option 1			Option 2		
	F	Catch	Spawning stock biomass	F	Catch	Spawning stock biomass
1978	F_{78}	2 894	3 167	F_{78}	2 894	3 167
1979	F_{78}	2 467	2 935	F_{78}	2 467	2 935
1980	F_{78}	2 350	2 311	$F_{max}=0.8F_{78}$	1 995	2 311
1981			2 119			2 403

Table 78. COD. Nominal catch (in tonnes) in Division VIIa, 1969-78.
(Data for 1969-77 from Bulletin Statistique)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978[x)]
Belgium	272	332	390	348	276	409	282	257	135	144
France	563	1 282	2 575[a)]	2 024	2 507	2 601	2 623	1 938	1 370	987
Ireland	2 176	1 574	2 800	2 275	4 224	3 276	3 477	4 815	3 862	3 212
Netherlands	-	4	148	58	35	113	53	87	32	18
UK(Eng.&Wales)	3 445	1 710	2 451	2 856	3 158	2 463	2 132	1 815	1 186	901
UK (N.Ireland)	1 380	1 267	1 112	1 522	1 537	1 279	1 153	1 175	1 409	1 065
UK(Scotland)	131	88	64	90	50	49	70	91	60	79
Total	7 967	6 257	9 540	9 173	11 787	10 190	9 790	10 178	8 054	6 406
Total figures used by Working Group for stock assessment:	7 991	6 426	9 246	9 234	11 819	10 251	9 863	10 247	8 054	6 271

x) Preliminary

a) Includes Division VIIf.

Table 79. WHITING. Nominal catch (in tonnes) in Division VIIa, 1969-78.
(Data for 1969-77 as officially reported to ICES)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium	115	159	154	38	102	94	99	68	63	51
France	3 148	1 312	3 172	2 805	3 101	2 700	2 784	2 985	1 952	2 013
Ireland	2 712	1 282	2 306	2 188	3 414	4 184	3 946	5 055	4 821	4 821
Netherlands	-	+	23	5	12	52	52	56	24	13
UK (Engl.&Wales)	1 251	706	810	639	1 224	685	617	635	1 008	1 105
UK (N.Ireland)	2 391	1 314	1 899	1 976	2 437	2 045	2 280	3 290	2 692	3 089
UK (Scotland)	107	31	19	29	47	52	54	104	161	102
USSR	-	-	-	-	-	7	-	-	-	-
Total	9 724	4 804	8 383	7 680	10 337	9 819	9 832	12 193	10 721	11 194
Total figures used by the WG for assessment purposes:	9 443	4 667	6 917	7 445	9 972	9 364	9 275	11 651	10 204	10 404
Industrial catches Total (Ireland only):	707	2 198	2 531	1 231	744	283	353	425	760	927

* Preliminary.

Table 80. PLAICE. Nominal catch (in tonnes) in Division VIIa, 1969-78.
(Data for 1969-77 from Bulletin Statistique)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*
Belgium	208	305	175	179	221	247	248	136	110	109
France	33	250	-	440	500	132	134	126	141	246
Ireland	1 146	678	1 080	909	1 079	891	884	1 032	953	1 018
Netherlands	-	8	61	48	42	47	75	73	24	18
UK(Engl.&Wales)	2 540	1 869	2 744	3 366	3 002	2 240	2 544	1 945	1 422	1 770
UK (N.Ireland)	216	184	132	134	143	104	125	120	165	173
UK (Scotland)	88	58	92	89	73	54	53	52	89	89
USSR	-	-	-	-	-	1	-	-	-	-
Total	4 231	3 352	4 284	5 165	5 060	3 716	4 063	3 484	2 904	3 423
Total figures used by the WG for assessment purposes:	4 394	3 583	4 232	5 119	5 060	3 715	4 063	3 473	2 904	3 231

* Preliminary.

Table 81.A PLAICE. Nominal catch (in tonnes) in Divisions VIIf+g, 1970-78.
(Working Group data)

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978*)
Belgium	369	326	217	309	270	195	307	214	196
France	165	213	320	185	218	413	360	365	527
Ireland	19	74	46	39	20	50	49	28	45
Netherlands	-	-	-	16	-	2	-	-	-
U.K.(Engl.+Wales)	552	568	413	398	214	227	153	150	152
U.S.S.R.	-	-	-	4	-	1	-	-	-
Total	1 105	1 181	996	951	722	888	869	757	920

* Preliminary.

Table 81.B

Division	1970	1971	1972	1973	1974	1975	1976	1977	1978 *)
VIIg	276	434	372	408	358	419	555	424	528
VIIf	829	747	624	539	364	468	314	333	392
Total	1 105	1 181	996	947	722	887	869	757	920

* Preliminary.

Table 82. Irish Sea SOLE. Nominal catch (in tonnes), 1969-78.
(Data for 1969-77 as officially reported to ICES)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978*)
Belgium	841	1 142	883	561	793	664	805	674	566	453
France	97	115	45	38	12	54	59	72	39	69
Ireland	34	25	45	50	27	28	24	74	84	113
Netherlands	3	235	552	514	281	320	234	381	227	184
UK(Eng.&Wales)	400	267	316	238	258	218	281	195	160	189
UK(N.Ireland)	17	24	40	40	46	23	24	49	49	57
UK(Scotland)	-	1	1	9	11	...	15	18	21	29
Total	1 392	1 809	1 882	1 450	1 428	1 307	1 442	1 463	1 146	1 094

* Preliminary.

Table 83.A Celtic Sea SOLE. Nominal catch (in tonnes) in Divisions VIIf and VIIg, 1970-78.
(Working Group data)

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978*)
Belgium	1 003	989	546	822	914	663	1 054	779	506
France	386	731	587	435	75	133	181	80	160
Ireland	4	6	4	2	2	5	10	2	2
Netherlands	-	-	7	4	15	2	7	7	-
U.K.(Engl.+Wales)	164	135	134	128	99	116	99	93	117
Total	1 557	1 861	1 278	1 391	1 105	919	1 351	961	785

* Preliminary.

Table 83.B

Division	1970	1971	1972	1973	1974	1975	1976	1977	1978*)
VIIg	727	1 095	730	613	442	354	831	595	439
VIIf	830	766	548	778	663	565	520	366	346
Total	1 557	1 861	1 278	1 391	1 105	919	1 351	961	785

* Preliminary.

Table 84. RAYS and SKATES in Division VIIa. Nominal catch (in tonnes).
(From Bulletin Statistique)

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Belgium	246	262	272	248	161	296	365	278	195	236
France	415	220	17	125	127	1 516	426	337	491	827
Ireland	511	659	517	949	771	822	916	838	936	858
Netherlands	-	-	-	-	-	1	1	3	1	1
Norway	-	-	-	-	-	4	-	-	-	-
U.K. (England & Wales)	2 160	1 881	1 560	1 741	1 608	1 457	1 465	1 378	1 103	1 029
U.K. (N. Ireland)	55	83	99	88	88	107	68	52	60	101
U.K. (Scotland)	106	106	77	85	71	62	69	53	39	47
Total	3 493	3 211	2 542	3 236	2 826	4 265	3 310	2 939	2 825	3 099

Table 85. RAYS and SKATES in Division VIIf. Nominal catch (in tonnes).
(From Bulletin Statistique)

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Belgium	501	420	394	234	212	182	273	280	184	106
France	204	247	650	130	25	-	242	426	569	720
U.K. (England & Wales)	933	914	836	887	602	504	401	468	437	452
Total	1 638	1 581	1 880	1 251	839	686	916	1 174	1 190	1 278

Table 86. RAYS and SKATES. Nominal catch (in tonnes) in Divisions VIIg-k.
(From Bulletin Statistique)

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Belgium	216	231	238	186	93	259	238	190	509	293
France	5 475	5 917	4 237	6 181	3 335	2 781	2 458	3 841	4 272	3 397
Germany, Fed. Rep.	-	+	+	+	-	-	-	-	-	-
Ireland	572	523	584	119	164	147	158	148	241	158
Netherlands	1	+	-	-	-	-	-	1	7	13
Poland	-	-	-	-	-	24	28	-	-	-
U.K. (England & Wales)	221	209	145	45	84	38	36	181	150	145
Total	6 485	6 880	5 204	6 531	3 676	3 249	2 918	4 361	5 179	4 006

Table 87. NORWAY POUT. Annual landings (in thousand tonnes) by countries. North Sea 1957-78.

(Data provided by Working Group members)

	Denmark	Faroes	Norway	Sweden	U.K.(Scotland)	Others	Total
1957			0.2				0.2
58							
59	61.5		7.8				69.3
1960	17.2		13.5				30.7
61	20.5		8.1				28.6
62	121.8		27.9				149.7
63	67.4		70.4				137.8
64	10.4		51.0				61.4
1965	8.2		35.0				43.2
66	35.2		17.8			+	53.0
67	169.6		12.9			+	182.6
68	410.8		40.9			+	451.8
69	52.5	19.6	41.4			+	113.5
1970	142.1	32.0	63.5		0.2	0.2	238.0
71	178.5	47.2	79.3		0.1	0.2	305.3
72	259.6	56.8	120.5	6.8	0.9	0.2	444.8
73	215.2	51.2	63.0	2.9	13.0	0.6	345.9
74	464.5	85.0	154.2	2.1	26.7	3.3	735.8
1975	251.2	63.6	218.9	2.3	22.7	1.0	559.7
76	244.9	64.6	108.9	+	17.3	1.7	435.4
77	232.2	50.9 x)	98.3	2.9	4.6	1.0	389.9
78	163.4	19.7	80.8	0.7	5.5	-	270.1

x) including Division VIa.

Table 88. SANDEEL. Landings from the North Sea 1952-78 (in thousand tonnes)

(Data provided by Working Group members)

Year	Denmark	Germany, Fed.Rep. of	Faroes	Nether-lands	Norway	Sweden	U.K.	Total
1952	1.6	0	0	0	-	0	0	1.6
1953	4.5	+	0	0	-	0	0	4.5
1954	10.8	+	0	0	-	0	0	10.8
1955	37.6	+	0	0	-	0	0	37.6
1956	81.9	5.3	0	+	1.5	0	0	88.7
1957	73.3	25.5	0	3.7	3.2	0	0	105.7
1958	74.4	20.2	0	1.5	4.8	0	0	100.9
1959	77.1	17.4	0	5.1	8.0	0	0	107.6
1960	100.8	7.7	0	+	12.1	0	0	120.6
1961	73.6	4.5	0	+	5.1	0	0	83.2
1962	97.4	1.4	0	0	10.5	0	0	109.3
1963	134.4	16.4	0	0	11.5	0	0	162.3
1964	104.7	12.9	0	0	10.4	0	0	128.0
1965	123.6	2.1	0	0	4.9	0	0	130.6
1966	138.5	4.4	0	0	0.2	0	0	143.1
1967	187.4	0.3	0	0	1.0	0	0	188.7
1968	193.6	+	0	0	0.1	0	0	193.7
1969	112.8	+	0	0	0	0	0.5	113.3
1970	187.8	+	0	0	+	0	3.6	191.4
1971	371.6	0.1	0	0	2.1	0	8.3	382.1
1972	329.0	+	0	0	18.6	8.8	2.1	358.5
1973	273.0	0	1.4	0	17.2	1.1	4.2	296.9
1974	424.1	0	6.4	0	78.6	0.2	15.5	524.8
1975	355.6	0	4.9	0	54.0	0.1	13.6	428.2
1976	424.7	0	-	0	44.2	-	18.7	487.6
1977	664.3	0	11.4	0	78.7	5.7	25.5	785.6
1978	647.5	-	12.1	-	93.5	1.2	32.5	786.8

+ = less than half unit

- = no information

Table 89. Nominal catch (tonnes) of mackerel in the North Sea, Skagerrak and Kattegat (IV and IIIa) 1968-1978. (Data for 1968-1976 as officially reported to ICES)

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978[1)]
Belgium	77	139	19	85	129	78	145	134	292	49	-
Denmark	9 887	10 851	26 753	17 590	2 023	7 459	3 890	9 836	27 988	21 833	18 034
Faroe Islands[3)]	-	3 080	2 134	3 603	7 551	11 202	18 625	23 424	63 476	42 836	34 194
France	4 684	11 353	4 677	9 061	6 882	636	2 254	2 749	2 607	2 529	3 591
Germany, Dem.Rep.	349	399	51	166	346	214	234	141	259	41	233
Germany, Fed.Rep.	1 353	1 161	225	407	374	563	270	276	284	-	90
Iceland	352	612	1 492	649	687	3 079	4 689	198	302	-	-
Netherlands	5 986	4 928	2 956	4 945	4 436	2 339	3 259	2 390	2 163	2 673	1 062
Norway[2)]	779 084	683 045	278 631	200 635	160 141	298 877	255 132	241 533	207 867	182 200	89 613
Poland	1 629	12	205	130	244	561	4 520	2 313	2 020	298	-
Sweden	11 783	10 820	4 407	3 163	4 748	2 960	3 579	4 789	6 448	4 012	3 050
UK (England & Wales)	55	35	35	23	32	31	61	33	89	105	141
UK (Scotland)	583	231	148	616	395	2 943	390	578	1 199	1 590	3 658
USSR	6 094	12 516	718	2 600	611	17 150	8 161	9 330	1 231	2 765	557
Total	821 916	739 182	322 451	243 673	188 599	348 092	305 209	297 724	316 225	260 931	154 223

1) Preliminary

2) includes catches from Div. IIa (1973 - 21 573 tonnes, 1974 - 6 818 tonnes, 1975 - 34 662 tonnes, 1976 - 10 516 tonnes, 1977 - 1 400 tonnes, 1978 - 3 867 tonnes)

3) includes catches from Div. IIa (1978 - 283 tonnes)

Table 90. Landings (tonnes) of mackerel by Division in the Norwegian Sea, Skagerrak and Kattegat, and the North Sea.

