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Dr V.M. Nikolaev: Council's Statistician,  
Secretary to the Advisory Committee on  
Fishery Management

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I. REPORT OF THE MEETING 16-17 May 1980<sup>1)</sup>

INTRODUCTION

In response to a request from the Commission of the European Economic Community the ACFM met, on 16-17 May 1980, at ICES headquarters to provide advice, about 6 weeks earlier than it would have done in the normal course of events, on three topics:

- (a) any revision of the TAC, previously advised in the ACFM report prepared in July 1979, for North Sea cod in 1980;
- (b) any revision of the TAC for North Sea and Skagerrak saithe previously advised for 1980;
- (c) to comment on the advisability of re-opening in 1980, under small TACs, herring fisheries currently subject to prohibitions on directed fisheries.

The wording of the EEC Commission's request for advice on these topics is quoted verbatim below:

"As the next scheduled meeting of ACFM does not start until 1 July, the Commission would be grateful if ICES would consider convening a special meeting of ACFM as early as possible in May 1980 in order to provide it with the latest scientific advice on the stocks of North Sea, West Sea/Skagerrak saithe, and the stocks of herring in the North Sea, West of Scotland (VIA excluding the Clyde), in the Irish Sea (Mourne stock only) and in Divisions VIIe, f and VIIg-k (excluding Bantry Bay).

For North Sea cod the TAC for 1980 was based on the assumption that the 1979 year class was of average size. The results from the International O-Group Gadoid Survey indicated that this year class might be much bigger than average. Has this been confirmed by the results from the North Sea International I-Group Fish Survey? If so, the Commission wishes to be advised whether the recommended TAC for 1980 should be revised".

In an earlier request the EEC Commission had requested ICES to: "review the biological criteria for re-opening the herring fisheries in Sub-area IV and Division VIa." As this is an integral part of any consideration of Item (c) above, ACFM considered that it would be expedient to reply on this subject at the same time.

At its meeting in April 1980 the North Sea Roundfish Working Group made some major changes to the basic historic data for North Sea haddock and whiting to make them more compatible between years during the period from 1960 to date. The need to do this, and the method adopted, are explained more fully under the appropriate sub-heading below. One result of this change in the data base, however, has been to increase considerably the Working Group's estimates of TACs for North Sea haddock and whiting previously advised for 1980. In the light of the major effects these changes

<sup>1)</sup> The following members were prevented from attending this meeting: M E. Cadima, M J.A. Pereiro, Mr A.T. Pinhorn, Prof. J. Popiel, Prof. V. Sjöblom and Dr V.K. Zilanov.



would have on the fisheries exploiting these species, the ACFM considered it advisable to discuss this matter and comment on it now. Accordingly this item was added to the agenda of the ad hoc meeting, and is also reported on below.

In this report advice is given on the items listed above only in relation to any amendment of the advice previously given on TACs for 1980. These stocks will be considered further, and advice on management measures for 1981 given, during ACFM's main meeting in July 1980.

#### A. NORTH SEA COD

1. Provisional landings in 1979, of 228 000 tonnes, were 13% less than in 1978, and slightly below the TAC of 247 000 tonnes agreed between the EEC and Norway.
2. In the 1979 ACFM report it was indicated that the TAC recommended for 1980 was very dependent on a correct estimation of the size of the 1976 year class. The better estimate now available of the strength of this year class suggests that it is somewhat less abundant than previously thought, although still a very strong one. The 1977 year class is of below average strength as is the 1978 year class. It must be stressed, in relation to the question raised by the EEC Commission concerning North Sea cod, that the results of the International O-Group Gadoid Survey have not yet been shown to be of any value in predicting year class strength. If, and when, their value in this respect has been demonstrated, ICES Working Groups will immediately utilise the outputs from them in this way. In practice the 1980 International Young Fish Survey suggests that the 1979 year class is of only average abundance.
3. On the better data now available to estimate the TAC for North Sea cod in 1980, it would appear that the TAC of 200 000 tonnes recommended for 1980 will require a reduction in the fishing mortality rate of 14% from the 1979 level. In recommending this TAC for 1980 in its previous report, ACFM did so on the assumption that it would reduce the fishing mortality rate by 10% from the 1979 level. In the light of errors in making such predictions, the difference between 10% and 14% is of no significance and ACFM would accordingly recommend that the TAC of 200 000 tonnes previously advised for North Sea cod in 1980 be adhered to.