Year	Division				
	IIa	IIIa	IVa	IVb	IVc
1968	42	12 867	796 538	10 605	1 557
1969	7	24 917	700 816	11 529	1 521
1970	200	32 410	257 328	26 674	5 988
1971	358	15 462	199 280	17 217	11 548
1972	88	5 961	174 387	5 596	2 309
1973	21 573	8 220	297 459	19 433	1 407
1974	6 829	6 218	275 499	12 163	4 511
1975	35 272	10 994	231 536	16 691	3 841
1976	10 526	8 880	271 833	21 641	3 355
1977	1 400	7 018	229 100	27 100	5 300
1978*	4 153	4 620	113 381	30 754	1 751

* Preliminary.

Note:

Denmark	IVb	includes	IVa	1968-73 and in 1978
German Dem. Rep.	IVb	"	IIIa	1968-72
Norway	IVa	"	IVb	1968-72
Sweden	IVa	"	IVb and IIIa	1968-74
Sweden	IVb	"	IVa,c	1975
Sweden	IVa	"	IVb	1976-77
USSR	IVa	"	IVb,c	1968-73 and 1978

Table 91. Nominal catch (tonnes) of mackerel in the Western area (VI, VII, and VIII) (Data for 1968-76 as officially reported to ICES).

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978[1)]
Belgium	2	11	8	2	1	3	7	17	10	1	-
Denmark	-	-	-	-	-	-	-	-	3	698	8 381
Faroe Islands	-	-	-	-	-	635	8 659	1 760	5 539	3 978	12 136
France	34 896	31 356	42 899	33 141	35 354	41 664	37 824	25 818	33 556	35 702	36 758
German Dem.Rep.	95	9	130	93	214	1 733	2 885	9 693	4 509	431	-
Germany, Fed.Rep.	613	428	783	258	98	559	993	1 941	391	446	28 762
Iceland	-	-	90	86	74	52	-	21	10	-	-
Ireland	2 164	1 615	1 055	3 107	4 592	8 314	8 526	11 567	14 395	23 022	31 909
Netherlands	2 597	4 441	3 828	3 837	6 166	7 785	7 315	13 263	15 007	35 766	50 555
Norway	-	-	-	1 611	-	34 600	32 597	1 907	4 252	362	1 826
Poland	1 518	2 149	6 054	10 832	13 219	10 536	22 405	21 573	21 375	2 240	-
Spain	20 753	21 571	31 368	37 506	31 416	25 677	30 177	23 408	18 480	21 853	20 000[2)]
Sweden	-	-	-	-	-	-	-	-	38	-	-
UK (England & Wales)	2 585	2 692	3 374	4 791	6 923	13 081	21 132	31 546	57 311	132 320	213 347
UK (N.Ireland)	151	279	243	315	57	93	75	30	95	97	26
UK (Scotland)	537	402	807	805	1 412	5 170	8 466	16 174	28 399	52 662	103 514
USSR	-	6 147	13 555	36 390	71 249	65 202	103 435	309 666	262 384	16 396	-
Total, ICES memb.	65 911	71 100	104 194	132 774	170 775	215 104	284 496	468 384	465 754	325 974	507 214
Bulgaria	-	-	-	-	-	4 341	13 558	20 830	28 195	-	-
Rumania	-	-	-	-	-	-	-	2 166	13 222	-	-
Total	65 911	71 100	104 194	132 774	170 775	219 445	298 054	491 380	507 178	325 974	507 214

1) Preliminary

2) Working Group estimate

Table 92. Landings of mackerel (tonnes) by Sub-areas in the Western area.

Year	Sub-area	
	VI	VII + VIII
1968	5 064	60 847
1969	4 760	66 340
1970	3 854	100 340
1971	10 213	122 561
1972	13 013	157 762
1973	52 166	167 279
1974	64 136	234 081
1975	64 849	416 538
1976	67 765	439 413
1977	74 829	259 111
1978*	151 747	355 487

* Preliminary.

Table 93.A Hake catches (nominal weight in thousand tonnes) from the Northern stock, by countries, and by fishing areas, as reported to ICES, during 1967-77.

YEARS	TOTAL	FRANCE				SPAIN				U. K.			OTHERS		
		TOTAL	IVa+VIa	VII	VIII(1)	TOTAL	IVa+VIa	VII	VIII(1)	TOTAL	IVa+VIa	VII	TOTAL	IVa+VIa	VII
1967	61.4	23.5	2.9	9.6	11.0	31.6	-	-	31.6	4.9	4.1	0.8	1.4	0.9	0.5
1968	59.7	20.5	2.5	7.8	10.2	32.2	-	-	32.2	5.4	4.5	0.9	1.6	1.3	0.3
1969	52.7	19.6	2.9	7.9	8.8	27.1	-	-	27.1	4.3	3.9	0.4	1.7	0.5	1.2
1970	63.7	24.1	1.5	9.8	12.8	34.3	-	-	34.3	3.2	2.7	0.5	2.1	1.9	0.2
1971	50.9	23.0	0.8	9.1	13.1	22.7	0.9	7.8	14.0	2.6	2.2	0.4	2.6	2.1	0.5
1972	69.5	21.8	0.4	8.8	12.6	42.6	6.1	20.2	16.3	2.9	2.4	0.5	2.2	2.2	-
1973	72.2	24.2	2.2	10.7	11.3	41.9	6.5	19.8	15.6	2.8	2.2	0.6	3.3	2.9	0.4
1974	74.3	21.5	2.5	11.8	7.2	47.5	7.1	21.9	18.5	2.7	2.1	0.6	2.6	2.3	0.3
1975	72.9	22.1	3.2	11.0	7.9	44.9	6.4	20.5	18.0	2.6	2.3	0.3	3.3	2.4	0.9
1976	69.0	19.0	3.8	10.4	4.8	45.1	4.1	20.8	20.2	2.3	1.7	0.6	2.6	1.8	0.8
1977	41.8	15.3	2.6	6.1	6.6	23.5	1.6	5.3	16.6	1.9	1.6	0.3	1.1	0.8	0.3

(1) Includes Divisions VIIIa, b and VIIIc.

Table 93.B Corrected values of hake catches adopted by the Working Group, during 1973-78, by fishing areas (nominal weight in thousand tonnes).

YEARS	TOTAL	IVa+VIa	VII	VIIIa,b
1973	78.7	10.7	31.2	36.8
1974	74.0	10.8	29.0	34.2
1975	74.4	12.9	29.1	32.4
1976	67.5	11.5	27.4	28.6
1977	50.3	5.9	20.9	23.5
1978	47.1	5.2	19.9	22.0

Table 94.A Hake nominal catches, in thousand tonnes, during the period 1967-77, according to ICES Bulletin Statistique, for Sub-areas VIII and IX, by countries.

YEARS	TOTAL	FRANCE			PORTUGAL			SPAIN		
		TOTAL	VIII (1)	IX	TOTAL	VIII (1)	IX	TOTAL	VIII (1)	IX
1967	97.7	13.4	11.0	2.4	7.6	-	7.6	76.7	31.6	45.1*
68	89.1	12.2	10.2	2.0	7.2	-	7.2	69.7	32.2	37.5*
69	82.8	10.5	8.8	1.7	6.6	-	6.6	65.7	27.1	38.6*
1970	99.7	14.3	12.8	1.5	9.3	-	9.3	76.1	34.3	41.8*
71	37.8	13.7	13.1	0.6	8.0	-	8.0	16.1	14.0	2.1*
72	52.7	12.6	12.6	-	8.7	-	8.7	31.4	16.3	15.1
73	63.0	11.3	11.3	-	15.3	-	15.3	36.4	15.6	20.8
74	47.7	7.3	7.2	0.1	7.8	-	7.8	32.6	18.5	14.1
75	54.4	8.0	7.9	0.1	9.4	-	9.4	37.0	18.0	19.0
76	46.7	4.9	4.8	0.1	7.9	-	7.9	33.9	20.2	13.7
77	46.2	6.6	6.6	-	5.5	-	5.5	34.1	16.6	17.5

* Data refer to port of landing, not area of capture (include catches off Africa).
(1) Include Divisions VIIIa, b and VIIIc.

Table 94.B Corrected values of hake catches in Divisions VIIIc and IXa adopted by the Working Group, during 1973-78 (nominal weight in thousand tonnes).

YEARS	TOTAL	VIIIc + IXa
1973	35.7	35.7
1974	23.4	23.4
1975	30.2	30.2
1976	26.7	26.7
1977	15.6	15.6
1978	14.2	14.2

Table 95. Landings (in tonnes) of Common Shrimp (Crangon crangon)
(Working Group data)

Year	Belgium	Denmark	France	Germany Fed.Rep.of	Netherlands	England and Wales*)	Scotland
1963	1 343	-	**)	42 356	24 672	1 361	142
1964	1 364	-	**)	28 674	21 975	1 622	122
1965	1 249	-	**)	28 340	17 381	1 334	118
1966	1 202	-	**)	38 370	15 478	1 377	116
1967	1 561	-	**)	24 350	14 246	1 404	98
1968	1 215	110	2 607	33 077	11 175	1 307	24
1969	1 750	175	2 689	27 581	11 621	1 247	8
1970	1 745	71	2 695	37 888	10 285	1 275	15
1971	1 197	57	2 809	23 672	5 323	1 168	27
1972	1 147	54	2 904	25 041	4 517	1 113	197
1973	2 140	143	2 891	29 596	6 031	1 335	7
1974	1 652	176	2 041	28 656	7 525	1 290	9
1975	1 956	330	1 922	20 637	7 423	1 531	13
1976	2 094	465	1 632	26 582	7 491	1 238	**)
1977	1 212	720	1 271	18 208	4 026	961	**)

*) Including pink shrimp (Pandalus montagui).

**) Not specified.

Table 96. Nominal catch (tonnes) of Cuttlefishes in the ICES statistical area, 1968-77.
(Data as officially reported)

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Denmark	1	1	+	1	1	+	+	-	-	-
France	-	-	-	-	... a)	... a)	3 945	6 591	3 715	6 736
Ireland	-	-	-	-	-	-	-	-	-	1
Netherlands	-	-	-	-	41	31	49	36	75	84
Portugal	780	875	405	...	...	...	1 176	896	824	1 243
Spain	4 382	4 615	5 591	...	4 256	4 024	3 585	1 974	1 869	1 681
U.K. (Eng. & Wales)	-	-	-	-	-	-	-	+	1	-
Total ...	5 163	5 491	5 996	1	4 298	4 055	8 755	9 497	6 484	9 745

a) Included in Squids.

Table 97. Nominal catch (tonnes) of Poulps (=octopuses) in the ICES statistical area, 1968-77.
(Data as officially reported)

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
France	-	-	-	-	-	-	-	8	15	-
Portugal	1 829	1 044	1 771	...	...	...	2 459	4 461	4 471	3 598
Spain	18 271	18 394	17 765	...	5 160	9 349	4 971	6 530	3 120	3 752
U.K. (Eng. & Wales)	-	-	-	-	-	-	-	-	+	-
Total ...	20 100	19 438	19 536	...	5 160	9 349	7 430	10 999	7 606	7 350

Table 98. Nominal catch (tonnes) of Squids in the ICES statistical area, 1968-77.
(Data as officially reported)

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Belgium	93	127	235	101	112	155	90	206	97	278
France	-	-	-	11 539	7 441[a]	11 500[a]	3 374	4 094	4 432	3 902
Germany, Fed. Rep.	-	-	-	-	-	-	-	+	+	-
Ireland	-	-	-	-	-	-	-	-	7	169
Norway	90	-	-	371	+	-	-	-	-	260
Portugal	633	498	744	...	...	...	1 122	669	591	1 041
Spain	5 880	4 522	5 601	...	4 353	2 358	4 227	4 493	4 081	3 083
Sweden	-	-	-	-	+	+	+	+	-	-
U.K. (Eng. & Wales)	75	187	255	338	142	244	230	650	908	1 042
U.K. (N. Ireland)	11	12	3	25	11	58	12	65	119	230
U.K. (Scotland)	88	101	1 044	1 368	583	657	226	356	462	163
U.S.S.R.	-	-	-	-	-	-	-	40	-	-
Total ...	6 870	5 447	7 882	13 742	12 642	14 972	9 281	10 573	10 697	10 168

a) Includes Cuttlefishes.

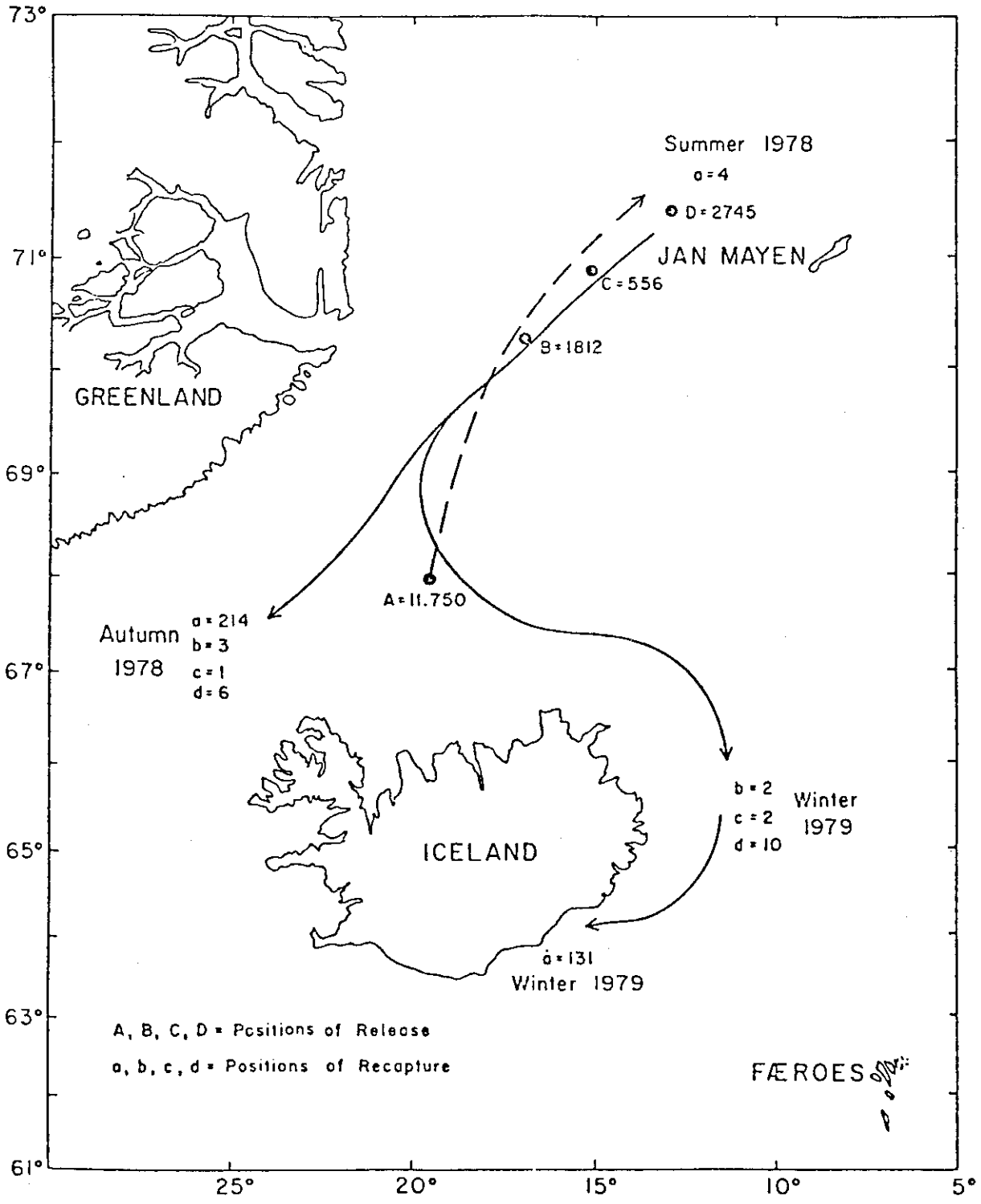


Figure 1. Migration routes of capelin as indicated by tag returns. Summer 1978 - winter 1979.