#### B. NORTH SEA (Sub-area IV) AND SKAGERRAK AND KATTEGAT (Division IIIa) SAITHE

4. Landings from Sub-area IV and Division IIIa in 1979, at 115 000 tonnes, were 27 000 tonnes less than in 1978. Of these landings 1 635 tonnes were by-catches from industrial fisheries. The fishery in 1979 was subject to quota regulations, but this had little effect on landings, which amounted to only 57% of the TAC. The changes which have taken place in the fisheries, following the extension of jurisdiction by coastal states, and the lack of data on fishing effort, make it difficult to estimate the present exploitation level.
5. Using the same input F values for 1979 in the VPA as were used in 1978 a trend in estimated Fs was produced which was consistent with what was thought to be the trend in fishing effort. This would suggest that the input Fs for 1979 were not seriously wrong, and unfortunately no better basis is currently available for assessing the exploitation rate on this stock in 1979. These F values in 1979 were accordingly used in the estimation of stock sizes and the appropriate TAC for 1980.

6. The 1979 exploitation pattern gives an estimate of  $F_{\max}$  of 0.22 on age groups subject to maximum exploitation. The predicted catch in 1980, if one assumes retention of the 1979 Fs into that year, is 126 000 tonnes compared to a TAC recommended by ACFM in its last report of 129 000 tonnes. The ACFM recommendation, however, was based on an estimated F of 0.28 in 1980, whilst the latest assessment would suggest that an F of only marginally less than 0.35 will be required to take this TAC. On this basis ACFM would see no justification for modifying its previous advice with regard to the 1980 TAC for North Sea and Skagerrak saithe.

7. Fishing for saithe with purse-seine in the North Sea is carried out only by Norwegian vessels. Landings by this method over the last six years have averaged 8 600 tonnes annually. The catch is predominantly of 2 and 3 years old fish. To assess the effects of this fishery on the yield, the Fs at age generated by this fishery have been deducted from the total Fs at age. The resultant exploitation pattern gives a yield per recruit at the current exploitation rate only 5% higher. This, then, would be the size of the gain to be expected if purse-seine fishing for saithe was prohibited.

#### C. HERRING FISHERIES CURRENTLY SUBJECT TO PROHIBITIONS ON DIRECTED FISHERIES

##### C.1 Criteria for Re-opening the Fisheries on Herring Stocks which are currently subject to bans on directed fishing

8. This question was discussed in the 1979 report of the Herring Assessment Working Group for the Area South of 62°N, particularly in relation to North Sea herring, and based on that report ACFM stated: "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". The value of 800 000 tonnes stated above for North Sea herring is the estimated minimum spawning stock size required to avoid a risk of recruitment failure with a reasonable degree of probability. The corresponding stock sizes to meet this requirement for the other stocks currently subject to prohibitions are less well known because the data base available for them covers a shorter time period. The best estimates which can be made for these, however, are: Division VIa - 200 000 tonnes; Celtic Sea - 40 000 tonnes. For the Mourne stock it is not possible to specify such a minimum spawning stock size because this stock was already severely depleted before the first assessment was carried out. In these circumstances ACFM can only recommend that there must be positive evidence of a substantial increase in the size of the Mourne spawning stock before a directed fishery on it is permitted. The conditions stated, in the last sentence of the quotation from a previous report of ACFM given above, apply with equal relevance to all herring stocks which have been depleted to the extent that it has been necessary to recommend prohibition of directed fisheries on them.

9. For each stock the spawning biomass should be rebuilt to the lower level of its optimal range in order to ensure the future of the stock and a fishery on it which can be sustained, and ultimately progressively increased to the potential optimum sustainable yield of the stock. Below this level of the spawning stock, failure in recruitment may occur. A very limited fishery could be allowed before this goal has actually been reached, provided that two basic criteria are fulfilled: Firstly there should be evidence of a recovery of the spawning stock, which is independent of any prognosis based on catch levels and assumed fishing mortality rates derived from the last year of permitted fishing, and evidence of improved recruitment. This means, for example, that re-opening of a fishery should not be based only on expected increases in the

spawning stock compared to an estimated level in a past year, and/or expected improved recruitment from an increasing spawning stock. Because of a) the errors involved in projecting the stock forwards from a given, but uncertain, starting value, b) the uncertainties about the actual form of the relation between spawning stock and recruitment, and c) the stochastic variability in recruitment around the stock/recruitment curve, it could have disastrous consequences to replace firm evidence with expectations. Secondly, the observed increases in spawning stock and recruitment should be of an order that will ensure that the rebuilding to the defined goal will take place with a limited fishery operating. Ideally exploitation should not start before the first year class which is estimated to be of the average size during the period when the spawning stock was within the optimal range has spawned once, and its strength has been confirmed by its contribution to the spawning stock.