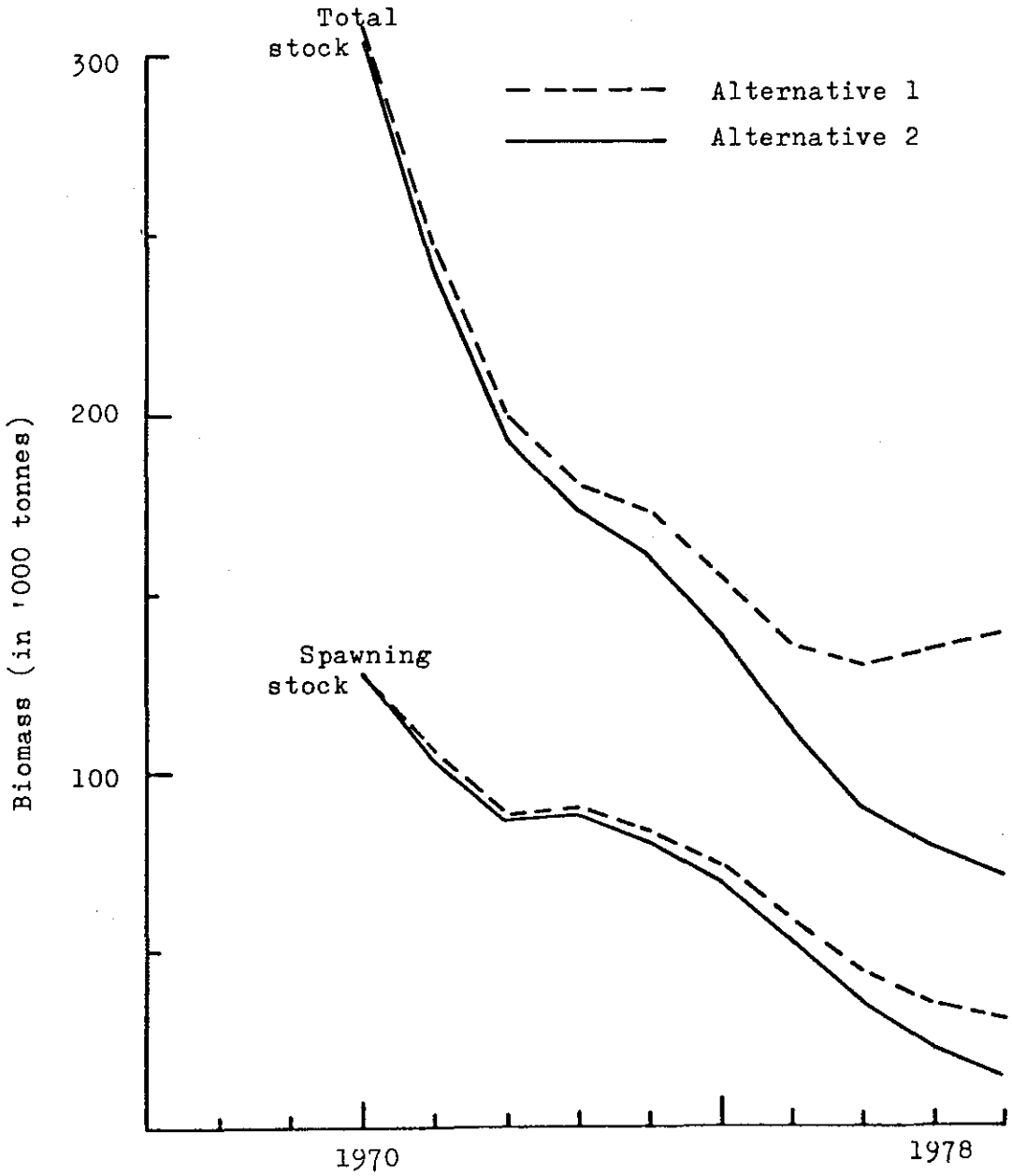


Figure 2. Greenland halibut in Sub-areas I and II. The stock size (4 years and older) and the spawning stock (9 years and older) 1970-78.

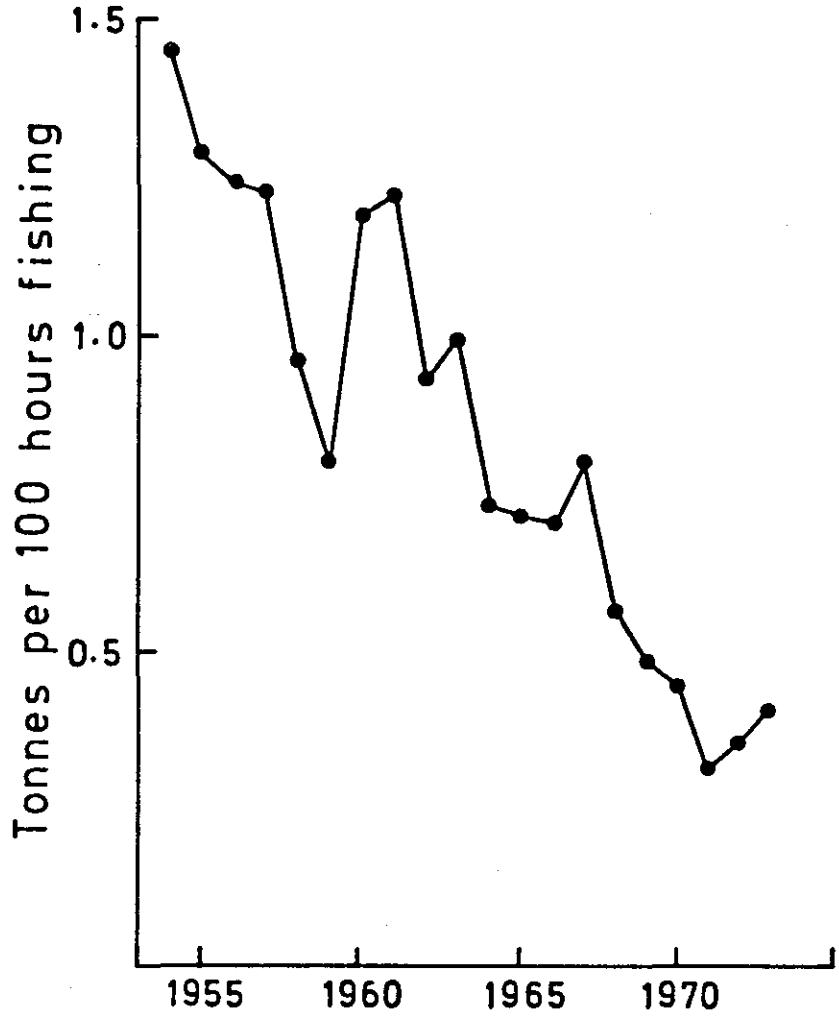
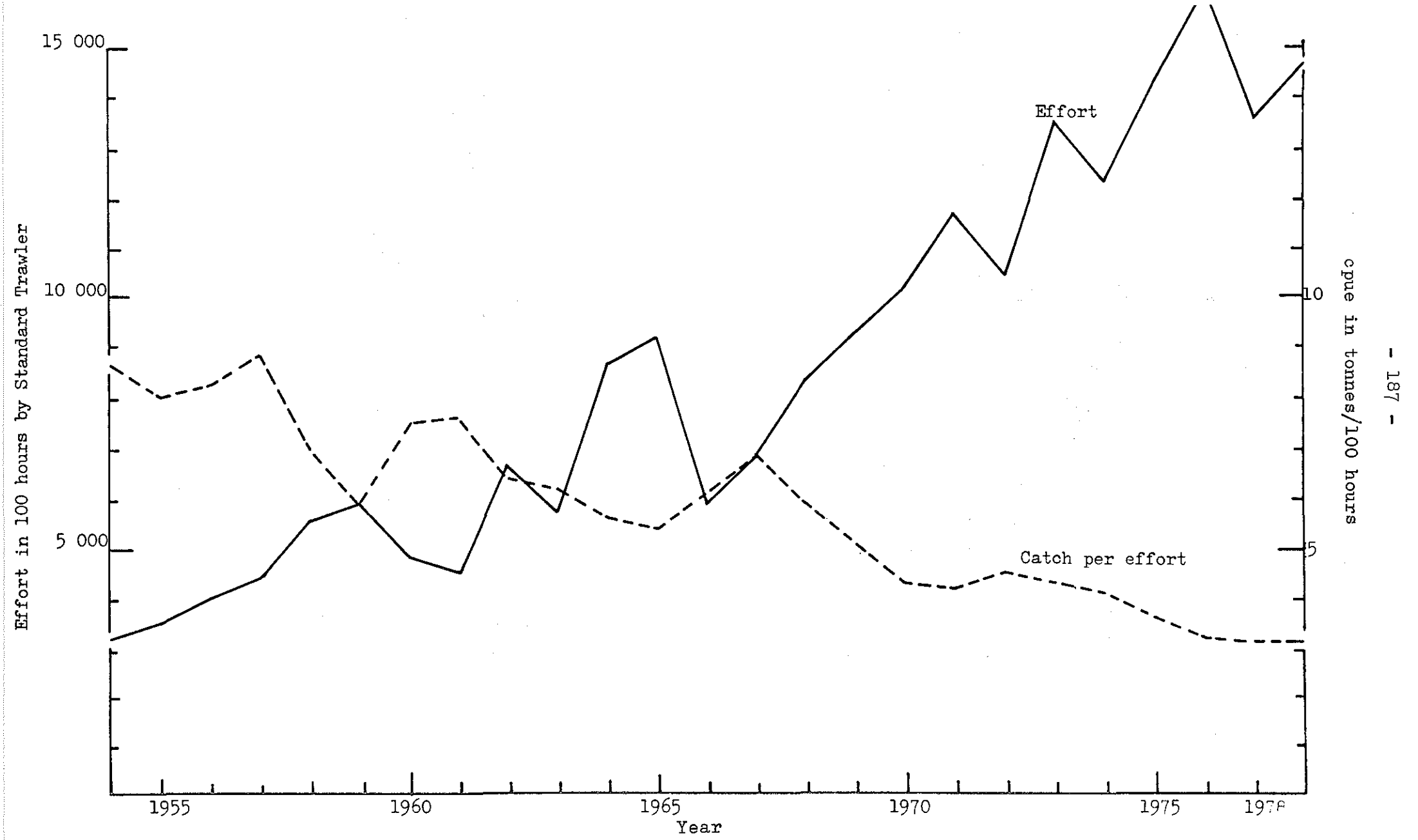


Figure 3. International catch per unit effort of skates and rays in ICES Divisions VIIa and VIIf.

Figure 4. Total demersal effort and catch per unit effort in Divisions VIIa + VIIf.



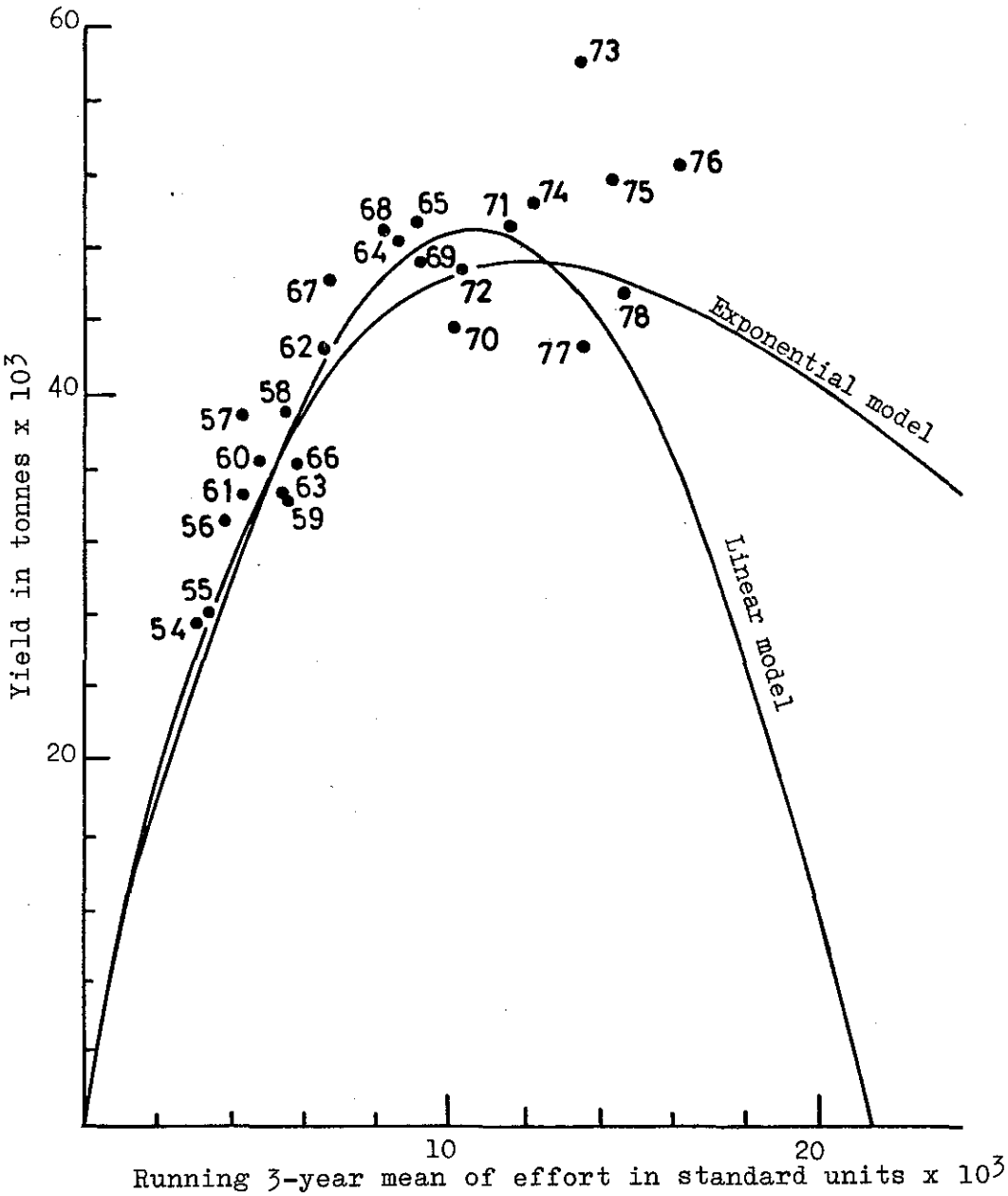
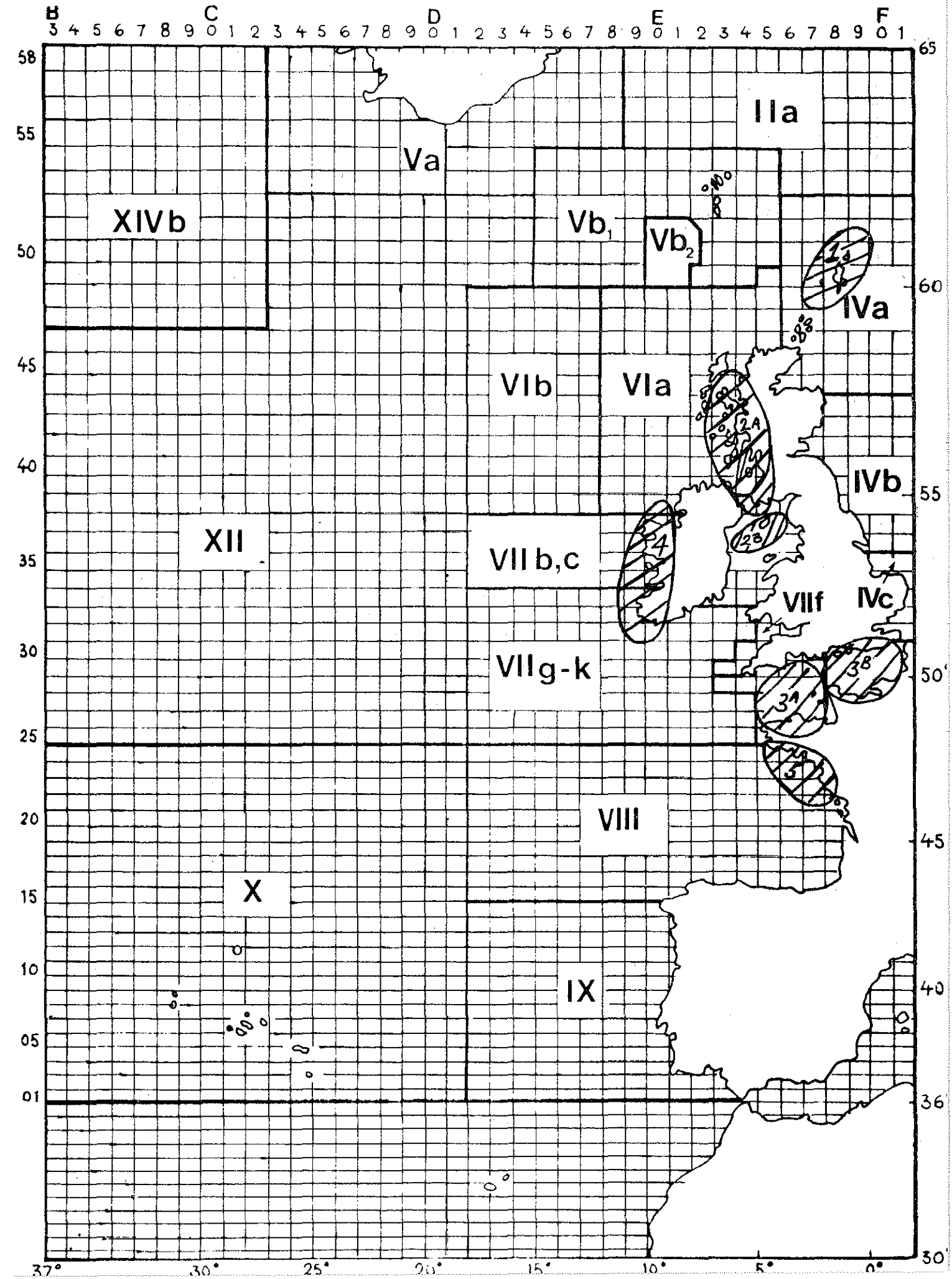
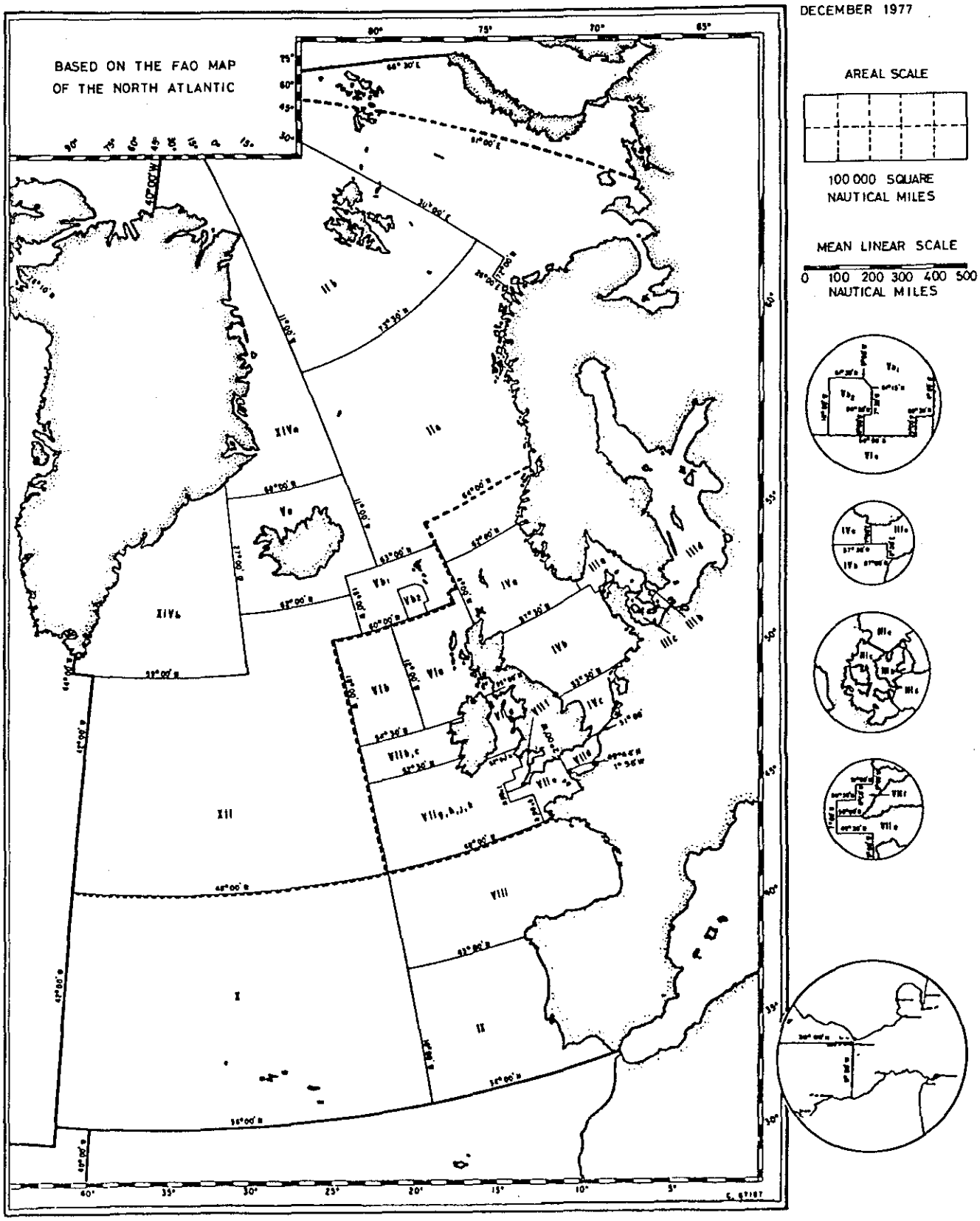


Figure 5. Total demersal yield curves for the Irish Sea and Bristol Channel.

Figure 6. Scallop management units.





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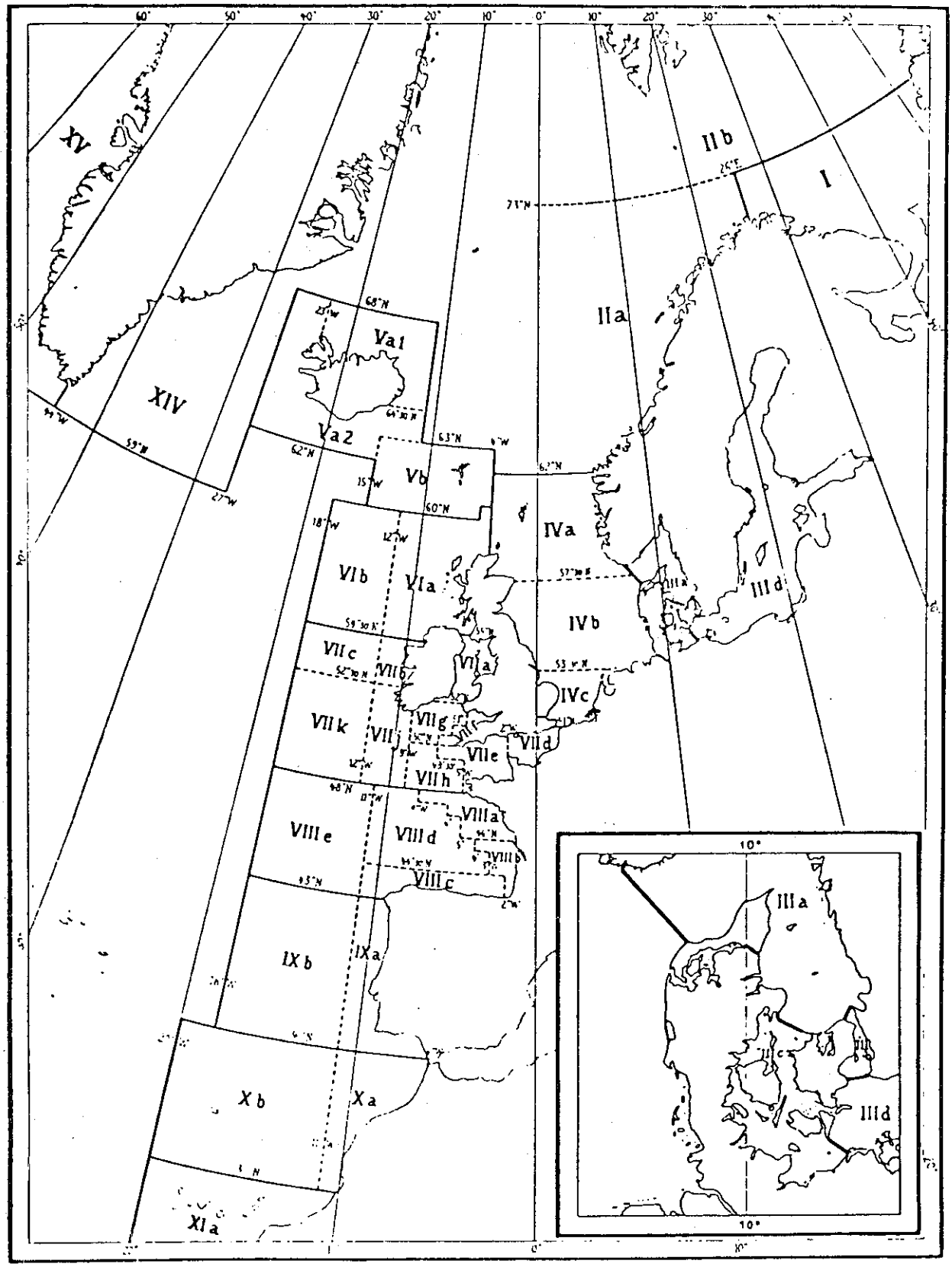


Chart of former statistical Divisions referred to in Sections D.5 and E.2 of the Report.

III. ADDENDUM TO THE REPORT OF THE ACFM OF ICES TO THE 18th ANNUAL MEETING OF NEAFC (October 1979)

A. Introduction

In the main report to the 18th Annual Meeting of NEAFC it was indicated that all of the data necessary for making analytical assessments with the required precision were not available for some of the stocks at the time when that report was prepared. ACFM therefore stated in that report that it intended to revise the provisional advice given for these stocks later, at the time of the 67th Statutory Meeting of ICES, in October 1979.