10. It is however realised that such an approach may be found unacceptable by the fishing communities, arguing that as soon as it is clear that the stock will recover within a short period with a very limited fishery operating, such a fishery should be allowed. This may be acceptable biologically if it can be shown that the recovery will take place even under conservative assumptions about strength of recruit year classes and present stock size, taking into account the confidence limits of the estimates. If it is to some extent uncertain whether a year class will increase the spawning stock to an extent which could allow a limited fishery, its contribution to the spawning stock should be confirmed before exploitation starts.

11. When considering the effects of very small TACs taken from stocks which are showing signs of recovery, but are still seriously depleted, it would be irresponsible of ACFM to disregard the possibilities of these TACs being seriously exceeded. In relation to re-opening in 1980 any of the herring fisheries which are prohibited account must be taken of the fact that there is at present no agreement between countries fishing in the relevant areas on sub-divisions of TACs into national quotas. As ACFM has pointed out in previous reports, acceptance of a TAC, without such a sub-division into national quotas, is quite meaningless as it is quite certain that the summation of the proportions to which each country considers itself to be entitled will amount to considerably more than 100% of the TAC. ACFM is also very conscious of the fact that enforcement, even of some TACs which have been large relative to historic catches, has been totally ineffective. Examples of failures in enforcement can be found in the cases of North Sea sole, where recent TACs have been about 1/3 of the maximum sustained catch levels ever achieved, Western mackerel where recent TACs have been greater than historic catches over any sustained period; and Division IIIa herring where recent TACs have been more than half the catches taken prior to TAC regulation. By contrast if one was envisaging a TAC of the order of 20 000 tonnes for North Sea herring this would be about 3% of the sustained historic catch level prior to stock depletion.

12. Indeed, even in the case of accepted prohibitions of all directed fisheries, which ought in principle to be the simplest to enforce, the enforcement performance has been less than impressive, as witnessed by the reported catches given below for Celtic Sea and Division VIa herring. In the light of the high vulnerability of a depleted herring stock to any exploitation, and lack of confidence in the current ability of management bodies to enforce small TACs, which would, in turn, demand very small national quotas, ACFM would be very much afraid that any gains in the states of the stocks which have been achieved from prohibitions now in force would be quickly dissipated if fishing were permitted before enforcement procedures have been strengthened.

13. ACFM would also wish to point out that its advice is based solely on biological criteria which should be the over-riding consideration when exploiting a renewable natural resource. ACFM is, however, aware that management bodies must take account of economic and sociological considerations which are outside ACFM's sphere of competence. It would merely point out that if too much stress is laid on short-term problems in these spheres, at the expense of the biological resource, the longer term result is likely to be merely to exacerbate the problems.