The following sections, on herring stocks in Division IIIa (Skagerrak and Kattegat), North-East Arctic haddock, and North Sea sole, are the results of these revised assessments of the state of these stocks and of the recommended total allowable catches from them in 1980.

B. Region 1 Fisheries

B.1 North-East Arctic haddock

1. The Arctic Fisheries Working Group met at the request of the Chairman of ACFM on 2 October 1979, in Warsaw, to assess the stock of haddock in the light of new data available.

Recent catches and recommended TACs in thousand tonnes:

1977			1978			1979			1980
Rec. TAC	Total quota	Actual catch	Rec. TAC	Total quota	Actual catch	Rec. TAC	Total quota	Est. catch	Rec. TAC
110	120	110	150	150	94[1)]	206	206	80	55-78

1) Preliminary figure.

2. In Section 42 (p.29) of the main body of the ACFM report it was stated that the bias in the basic data, due to uncertainties about the abundance of the 1975 year class in 1979, would give changes in the assessments of the size of the stock and the catch predictions for 1980. But the data available at the time of that ACFM meeting were not sufficient for a re-assessment of the haddock stock. It was also stated that the status of the stock would be somewhat better than given in the Working Group report of May 1979.

3. In the interim, new information has become available which allows a revision of the previous assessment.

These are:
1) Catch per unit effort data from Norwegian and United Kingdom fisheries.
2) Estimates of the likely catch of haddock in 1979.
3) An estimate of the abundance of the 1975 year class at the beginning of 1979 from a Norwegian echo-survey.

4. Catch per unit effort data from the Norwegian trawl fishery showed a considerable increase from the 2nd quarter in 1978 to the 2nd quarter in 1979, both in Sub-area I and Division IIa. Monthly figures for catch per unit effort for English trawlers showed a similar increase from January-May 1978 to January-May 1979 in Division IIa. For the eastern part of Sub-area I USSR reported, however, a decrease in catch per unit effort. This may be explained by the more westerly distribution of the haddock stock in 1979. Although this change in distribution makes it difficult to interpret catch per unit effort data, it was concluded that the available data indicated a higher stock size than estimated by the Working Group at its last meeting.

5. The total Norwegian and USSR catches for 1979 are expected to be about 50 000 and 20 000 tonnes respectively. For USSR, this represents a 56% reduction in catch compared with 1978. This might have been caused, to a great extent, by the extreme westerly distribution of the fish in the first half of 1979. Taking into consideration quotas allocated to third countries, the total catch in 1979 is expected to be about 80 000 tonnes. This estimate of the catch in 1979 is about 40% less than that used in the previous assessment and is estimated to generate an F of 0.21 in 1979.

6. From the Norwegian echo survey, in ICES Sub-area I and in the northern part of Division IIa during February-March 1979, the number of haddock of the 1975 year class was estimated as 261 million. Applying the fishing mortality estimated for this year class at age 3 in 1978 to this figure, results in an estimate of the 1975 year class at age 3 in 1978 of 440 million fish. This value is close to the regression line of the USSR young fish survey index against the VPA results, which is normally used by the Working Group to estimate recruitment at age 3. Since the Norwegian echo survey in the spring of 1978 resulted in a considerably higher estimate of the 1975 year class at age 3, the result of the 1979 survey was considered as a conservative estimate of the strength of the 1975 year class at age 4. It was therefore, adopted as a basis for the re-assesment of the haddock stock. Estimates used for the remaining year classes were as given in the Working Group report.

7. The results of this re-assessment indicate a total recruited biomass of 412 000 tonnes at the beginning of 1979. This is 43% higher than estimated previously, as a result of the revised figure for the abundance of the 1975 year class. The estimate of the spawning stock biomass in 1979 is not affected by this revision, since the 1975 year class did not reach maturity in 1979.

8. At the beginning of 1980 the estimates of total recruited biomass (451 000 tonnes) and spawning stock biomass (62 000 tonnes) are about twice those previously estimated. This results from the revision of the estimates of both the abundance of the 1975 year class and of the likely catch in 1979.

9. In the main body of its report to the 18th Annual Meeting of NEAFC, ACFM recommended an increase to 155 mm in the minimum mesh size in Sub-areas I and II, by 1980, in the context, particularly, of the cod fishery. Not knowing what action will be taken by 1980 in response to this recommendation, the effects on the haddock stock of various levels of fishing mortality in 1980 have been assessed with three levels of minimum mesh size: the present mesh size of 120 mm, 135 mm and 155 mm. With any of these mesh sizes, and with any practicable fishing mortality

rate in 1980, the spawning stock biomass in 1981 will be substantially above the 1980 level, as a result of the 1975 year class recruiting to it in that year. In almost all cases it will also exceed, or be very near, the long-term average spawning stock of 168 000 tonnes. Options which include an increase in mesh size to 155 mm in 1980 result in greater gains in spawning stock size. This demonstrates the value of such a management measure in guaranteeing substantial contributions to the spawning stock from strong year classes.

10. Since no stock/recruitment relationship can be established for North-East Arctic haddock at present, management strategies should aim at maintaining the spawning stock biomass at, or above, the long-term average of about 170 000 tonnes. Since this criterion is met by fishing at $F_{(max)}$, and since the fishing mortality in 1979 is already close to this value, ACFM recommends that the fishery for North-East Arctic haddock in 1980 should be regulated by setting a TAC for that year which would require fishing at the $F_{(max)}$ level.

What this means in terms of the size of the TAC will depend on the minimum mesh size in force in that year. The values of mesh size, the corresponding $F_{(max)}$ values, the resulting TACs for 1980 and the estimates of the resulting spawning stocks in 1981 are given in the text table below:

Mesh size (mm)	$F_{(max)}$	TAC (1 000 tonnes)	Spawning stock biomass (1 000 tonnes)	Total recruited biomass (1 000 tonnes)
155	0.30	55	219	528
135	0.25	68	209	518
120	0.18	78	210	516

C. Region 2 Fisheries

C.1 Division IIIa herring

11. In the main body of its report to the 18th Annual Meeting of NEAFC the ACFM drew attention to the problems in assessing the herring stocks in Division IIIa, both because of the lack of an adequate data base and because of the complexity of the stock composition in this area. ACFM accordingly recommended that a survey be carried out, in September 1979, to monitor the abundance of 1-group fish. Giving any advice on a TAC for 1980 was deferred until this information was available.

12. Such a survey has now been carried out, using acoustic methods combined with experimental trawling. The results gave a total biomass estimate of herring of about 300 000 tonnes. The 1-group fish (year class 1977/78), which are likely to be the major contributors to the catches, as 2-group, in 1980, formed about 30% of the stock by numbers. This indicates that this year class is a weak one, being only about 25% - 33% of the strength of the corresponding age group in 1978.

13. The estimates from this survey suggest that the spawning stock currently constitutes only about 2%, by numbers, of the total population. The size of the spawning stock in 1981 and 1982 will be heavily influenced by the additions to it provided by the weak 1977/78 year class, and by the fishing mortality rates to which the population is subjected in 1980 and 1981.

14. In the light of the above considerations it is important to reduce fishing mortality rates on the exploited stock in 1980, to try to ensure that the spawning stock in 1981 is not reduced to an even lower level than the current one. ACFM accordingly recommends that the TAC for herring in the whole of Division IIIa in 1980 should be set at a level not exceeding 40 000 tonnes. This TAC should include catches taken in Norwegian fjords within Division IIIa, which currently amount to about 2 000 tonnes. The proportions of this TAC allocated to the Skagerrak and the Kattegat should be retained at the same levels as agreed between EEC, Norway and Sweden for 1979. This would entail TACs of 10 500 tonnes for Skagerrak and 29 500 tonnes for Kattegat in 1980.

C.2 North Sea sole

15. In the main body of its report to the 18th Annual Meeting of NEAFC, ACFM pointed out the problems which it faced in recommending a TAC for North Sea sole in 1980, because of the unknown mortality generated by the hard winter of 1978/79 on both the adult component of the stock and on the recruitment to it by the 1978 year class. It accordingly recommended that, if for management purposes some level of TAC had to be set at that time, then this should not be more than 10 000 tonnes; and committed itself to providing a revised recommendation later, when more data were available on the effects of the 1978/79 winter.

16. The data now available would point to the mortality generated on the adult stock by the 1978/79 winter as having been small. Unfortunately, little fresh data are, as yet, available on its effects on the survival of the 1978 year class. Accordingly, ACFM would recommend that a cautious estimate should be adopted of the likely recruitment by this year class to the exploited stock in 1980. On this basis ACFM would recommend, with the management objective of achieving a spawning stock biomass in 1981 equal to that in 1978, that the TAC for North Sea sole in 1980 should be set at a level of 14 000 tonnes.

17. It will be appreciated that the revised estimate of the TAC for North Sea sole in 1980, given above, still contains some uncertainty, due to lack of information about the survival of the 1978 year class. Accordingly ACFM may have to issue a further revision of this TAC when it next meets, in July 1980, in the light of the data then available about the strength of this year class. ACFM would also wish to take this opportunity to reiterate its concern, expressed in the main body of its report, at the very high level of unreported landings in this fishery and their effect on the management of this stock, and the accuracy with which it can be assessed.

IV. REPORT OF ACFM TO THE INTERNATIONAL BALTIC SEA FISHERY COMMISSION (July 1979)

INTRODUCTION

In the introduction to its previous report, ACFM drew attention to the effects on the precision with which it could give advice on stock management which arose from uncertainties about the conditions under which the fisheries would be operating in the period between formulating the advice and the year to which it applied. This situation has not been appreciably improved by the change in the timing of the ACFM meeting and the resulting shorter time period between the provision of the advice and the period to which it applies, which it was agreed, with the cooperation of the management bodies, would be acceptable in 1979.

The assessments given in this report have made little use of data collected from the fisheries in the early part of 1979; largely because the laboratories in the member countries were unable to process this data sufficiently quickly. It is hoped that this will improve in future when these laboratories have adapted their procedures to the new timetable.

The situation regarding agreement on, and enforcement of, total allowable catches is in some cases unsatisfactory. ACFM would wish to stress that agreement on a TAC is meaningless if agreement has not also been reached on how it will be subdivided between the countries participating in the fishery. Under these circumstances, which apply in the case of one of the most important species in 1979, there would seem little prospect that the TAC will be adhered to. Accordingly, in estimating stock sizes, and the appropriate TACs for 1980, ACFM has had no option but to make the best estimates it can of the likely catches in 1979. These are generally considerably greater than the recommended TACs. Even in the situation when national quotas have been agreed, their enforcement, in some cases, leaves much to be desired. ACFM must stress that it deplores the lack of meaningful agreements on such essential elements of stock management, and proper enforcement of those agreed, both because of their effects on the stocks themselves and because, under these circumstances, predictions of future TAC levels must be much less precise than they would otherwise be.

It must also be stressed, in case there is any misunderstanding on this, that catches taken within the base lines from which zones of fisheries or national territorial jurisdiction are drawn, must be counted against the national quotas. The TAC is estimated for the whole stock over its entire area of distribution and all removals from it must be counted against the TAC. It should also be pointed out that zones of national fisheries jurisdiction have little relevance to stock boundaries. The management units used by ICES in doing its assessments were chosen to coincide, as closely as possible, to sub-divisions between stocks, and assessments can be done only for these units as a whole. As zones of national fisheries jurisdiction are very different from management units, there are considerable dangers to the rational management of the stocks in basing management on national zones.

A. REVIEW OF NOMINAL CATCHES IN THE BALTIC, 1968-77

1. The nominal fish catches in the Baltic from 1968-77 are summarised in the text-table below, in thousand tonnes:

Species \ Year	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Cod	203	201	192	160	186	189	189	234	252	213
Herring	355	295	312	335	345	404	407	415	386	412
Sprat	84	119	153	185	207	213	242	201	194	228
Flatfishes	23	21	19	19	20	18	21	24	19	22
Salmon	4	3	3	2	2	3	3	3	3	2
Freshwater species	17	19	17	14	17	23	21	20	20	22
Others	50	42	49	51	54	62	58	60	50	30
Total	735	700	745	766	831	912	941	957	924	929

Non-teleost fish as well as unsorted and unidentified species are included in the "Others" category, whereas anadromous species, except salmon, and shellfish catches are not reflected in the table. It should be noted that the table above is based on the official nominal catch figures as reported to ICES by national statistical offices by Divisions IIIb,c and IIId. These do not necessarily correspond to the biological data used by ICES Working Groups for assessments, based on smaller sub-divisions or groups of sub-divisions, which are given in the paragraphs below dealing with stock assessments.

2. The present report includes three tables of nominal catches from 1963-78 for cod, herring and sprat, and one table (1963-77) for flatfishes. The 1963-77 figures have been extracted from ICES "Bulletin Statistique" (except for the German Democratic Republic catches from 1963-72, which were provided by the Institute for Sea Fisheries and Fish Processing (Fish.Biol.Div., Rostock-Marienehe)). Except for the German Democratic Republic, Poland and USSR, the 1978 figures are preliminary ones. (See Tables 1-4.)

A combined table of recent catches by sub-divisions and recommended TACs is given on page 213 (Table 5).

3. The 1977 total production of all fish species combined, at the level of 929 000 tonnes, was 5 000 tonnes above the 1976 figure, but 28 000 tonnes below the all-time record level of the total catch in 1975. Nevertheless, the 1977 total catch was approximately 14% above the average 1967-76 level.

4. Catches of cod were subject to relatively small fluctuations during 1968-74, except in 1971 when there was a drop in catches of practically every country engaged in the fishery. The average catch during this period was around 189 000 tonnes. In 1975 the catch increased sharply to 24% above this average, and this increase continued in 1976 when 252 000 tonnes were caught (33% above the average). In 1977, however, the catch dropped to 213 000 tonnes, which is still nearly 13% above the 1968-74 average.

5. The 1977 herring catch recovered, after a decline in 1976, to nearly the record 1975 level of 415 000 tonnes. This event was confirmed by biological data used by the Working Group on Assessment of Pelagic Stocks in the Baltic, which take account of herring and sprat by-catches in each of those fisheries. The 1977 figure is 14% above the 1968-76 average.

6. Sprat catches rose continuously from 1968 to 1974 from 84 000 tonnes to 242 000 tonnes (i.e. an increase of 188%). In 1975 the catch dropped to 201 000 tonnes, and decreased by a further 7 000 tonnes in 1976. In 1977, there was a large increase of about 30 000 tonnes over the 1975-76 level, and the catch of 228 000 tonnes was the second highest on record. Biological data, however, indicate that the recovery was of a much lower magnitude, and that the 1977 catch returned only to the 1975 level.

7. Catches of flatfishes were relatively stable during 1968-76, with the average slightly in excess of 20 000 tonnes. There was a comparatively large decrease in 1976 (by 21%) from the 1975 level of 24 000 tonnes. In 1977, however, the catch reached 22 000 tonnes which is in line with the average for the period in question. Flounder continued to predominate in the catches, making up nearly 75% of the total in 1977.

8. Catches of salmon fluctuated around 3 000 tonnes. After a period of stabilisation at that level in 1973-76, the 1977 catch decreased to 2 000 tonnes, i.e., the level of catches in 1971-72.

9. Catches of freshwater species were at about the same levels as the flatfish catches throughout the period in question, taking into account the pre-1973 catches of the German Democratic Republic not included in the table. The 1977 catch of 22 000 tonnes was no exception.

10. The total 1977 catch of "other species" dropped sharply, by 40%, from the 1976 level of 50 000 tonnes, and was only 50% of the high average catches in 1973-75. This, together with a decline in the cod catch, prevented the 1977 total yield from returning to the high 1974-75 level.

B. THE BALTIC PELAGIC FISHERIES

11. Following an IBSFC request, the Working Group on Assessment of Pelagic Stocks in the Baltic met at ICES headquarters from 21-30 May 1979 to:

(i) estimate TACs for herring and sprat stocks in management units in the Baltic area;

(ii) compile available data on the by-catch of herring in the sprat fisheries;

(iii) assess the effects of by-catch of juvenile herring in the sprat fisheries on the herring stocks, and consider means of minimising these effects;

(iv) estimate the quantities of juvenile herring caught in the directed herring fisheries, with reference to any proposed minimum landing sizes for herring, proposals of minimum mesh size appropriate to this minimum landing size, and other proposals to protect juvenile herring.

B.1. Herring Stocks

B.1.1. General

12. Table 1. Recent catches of herring and recommended TACs in thousand tonnes.

Sub-division	1976	1977			1978			1979		1980
	Actual catch[1]	Recom. TAC	IBSFC TAC	Actual catch[1]	Recom. TAC	IBSFC TAC	Actual Catch[1]*	Recom. TAC	IBSFC TAC	Recom. TAC
22-24	64	400	422	75	290	444	78	68	405	67
25,26	156			152			142	115		118
27,28[2],29S	65			68			73	65		61
Gulf of Riga	27			24			15	16		15
29N, 30, 31	65			64	74		68	78		73
32	51			50	33		50	44		40
Total	428[3]			433	397		426	386		374

* Preliminary
1 Working Group data (including by-catches in sprat fisheries).
2 Excluding Gulf of Riga.
3 TAC of 400 000 tonnes was recommended for 1976.

There are marked differences in trends in herring catch between the management units in recent years. In Management Unit 1, the catches increased up to 1975 and since 1976 have stabilised. In Management Unit 2, catches decreased up to 1976. Since then, in this unit also, stabilisation of catches has taken place. In Management Unit 3, catches have shown some tendency to increase and in Management Unit 4, rather stable catches have been taken in the period 1974-78. After an increasing trend up to 1968, continued again from a lower starting point from 1969 to 1973, total herring catches in the Baltic Sea were relatively stable in the period 1973-78.

Catch data presented for 1977 and 1978 include herring catches in mixed fisheries and exclude the sprat by-catch in directed herring fisheries. Compared with the previous year, total herring catches in 1978 have decreased by about 8 000 tonnes.

13. Assessment of herring stocks was carried out by the same groups of Sub-divisions as in 1978: 22+24; 25+26; 27+28 (Gulf of Riga excluded) + 29S; Gulf of Riga; 30+31+29N; and 32. Stocks of spring and autumn spawning herring were assessed as one unit. At present, the importance of autumn spawning herring is low in all the Sub-divisions. In accordance with previous assessments, the natural mortality rates were taken to be: in Sub-divisions 22+24 - 0.3; in Sub-divisions 25+26, and 27+28 (Gulf of Riga excluded) + 29S - 0.2; in the Gulf of Riga up to 1978 - 0.15, and in 1979-80 - 0.2 (owing to the increase in cod abundance); and in the Gulf of Finland and Gulf of Bothnia 0.15.

B.1.2. State of the stocks and catch predictions

14. Table 2. Herring. Spawning stocks (≥3 years, except in the Gulf of Riga and in Sub-divisions 22+24 where ≥2 years) estimated by VPA('000 tonnes).

Assessment units	From VPA							Acc. to input Fs and prognoses			
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
22+24	251.9	264.3	269.5	261.9	223.8	194.7	156.9	152.5	178.2	190.3	184.2
25+26	768.9	686.4	681.0	624.1	535.3	494.3	389.4	278.1	231.7	189.6	128.7
27+28 (excl. Gulf of Riga) + 29S	291.9	306.2	336.9	354.5	313.5	334.8	303.5	270.2	282.5	232.6	171.9
Gulf of Riga	44.8	37.4	61.9	63.6	60.7	59.8	41.1	50.5	30.6	26.4	27.9
29N, 30 + 31				264.3	286.4	302.8	314.7	301.6	333.1	315.3	309.9
32	130.6	99.0	78.3	152.1	143.3	123.4	109.2	90.3	117.9	92.1	83.9

Sub-divisions 22, 23 and 24

15. The fishing mortality for 1978 was taken as the average of the years 1970-75 for ages equal to or greater than 2 years old. The 1978-80 year classes were taken to be average. For 1979 and 1980, the 1978 exploitation pattern and rate were applied. For 1980, applying the same level of fishing mortality as in 1978, the expected landings will be about 79 000 tonnes. Reducing the overall fishing mortality by 20% would yield 67 000 tonnes. The current level of fishing mortality is high, and the spawning stock is at a low level. It is desirable to increase the spawning stock biomass and ACFM accordingly recommends that the TAC for 1980 be set at a level of 67 000 tonnes.

Sub-divisions 25 and 26

16. Each of the year classes 1978-80 were taken to be of average strength. The fishing mortalities on the oldest age groups were taken from the last report, while the exploitation pattern in 1978 was estimated which agreed with the age structure observed in the stock in October 1978 by a combined German Democratic Republic - Swedish hydro-acoustic trawl survey. The resulting exploitation pattern is somewhat different from the one in the previous report, particularly in age groups 1-4. The continuation of the 1978 exploitation rate and pattern into 1980 would be expected to yield 133 000 tonnes, while a decrease of the fishing mortality by 20% would give 118 000 tonnes. The spawning stock in these sub-divisions has declined rapidly. It is expected to continue to decline under both options. The exploitation pattern is far from optimal in terms of utilisation of the stock; the mortality of the immature component of the stock being high. However, the recruitment to this stock has, in the period

considered, shown no sign of failure. In view of the sharp decline in stock biomass, ACFM would recommend a TAC for 1980 of 118 000 tonnes. This will give a lower risk of future recruitment failure.

Sub-divisions 27, 28 and 29S

17. As in previous years, two separate assessments were carried out in this area - one for the Gulf of Riga herring and one for the stocks inhabiting the Baltic proper.

For the open sea stock fishing mortalities on the oldest age groups were left unchanged as compared with the 1978 assessment, while the exploitation pattern was fitted so that the age composition of the stock corresponded to the observed age composition from the hydro-acoustic trawl survey. The 1976, 1977 and 1978 year classes appear to be below average. This decline in recruitment will result in a decline in the spawning stock in the years 1979-80. The 1978 exploitation rate applied to the estimated stock in 1980 would give a yield of 61 000 tonnes.

In the Gulf of Riga, the 1976, 1977 and 1978 year classes are also below average. Applying the 1978 exploitation rate in 1979 and in 1980 gives an expected catch in 1980 of about 16 000 tonnes. Since the exploitation rate is far beyond the optimum, a decrease in fishing mortality on this stock is recommended. The catch resulting from a 20% decrease in fishing mortality in 1980, compared with the 1978 level, would be 15 000 tonnes.

In the open sea stock component there has been a series of poor year classes. The exploitation rate does not suggest overfishing. In the Gulf of Riga a reduction in fishing mortality seems to be necessary. The TAC recommended for the whole area is 76 000 tonnes.

Sub-divisions 29N, 30 and 31

18. More than 90% of the herring catches in these sub-divisions in recent years have been taken close to the Finnish coast, and the age compositions used in the assessments have been entirely derived from the Finnish catches taken in that area. Moreover, the data from tagging experiments would suggest that there is very little interchange between the populations fished in the areas off the coast of Finland and off the coast of Sweden.

Under these conditions, it is quite clear that the assessments previously done have, in reality, been applicable only to the Finnish zone of these sub-divisions. In the absence of any age composition data for catches taken in the Swedish zone, or any independent estimate of the stock size in that zone, no analytical assessment can be made of the appropriate TAC for the Swedish zone.

The rather high number of 0-group fish during 1978 in the Finnish zone indicates that this year class is of about average size. Average recruitment was assumed for both 1979 and 1980. An increase of 20% above the 1978 level in fishing mortality was estimated to be required to take the TAC agreed for 1979. As no decrease in spawning stock is apparent, and the fishing mortality is still below the maximum on the yield per recruit curve, maintaining the F at the 1979 level in 1980 would be advisable and would result in a catch of about 65 000 tonnes in 1980 in the Finnish zone. In the Swedish zone only a precautionary TAC, based on historic catches, can be advised. ACFM would accordingly recommend a TAC of 65 000 tonnes for the Finnish zone of these Sub-divisions and one of 8 000 tonnes in the Swedish zone.

Sub-division 32

19. According to the abundance of larval and 0-group fish, the 1978 year class is estimated to be slightly above average. The exploitation rate required to take the 1979 TAC was estimated to be 0.46, and was reduced to the 1978 level in 1980. On this basis a TAC of 40 000 tonnes is recommended for Sub-division 32 in 1980.

B.2. Sprat Stocks

B.2.1. General

20. Table 3. Recent catches of sprat and recommended TACs in thousand tonnes.

Sub-division	1976	1977			1978			1979		1980
	Actual catch[1])	Recom. TAC	IBSFC TAC	Actual catch[1])	Recom. TAC	IBSFC TAC	Actual catch[1])*	Recom. TAC	IBSFC TAC	Recom. TAC
22, 24, 25	34			36			22	34		17
26,28	65	240	275	85	210	184.3	73	80	161	46
27, 29, 32	67			60			40	41		14
Total	166[2])			181			135	155		77

*) Preliminary.
1) Working Group data (excluding herring by-catches).
2) TAC of 240 000 tonnes was recommended for 1976.

Sprat catches in the Baltic Sea reached a peak in 1974 and decreased steadily thereafter, with the exception of 1977. Catch data presented above for 1977 and 1978 include sprat catches in mixed fisheries but exclude herring catches in sprat fisheries. Compared with 1977 sprat catches decreased in 1978 by about 47 000 tonnes (26%). Decreasing yields have been observed, especially in the southern and north-eastern parts of the Baltic. In 1978 a higher yield than in 1977 has been observed only in Sub-division 28. In 1978 anomalies in the distribution of wintering sprat shoals have been observed in the south-eastern Baltic.

21. As in 1978, sprat stocks were assessed by the following three groups of Sub-divisions: 22+24+25 , 26+28 and 27+29+32. Natural mortality rates were assumed to be: in Sub-divisions 22+24+25 - 0.4, in Sub-divisions 26+28 - 0.5, and in Sub-divisions 27+29+32 - 0.2. In accordance with the increase in the cod stock in recent years higher natural mortality rates were used for catch predictions for the years 1979 and 1980. These were 0.5, 0.6 and 0.3 for the respective groups of Sub-divisions.

B.2.2. State of the stocks and catch predictions

22. Table 4. Sprat spawning stock biomass (≥2 winter ring) estimated by VPA in 1970-80 ('000 tonnes).

Assessment units	From VPA							Acc. to input Fs and prognoses			
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
22+24+25	99.4	97.3	94.9	89.9	110.5	89.5	54.5	79.8	81.3	79.9	56.6
26+28	663.5	623.5	484.4	416.5	452.3	378.2	245.3	405.3	424.5	230.6	207.8
27+29+32	358.7	381.3	296.1	234.7	277.5	203.1	131.3	208.0	145.7	89.0	57.0

Sub-divisions 22, 24 and 25

23. In 1978 the catches decreased by about 14 400 tonnes (about 40%) compared with 1977. The 1977 and 1976 year classes are strong, the 1978 year class weak. The 1979 year class was assumed to be average. Fishing mortality for 1978 was estimated based on the mean values for 1975-77, but adjusted to an assumed lower exploitation level than during this period. Assuming continuation of the 1978 exploitation rate and pattern in 1979 and 1980 resulted in a TAC for 1980 of about 20 000 tonnes. A 20% decrease in fishing mortality is considered advisable and a TAC of 17 000 tonnes for 1980 is recommended.

Sub-divisions 26 and 28

24. Compared with 1977, the catches in 1978 decreased by about 12.3 thousand tonnes (about 14%). This decrease has, however, been restricted to the southern part of the assessment unit. In Sub-division 28, the yield increased by about 6 000 tonnes. The 1977 year class is weak. The 1978 year class is abundant in the southern part of the assessment unit, but weak in the northern part. The 1979 year class was assumed to be average. To take the TAC recommended for 1979 would require an increase in the fishing mortality rate of 50% above the 1978 level and will result in a decrease in both the total stock biomass and the spawning stock biomass. Reduction of the fishing mortality back to the 1978 level is considered advisable and a TAC for 1980 of 46 000 tonnes is accordingly recommended.