## C.2 North Sea Herring

14. Throughout 1979 directed fishing for herring was prohibited. The estimated by-catch of herring from the North Sea in 1979 was 18 938 tonnes compared with 11 033 tonnes in 1978. About 15 700 tonnes were taken in the sprat fisheries. There is some information on illegal directed fishing for herring and an estimate of 3 000 tonnes has been added to the total catch to take account of this. The total catch of North Sea herring has therefore been estimated to be about 22 000 tonnes in 1979.
15. About 95% of the catch in number was 0- and 1-group. The apparent increase in by-catches in 1979 may be partly due to reporting of by-catches in earlier years being less efficient than at present.
16. The results from the International Young Fish Survey in 1980 would suggest that the 1978 year class is of about the same strength as the 1976 year class. Although the indices of these two year classes would suggest that they are stronger than the others produced in the period 1974-79, they are only about 25% of the long-term average strength. The members of the 1978 year class caught during the 1980 survey were very small compared with fish of this age caught in preceding surveys. It should also be pointed out that the predicted size of the 1977 year class from the results of the International Young Fish Survey in 1979 would mean that the contribution which it will make to the spawning stock in 1980 will be very small even if it is not subject to exploitation in 1980.
17. Very high numbers of herring larvae belonging to the year class 1979 were observed during the International Young Fish Survey in February 1980. This may indicate that the 1979 year class will be stronger than the preceding year classes but a long enough series of observations on the abundance of larvae of this age is not available to gauge whether such observations are of any predictive value. A reliable estimate of this year class will not be obtained before the Young Fish Survey in February 1981.
18. The estimated fishing mortality on 0-ringers in 1979 was 0.29 compared to 0.27 in 1978. The estimated fishing mortality on 1-ringers in 1979 was 0.49, which is higher than estimated for the previous years, and could indicate that the 1977 year class has been underestimated by IYFS. However, because of the possibility that reporting of by-catches of herring was more efficient in 1979, a strict comparison with F values of previous years is difficult.
19. Estimates from herring larval surveys of spawning stock sizes indicate a slight increase from 1978 to 1979 in Division IVa. The estimated spawning stock in Division IVb was at the same level as in 1978, while a significant increase seems to have occurred in Divisions IVc - VIId. For the

total North Sea, the larval surveys indicate an increase from about 200 000 tonnes in 1978 to 255 000 tonnes in 1979. However, taking into account the large variance on these estimates, the estimated increase is not significant.

20. In addition to the estimates of spawning stock from herring larval surveys an estimate has also been made by projecting stock sizes forward from the 1977 stock, as estimated by the Working Group in 1978. Recruitment as 1-ringers was calculated from the IYFS catch per hour. This projection gives a spawning stock of 442 000 tonnes in 1979. This estimate is sensitive to any errors in the starting point (1977 stock in numbers by age). It should also be stressed that the basic assumption for the projection is that recruits, as estimated from the IYFS remain in the North Sea throughout their life. It is known that recruits to Division VIa occur in the juvenile population in the North Sea. Thus, the spawning biomass estimate for the North Sea from the projection may contain a component of herring which does not contribute to the actual spawning in that area.

21. The lower level of the optimal range of the spawning stock has previously been defined as 800 000 tonnes for North Sea herring. Although some rebuilding of the spawning stock has taken place in recent years the estimated spawning stock biomass in 1979 is still far below this level. The increase in the spawning stock from 1979 to 1980, arising from the contribution of the 1977 year class, is expected to be small. Also the most recent year class for which an estimate is available is at a low level. According to both of the criteria outlined in Section C.1, and the concern expressed in paras. 11 and 12 about enforcement, there is therefore no reason to revise the advice previously given, that there should be no directed fishery for North Sea herring in 1980.

It should be stated that this advice was subject to prolonged debate, as some of the members of ACFM had thought that a small TAC might be an acceptable alternative to a total prohibition. Finally, however, the advice given above was agreed in the light of the dangers seen in any re-opening of the fishery in 1980.

22. The Report of the Herring Assessment Working Group for the Area South of 62°N also draws attention to the very high fishing mortality rate apparently generated on the 1977 year class as 1-group by by-catches in the sprat fishery. This may be an artefact caused by overestimation of the numbers of this year class caught by the sprat fishery, but equally it might arise from high vulnerability at this age of weak year classes to exploitation by the sprat fishery. ACFM has repeatedly stressed in past reports the importance of reducing the mortality generated by the sprat fishery on juvenile herring, in the present critical state of the North Sea herring stock, but without having been able to advise on any practicable method of doing this. However, arrangements are being made to get better data on the seasonal and areal distribution of herring by-catches in the sprat fisheries for the ACFM meeting in July 1980. It is hoped that the ACFM will then be in a position to advise on this important question.

23. At present it is not possible to give advice for 1981 since the results of the 1980 herring larval surveys and the 1981 IYFS are of vital importance for the assessment of spawning stock and recruitment in 1981. At present it can only be advised that a directed fishery for herring should not be allowed in 1981 before the results of these surveys have been evaluated.

24. Since the stock components of the North Sea herring may be recovering at different rates, and since the level of recruitment to these components may differ, re-opening of the total North Sea herring fishery may prevent one stock from recovering while another may remain lightly fished, depending on the distribution of fishing effort. It is therefore recommended that before the fishery is re-opened, on receipt of advice that that is permissible detailed consideration should be given to the way in which the re-opening should be carried out. This should include the assessment of the appropriate duration, location, and level of exploitation in the fishery, bearing in mind the need to allow for continued growth of the North Sea population as a whole and of its component stocks.