Sub-divisions 27, 29 and 32

25. Compared with 1977, the catches in 1978 decreased by about 20.3 thousand tonnes (about 34%). At present, the only strong year class in the catches is the 1975 year class. The 1976-78 year classes are weak. The 1979 year class was assumed to be average. Fishing mortalities in 1978 were assumed to be at the average 1975-77 level. For 1979 fishing mortalities were assumed to be 1.25 times higher than in 1978. Taking into consideration the effects of the high TAC for 1979, which will further greatly reduce the stock level, a decrease in the exploitation rate to the 1978 level is desirable in 1980. ACFM accordingly recommends a TAC of 14 000 tonnes for 1980.

B.3. Juvenile Herring

26. As in previous years, data presented on landings of juvenile herring in the Baltic are incomplete for Sub-divisions 22-27. Also, no information on discards has been given. The catches of juvenile herring are highest in the southern and western Baltic. In 1978, the young herring catch seems to have been lower than in previous years (12 706 tonnes, incomplete data), partly because the year classes at ages 0 and 1 were of low abundance in that year and partly because new regulatory measures have been introduced, by some countries, with the objective of decreasing the exploitation rate of juvenile herring. It must be stressed, however, that the separation length (16 cm), used for distinguishing juveniles from adults, in Sub-divisions 22-26 does not coincide with the length separating immature and mature fish. A length of 18-20 cm would be better, in biological terms, for this purpose.

It must be stressed that reduction of fishing mortality on juveniles could be achieved mainly by regulating the herring by-catch in the sprat fishery, although some improvement could also be made by regulating the catches of juveniles in directed herring fisheries. Reducing the herring by-catch in the sprat fishery will influence the yield of the sprat fishery but at present no proper data are available to estimate either losses in sprat catches or gains in herring catches.

C. THE BALTIC DEMERSAL FISHERIES

27. Following an IBSFC request, the ICES Working Group on Assessment of Demersal Stocks in the Baltic met from 21-26 May 1979 to:

(i) provide advice on TACs for cod for each stock/fishery unit;

(ii) assess the effects on cod of fishing with smaller meshed gears than that applied for cod;

(iii) assess the effect of increasing the minimum landing size and minimum mesh size for cod, and the tolerable level of catches of undersized cod which should be permitted in relation to any recommended changes in mesh size and landing size.

C.1. Cod in Sub-division 22

28. Recent catches and recommended TACs, in thousand tonnes:

Nominal catch					Recommended TAC			
1974	1975	1976	1977	1978	1977	1978	1979	1980
31.3	31.9	33.4	29.5	24.2[1)]	27.2	28.0	29.0	19.0

1) Preliminary

The landings in 1978 amounted to 24 232 tonnes, the lowest since 1970. This reduction may have been partly due to the quota regime, which forced Danish fishermen to stop fishing on several occasions. The recommended TAC for 1978 was 28 000 tonnes.

29. The Virtual Population Analysis was run with M = 0.2. Trial runs were made both with the fishing mortality at age in 1977 and with values close to the mean for the period 1974-76. In the 1978 report, the 1977 year class, based on a young fish survey, was considered to be average (77 x 10^6). From the 1979 VPA, it seems to be well below average (21-23 x 10^6).

According to the young fish survey, the 1978 year class seems to be very poor (< 20 x 10^6). This means that all year classes of importance in the catch in 1980 are below average.

30. Observations from Danish commercial catches in 1979 indicate that the 1977 year class is average (78 x 10^6). The 1978 year class is assumed to be 10 x 10^6, and the 1979 year class 70 x 10^6. On the assumption that the 1979 TAC will be taken, and that the fishing mortality in 1980 is reduced to 70% of that in 1978, the catch in 1980 will be 19 685 tonnes. The spawning stock in 1981 will then be 20 000 tonnes.

A reduction of F to F_{max} in 1980 would yield a catch of 7 000 tonnes in 1980, and a spawning stock of 37 600 tonnes.

ACFM recommends that the TAC for 1980 should be 19 000 tonnes.

31. No proper information about by-catch in smaller meshed gear than applied for cod was submitted.

32. In 1978 discards have been assessed for the fisheries of Denmark and the Federal Republic of Germany, by different methods. In Denmark field investigations showed that discards amounted to about 15% of the landed catch. Logbooks from the Federal Republic of Germany reported discards amounting to 10% of landings. The discard proportion in the German Democratic Republic fisheries was also thought to be 10%. It was assumed that these discards belong only to the 1-group cod. The discards were not included in the assessment.

33. If the results of Swedish mesh selection experiments, carried out in Sub-division 25-26, are applied, and the recruitment is kept constant, a change in mesh size from 90 mm to 100 mm, in 1980, will influence the catch in Sub-division 22 in 1980 and subsequent years as shown below:

Year	1	2	3	4
% change in yield	-33.9	+0.9	+16.1	+21.2

C.2. Cod in Sub-division 24

34. Recent catches and recommended TACs, in thousand tonnes:

Nominal catch					Recommended TAC			
1974	1975	1976	1977	1978	1977	1978	1979	1980
15	13	15	15	14.6[1)]	12.4	12	10	14

1) Preliminary

The average annual catch of cod has been 16 185 tonnes in the period since 1965. These catches include by-catches in sprat and herring fisheries, but not discards.

In the last seven years, the catch has stabilised at 15 000 tonnes annually. The catch in 1978 was 14 583 tonnes; the TAC for that year was 12 000 tonnes.

35. Catch per unit effort data for recent years were not available. To determine input Fs, trial runs were made with an F at age array close to the mean of 1972-75, and of 1973-76. M was taken to be 0.2.

The spawning stock size in 1978 has declined to the lowest recorded value, but due to the very abundant year class 1976, and the average to good year class 1977, the spawning stock size in 1980 and 1981 will increase to the average level. The yield per recruit curve shows the present situation is well above F_{max}. There is no evidence of a stock/recruitment relationship.

36. As the information concerning recent year classes is very poor, the catch prediction is made under the assumption of average recruitment (35×10^6), the exploitation rate and pattern in 1979 as in 1978, and a reduction to 0.7 of Fs in 1980. The catch in 1980 will then be 13 700 tonnes.

ACFM recommends a TAC for 1980 of 14 000 tonnes.

37. No information about discards in Sub-division 24 was submitted and no proper information about by-catches of cod in smaller meshed gear than applied for cod.

38. No data on mesh selection in Sub-division 24 were available. If the results of the Swedish mesh selection experiments (Olofson and Otterlind (1978)) are applied to the stock, and the recruitment is kept constant in Sub-division 24, the effect on the catch of an increase in mesh size from 90 mm to 100 mm in 1980 and subsequent years will be as follows:

Year	1	2	3	4
% change in yield	-24.6	+2.9	+20.4	+26.6

C.3. Cod in Sub-divisions 25-32

39. Recent catches and recommended TACs, in thousand tonnes:

Nominal catch					Recommended TAC			
1974	1975	1976	1977	1978	1977	1978	1979	1980
148	195	203	165	153[1)]	120	131	136	179

1) Preliminary

The catch in 1978 declined slightly from 164 692 tonnes in 1977 to 152 817 tonnes in 1978. This resulted from a major decline in the Danish and Federal Republic of Germany effort due to the fishery being stopped by quota regulation and the transfer of effort to the North Sea. The Polish and Soviet catches increased considerably.

40. As the total catch had remained at almost the same level as in 1977, with a decreasing trend the same input Fs as used in the 1978 VPA were chosen. A natural mortality rate of 0.3 was used.

The stock in numbers, at the beginning of the year 1978, indicates that the 1976 year class is very abundant (612 x 10^6) as age group 2. The year class 1975, which in the 1978 report was indicated to be weak, seems from the 1979 VPA to be about average. According to the combined results of Polish and Soviet young fish surveys, the 1977 year class seems to be average to above average. If the exploitation rate remains at the 1978 level this will give a catch in 1979 of 161 000 tonnes; about 25 000 tonnes above the previously recommended TAC.

The indications from Soviet and Federal Republic of Germany young fish surveys are that the 1978 year class is weak, but Polish surveys suggest that it is average or above average. In the predictions of catch in 1980, this year class is assumed to be somewhat below average.

41. Using the assumptions given above of recruitment, and the same rate and pattern of exploitation as in 1978, the spawning stock size will remain about average and the catch in 1980 will be 179 000 tonnes.

ACFM recommends a TAC for 1980 of 179 000 tonnes.

42. Data on discards were only submitted by Denmark and the Federal Republic of Germany. The Danish data, which are representative of the fishery in April and November 1978 using a 90 mm mesh size, showed great variability according to month and depth (in November 3-15%, in April 15-43%).

It is therefore necessary to obtain data covering all seasons of the year in order to assess satisfactorily the influence of discards.

43. No proper information about by-catch in smaller meshed gear than applied for cod was submitted to the Working Group.

44. In the 1978 report the ACFM recommended a minimum landing size of 33 cm, slightly below the 50% retention point for an 100 mm mesh size.

The results of more recent Swedish and Danish mesh selection experiments showed that the mesh opening corresponding to a 50% retention length of 35 cm is about 95 mm.

Mean lengths at age used in the mesh assessment were from Soviet, Polish and Danish data. Based on these data, a change of the mesh size from 90 mm to 100 mm at the beginning of 1980, with a constant recruitment at age 1, will affect the catch in Sub-divisions 25-32 as follows:

Year	1	2	3	4	5
% change in yield	-10.5	-4.0	+3.1	+8.2	+11.1

C.4. Changes in Minimum Mesh Size and Minimum Landing Size for Baltic Cod

45. The assessments of the effects of a change in mesh size show that considerable gains in yield for all sub-divisions would result from an increase in mesh size from 90 mm to 100 mm. In some sub-divisions there would be appreciable short-term losses, but these would be very short-lived. The 50% retention length for an 100 mm mesh size is about 38 cm; but fixing the minimum landing size at that level would result in considerable discarding.

ACFM accordingly recommends that a 100 mm mesh size and a 35 cm minimum landing size be introduced in all cod fisheries in the Baltic.

C.5. Discards, By-catches and Tolerances of Undersized Fish

46. ACFM was asked by the Baltic Fishery Commission to advise on the effects of discarding, and of the by-catches of cod in small-meshed fisheries, on the yields of Baltic cod fisheries. Although countries fishing in the area were asked to supply relevant data on this question, as will be evident from the comments given above in relation to each Division, the data provided was quite inadequate to make any meaningful statements on these questions. ICES will continue to press for the provision of suitable data, and will report further on these questions once these data are available.

47. ACFM was also asked to advise on the permitted level of undersized fish appropriate to any increase in mesh size and minimum landing size recommended for cod fisheries. In this context it can only point out that any permitted level of landing of undersized fish is likely to reduce to some extent the gains expected from increases in mesh size. It would therefore recommend that tolerances of undersized fish should be reduced to the minimum, and would see no justification for increasing the present permitted level because the minimum landing size had been increased. In any case the permitted level should not be applicable to the total landing of all fish species, but only to that of cod.

Table 1. Nominal catch (tonnes) of herring in Divisions IIIb,c,d, 1963-78. (Data for 1963-77 from "Bulletin Statistique")

Country / Year	Denmark	Finland	German Dem. Rep. [1]	Germany, Fed.Rep. of	Poland	Sweden	USSR	Total
1963	14 991	48 632	10 900	16 588	28 370	27 691	78 580[2]	225 752
1964	29 329	34 904	7 600	16 355	19 160	31 297	84 956	223 601
1965	20 058	44 916	11 300	14 971	20 724	31 082[3]	83 265	226 216
1966	22 950	41 141	18 600	18 252	27 743	30 511	92 112	251 309
1967	23 550	42 931	42 900	23 546	32 143	36 900	108 154	310 124
1968	21 516	58 700	39 300	16 367	41 186	53 256	124 627	354 952
1969	18 508	56 252	19 100	15 116	37 085	30 167	118 974	295 202
1970	16 682	51 205	38 000	18 392	46 018	31 757	110 040	312 094
1971	23 087	57 188	41 800	16 509	43 022	32 351	120 728	334 685
1972	16 081	53 758	58 100	10 793	45 343	41 721	118 860	344 656
1973	24 834	67 071	65 605	8 779	51 213	59 546	127 124	404 172
1974	19 509	73 066	70 855	9 446	55 957	60 352	117 896	407 081
1975	18 295	69 581	71 726	10 147	68 533	62 791	113 684	414 757
1976	23 087	75 581	58 077	6 573	63 850	34 730	124 479	386 377
1977	25 467	78 051	62 450	7 660	60 212	52 871	126 000	412 711
1978	30 371⁎⁎⁎)	77 000⁎⁎⁎)	46 261	6 907⁎⁎⁎)	63 850	52 300⁎)	130 642	407 331

⁎) Preliminary.
⁎⁎⁎) Working Group data, by-catch of sprat excluded and by-catch of herring in sprat fisheries included.

1) Data for 1963-72 provided by the Institute for Sea Fisheries and Fish Processing, Fish.Biol.Div., Rostock-Marienehe, German Democratic Republic (in thousand tonnes).

2) Including Division IIIa.

3) Large quantity of herring used for industrial purposes is included with "Unsorted and Unidentified Fishes".

Table 2. Nominal catch (tonnes) of sprat in Divisions IIIb,c,d, 1963-78. (Data for 1963-77 from "Bulletin Statistique".)

Country / Year	Denmark	Finland	German Dem. Rep.[1]	Germany, Fed.Rep. of	Poland	Sweden	USSR	Total
1963	2 525	1 399	8 000	507	10 693	101	45 820[2]	69 045
1964	3 890	2 111	14 700	1 575	17 431	58	55 753	95 518
1965	1 805	1 637	11 200	518	16 863	46	52 829	84 898
1966	1 816	2 048	21 200	366	13 579	38	52 407	91 454
1967	3 614	1 896	11 100	2 930	12 410	55	40 582	72 587
1968	3 108	...	10 200	1 054	14 741	112	55 050	84 265
1969	1 917	1 118	7 500	377	17 308	134	90 525	118 879
1970	2 948	1 265	8 000	161	20 171	31	120 478	153 054
1971	1 833	994	16 100	113	31 855	69	133 850	184 814
1972	1 602	972	14 000	297	38 861	102	151 460	207 294
1973	4 128	1 854	13 001	1 150	49 835	6 310	136 510	212 788
1974	10 246	1 035	12 506	864	61 969	5 497	149 535	241 652
1975	9 076	2 854	11 840	580	62 445	31	114 608	201 434
1976	13 046	3 778	7 493	449	56 079	3	113 217	194 065
1977	16 933	3 213	17 241	713	50 502	433	121 700	227 976
1978	10 797⁎⁎)	8 000⁎⁎)	13 710	788⁎⁎)	28 574	3⁎)	75 529	137 401

⁎) Preliminary.
⁎⁎) Working Group data, by-catch of herring excluded and by-catch of sprat in herring fisheries included.

1) Data for 1963-72 provided by the Institute for Sea Fisheries and Fish Processing, Fish.Biol.Div., Rostock-Marienehe, German Democratic Republic (in thousand tonnes).

2) Including Division IIIa.

Table 3. Nominal catch (tonnes) of cod in Divisions IIIb,c,d, 1963-78. (Data for 1963-77 from "Bulletin Statistique".)

Country / Year	Denmark	Finland	German Dem. Rep.[1]	Germany, Fed.Rep. of	Poland	Sweden	USSR	Total
1963	35 851	12	7 800	10 077	47 514	22 827	30 550[2]	154 631
1964	34 539	16	5 100	13 105	39 735	16 222	24 494	133 211
1965	35 990	23	5 300	12 682	41 498	15 736	22 420	133 649
1966	37 693	26	6 000	10 534	56 007	16 182	38 269	164 711
1967	39 844	27	12 800	11 173	56 003	17 784	42 975	180 606
1968	45 024	70	18 700	13 573	63 245	18 508	43 611	202 731
1969	45 164	58	21 500	14 849	60 749	16 656	41 582	200 558
1970	43 443	70	17 000	17 621	68 440	13 664	32 248	192 486
1971	47 563	3	9 800	14 333	54 151	12 945	20 906	159 701
1972	60 331	8	11 500	13 814	56 746	13 762	30 140	186 301
1973	66 846	95	11 268	25 081	49 790	16 134	20 083	189 297
1974	58 659	160	9 013	20 101	48 650	14 184	38 131	188 898
1975	63 860	298	14 740	21 483	69 318	15 168	49 289	234 156
1976	77 570	278	8 548	24 096	70 466	19 812	51 516	252 286
1977	74 495	310	10 967	31 560	47 703	18 327	29 680	213 042
1978	50 486⁎⁎⁎)	350⁎⁎⁎)	9 345	15 122⁎⁎⁎)	64 113	13 459⁎)	37 200	190 075

⁎) Preliminary.
⁎⁎⁎) Working Group data (provisional).

1) Data for 1963-72 provided by the Institute for Sea Fisheries and Fish Processing, Fish.Biol.Div., Rostock-Marienehe, German Democratic Republic (in thousand tonnes).

2) Including Division IIIa.

Table 4. Nominal catch (tonnes) of flatfishes in Divisions IIIb,c,d, 1963-77. (Data from "Bulletin Statistique".)

Country / Year	Denmark	Finland	German Dem. Rep.[1]	Germany, Fed.Rep. of	Poland	Sweden	USSR	Total
1963	9 888	-	3 900	794	2 794	1 026	1 460[2]	19 862
1964	9 592	-	4 600	905	1 582	1 147	4 420	22 246
1965	8 877	-	2 300	899	2 418	1 140	5 471	21 105
1966	7 590	-	2 900	647	3 817	1 113	5 328	21 395
1967	8 773	-	3 400	786	2 675	1 077	4 259	20 970
1968	9 047	-	3 600	769	4 048	1 047	4 653	23 164
1969	8 693	-	2 800	681	3 545	953	4 167	20 839
1970	7 937	-	2 200	606	3 962	464	3 731	18 900
1971	7 212	-	2 500	553	4 093	415	4 088	18 861
1972	6 817	-	3 200	542	4 940	412	3 950	19 861
1973	6 181	-	3 419	655	4 278	724	2 550	17 807
1974	9 686	55[3]	2 390	628	4 668	653	2 515	20 595
1975	8 257	100	2 172	937	5 139	658	6 455	23 718
1976	7 572	194	2 801	836	4 394	289	3 018	19 104
1977	7 239	203	3 378	960	4 879	484	4 754	21 897

1) Data for 1963-72 provided by the Institute for Sea Fisheries and Fish Processing, Fish.Biol.Div., Rostock-Marienehe, German Democratic Republic (in thousand tonnes).

2) Including Division IIIa.

3) Excluding subsistence fisheries.

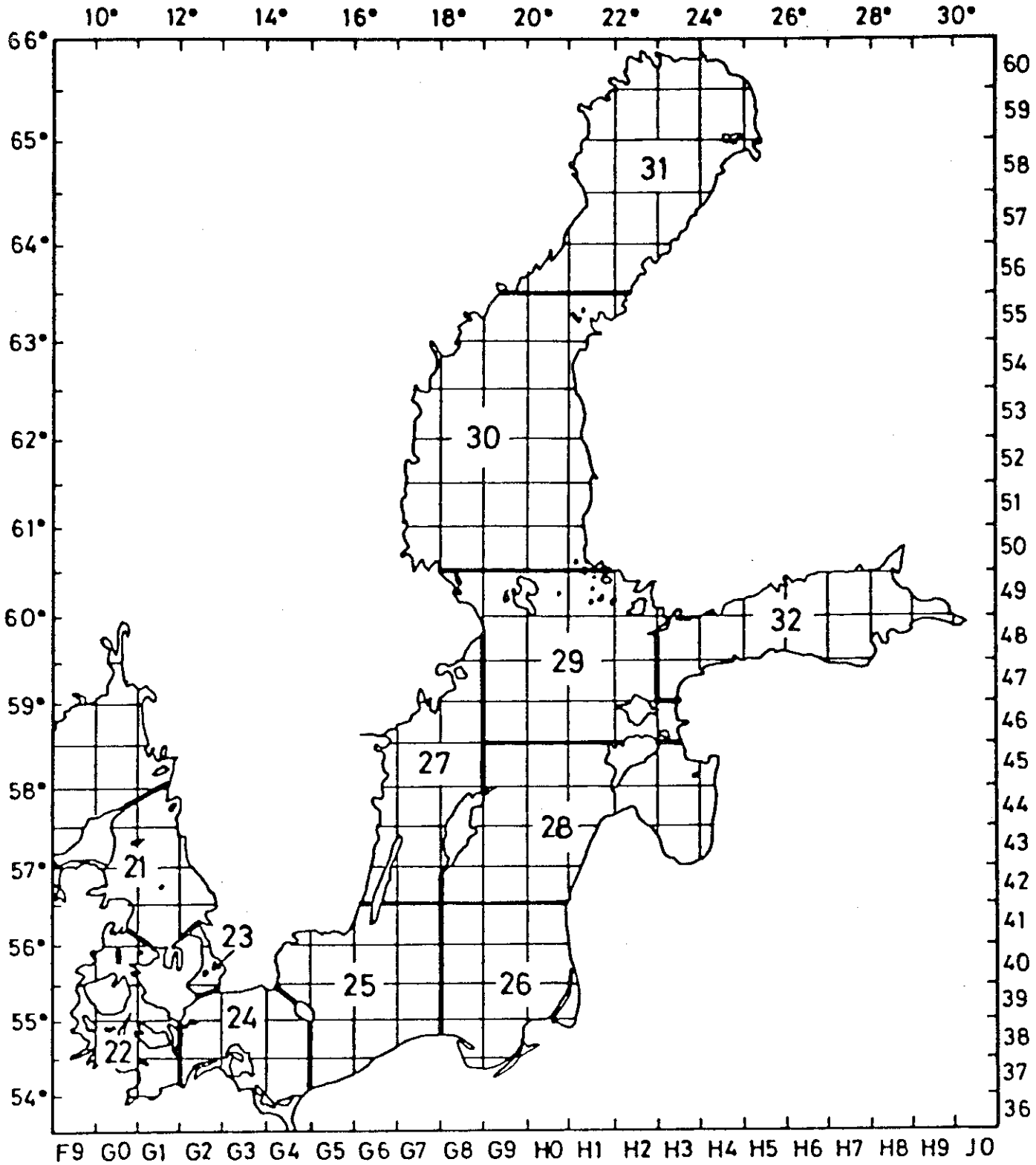
Table 5. Recent catches[1] and recommended TACs (in '000 tonnes).

Fishery and Sub-divisions	1975	1976		1977			1978			1979		1980
	Actual Catch	Recom. TAC	Actual Catch	Recom. TAC	IBSFC TAC	Actual Catch	Recom. TAC	IBSFC TAC	Actual Catch[2]	Recom. TAC	IBSFC TAC	Recom. TAC
Herring												
22-24	74		64			75			78	68		67
25,26	159		155			152	290		142	115		118
27, 28[3], 29S	69	400	65	400	422	68		444	73	65	405	61
Gulf of Riga	29		27			24			15	16		15
29N,30,31	65		65			64	74		68	78		73
32	39		51			50	33		50	44		40
Total	435		427			433	397		426	386		374
Sprat												
22,24,25	32		34			36			22	34		17
26,28	83	240	65	240	275	85	210	184.3	73	80	161	46
27,29,32	67		67			60			40	41		14
Total	182		166			181			135	155		77
Cod												
22	32	41	33	27.2	185	30	28	173.8	24	29	175	19
24	12		15	12.4		15	12		15	10		14
25-32	195	150	203	120.0		165	131		153	136		179
Total	239	191	251	159.6		210	171		192	175		212

1) Working Group data by Sub-divisions.

2) Preliminary.

3) Excluding Gulf of Riga.



ICES 27.3.03.00 (Baltic)

V. INTERACTION BETWEEN GREY SEAL POPULATIONS AND FISH SPECIES

The grey seal, which competes with man for important fish stocks and is final host to the codworm, an economically important fish parasite, has shown a steady increase in numbers over the last ten to fifteen years. In order to assess the problems associated with this increase, an ICES Working Group on Grey Seals met at Cambridge in May 1977 and prepared a report (C.M.1977/N:11) which contains much information of relevance to the current situation.

A further meeting of the Working Group was convened by ICES from 14 to 18 May 1979 at the request of the EEC Commission. The Working Group, in reviewing the current status of the grey seal population in the NE Atlantic, considered the extensive series of observations carried out in the United Kingdom over the last twenty years, particularly at the Farne Islands. These indicate clearly that undisturbed populations have increased at an annual rate of 6-7%. There is no evidence that natural limiting factors will have an effect on this rate of increase in the near future, although clearly it cannot be sustained indefinitely. The estimated total population of the British Isles in 1977 was 73 000, compared to 55 000 in 1968.

Estimation of the impact of grey seals on fish stocks relies on analysis of seal stomach contents, which are thought to adequately mirror the proportion of commercial fish in the diet, and on estimates of daily food consumption, largely derived from captive seals. The estimated total food consumption of the British grey seal population lies between 90 000 and 150 000 tonnes. This revises the estimate of 168 000 tonnes given in the previous ICES Working Group report.

Direct damage to fisheries is primarily concerned with salmon in Scotland. In the last 15 years there has been no significant change in the damage to entrapped fish, which is currently about 3%. However, there is new evidence to show that 2.3% of the fish may be taken from the nets by grey seals, before they can be recovered by the fishermen.

Commercial catches of twenty species of fish, important to both man and seals, amounted to between 3 and 4 million tonnes in 1975-77 in waters around the British Isles. By comparison, seals consumed an estimated 90-150 000 tonnes, of which two-thirds are commercially important species of commercial sizes. This consumption by seals represents 1.5-3.3% of the commercial catch of all species combined. However, in ACFM's opinion, this estimate, given by the Working Group, is not completely realistic in relation to the impact on the fisheries. The seal populations are distributed in local colonies, and their effect on the fish populations and on the fisheries of communities adjacent to the seal colonies will be much greater than this range of proportions would imply. It should also be pointed out that fish below the commercial size would recruit to the fished stock in due course, if not consumed by seals. In the only species of fish considered in detail, the salmon, the impact of grey seals on the stock may be of the order of the impact of the commercial fishery (5 000 tonnes in 1977 for the United Kingdom, Ireland and France). This again will constitute a much higher proportion for salmon fisheries adjacent to seal colonies.

Little is known of the effect of other predators on fish stocks. Birds appear to consume about the same amount of fish as grey seals, while cod consume their own weight of fish annually, about 400 000 tonnes. However, nothing is known of the inter-relationships of the various species concerned.

In reviewing management of the United Kingdom grey seal populations, the Working Group considered three options: no killing of seals, maintaining the population at its present level, and reducing the population. Under the first option, the increased food consumption by grey seals would represent a loss to fisheries of 7 to 12 000 tonnes in the first year, with a possible increase to 25-40 000 tonnes at equilibrium. Consumption of salmon would rise, resulting in concern that eventually spawning escapement might be eliminated. No significant increase in codworm would be expected but larger breeding populations could cause significant increase in terrestrial erosion, with resultant problems at such sensitive sites as the Farne Islands, and the Monach Isles in the Outer Hebrides.

The effect of maintaining the present level of population is as described earlier.

The effect of reducing the population is best considered at the level recommended by the Seals Advisory Committee: a Scottish population of 35 000 (the mid-1960s level) within a total population of 55 000. At this level, an additional 4-6 000 tonnes of fish would become available to fisheries in the first year, with 13-20 000 tonnes at equilibrium. No significant reduction in the levels of damage to netted salmon and of codworm infestation would be likely. A reduction of the seal populations to this level would not entail any danger of eliminating the seal populations.

The above calculations were derived from consideration of a general production model (Appendix I in the report), which is concerned with only a single stock. Unfortunately at this time, multi-species inter-relationships, which are extremely complex, are poorly understood, and there is no satisfactory way of modelling them. Such relationships were therefore ignored in the calculations, and it was assumed that the biomass of commercially important species eaten by the number of grey seals added to, or removed from, the population would be directly added to or removed from the biomass available to the fishery.

Strategies for managing grey seal populations were considered. These fall into three categories, breeding season culls of pups only, breeding season culls of adults and pups, and culls at other times than the breeding season. Each has advantages and disadvantages, but culling both adults and pups during the breeding season is the most effective. There are several means of applying control, the most reliable of which is culling under government supervision. Whatever means of control is used, killed seals should, where possible, be fully utilised.

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

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