### C.3 Celtic Sea Herring

25. Despite the prohibition on directed herring fishing, considerable catches have been made since the initial closure in 1977/78. During the 1979/80 season about 4 200 tonnes were taken in a directed Irish trawl and driftnet fishery, and as a by-catch in Dutch and French mackerel fisheries.

26. Although young herring surveys have been initiated there is still no method available for estimating the recruitment to the Celtic Sea stock. There are, however, some signs of improved recruitment. During a trawling survey in January 1980, considerable quantities of 1-group herring were present along the southeastern Irish coast.

27. Since the prohibition of the fishery was introduced, the Irish boats have been operating under a quota system which has made it difficult to measure fishing mortality or total effort from catch per unit of effort data. The Working Group in 1979 concluded that there had been a considerable increase in fishing effort from 1977/78 to 1978/79. This was reviewed at the 1980 meeting, and although no reliable data on changes in fishing effort exist, it was suggested that it was more likely that fishing effort was reduced when the prohibition on fishing was first introduced, but stayed more or less stable in later years. On this basis, the adult stock size has been estimated to be about 13 000 tonnes at 1 April 1980 compared with about 9 000 tonnes in 1978 and 1979. Although these stock sizes are higher than those estimated last year, it is still evident that the catches taken since the prohibition of the fishery have prevented any significant recovery of the stock.

28. The defined management objective for this stock is to rebuild the spawning biomass to 40 000 tonnes. This level was based on historical data on spawning stock size and recruitment during a period when the fishery was almost entirely based on a winter spawning component. There is now evidence that the proportion of the autumn spawning component has increased, and it is therefore possible that the defined management objective is not now the most appropriate. However, at the moment it is not possible to redefine a desired stock level.

29. Although some increase in stock size may have occurred from 1978/79 to 1979/80 the stock is probably still in a depleted state. Although there is no firm evidence of increased recruitment, there are indications as discussed in para. 26 that a stronger year class may recruit to the spawning stock in the 1981/82 season. If this does happen, it would be advisable to allow it to spawn at least once before subjecting it to exploitation. Taking into account the general criteria for re-opening a fishery as outlined in Section C.1 there is no reason, at present, to revise the advice previously given for the 1980/81 season that there should be no fishing for Celtic Sea herring. As in the case of the North Sea herring advice this recommendation was subject to a detailed discussion on the possible justification for a re-opening of the fishery on a very limited scale in 1980. Finally, however, the advice given above was agreed in the light of the dangers seen in any re-opening of the fishery in the 1980/81 season.

30. The data available to monitor the recovery of this stock are inadequate because of lack of sufficient research effort in its area of distribution. A considerable increase in research effort in this area is required to provide better information on the current stock size and the potential recruitment to it in order to provide a firmer data base for advising on the state of the stock in 1981/82 at the next meeting of the relevant Working Group.

#### C.4 West of Scotland Herring (Division VIa)

31. The preliminary catch figure for 1979 (6 028 tonnes, excluding the Firth of Clyde) is greatly reduced from the total for the previous year because of the observance, by most countries, of the ban on herring fishing within Division VIa, excluding the Clyde. A major proportion of the catch came from the area to the northwest of Ireland, and most of the remainder as a by-catch from the mackerel fishery.

32. There are no reliable indices of year class strength from young herring surveys in Division VIa. However, the 1977 year class was abundant both in the Moray Firth sprat fishery in 1978, and in the north-western North Sea in 1979, as measured by IYFS. Because the fishery for sprat in the Moray Firth in 1979 was very erratic, and could therefore give no indication of abundance of 0-group herring, little information is available about the strength of the 1978 year class.

33. The herring larval surveys in Division VIa in 1979 provided the only available data from which to estimate the size of the spawning stock (2-ringers and older). From a regression line of spawning stock size on larval abundance indices, the spawning stock sizes in 1978 and 1979 were estimated to be 69 000 tonnes and 290 000 tonnes respectively. These estimates, however, are not regarded as of high reliability because of incomplete coverage in 1978 and because of the high variability about, and low significance of, the regression line. On this basis neither the absolute sizes of the spawning stocks nor the apparent increase in recruitment, which comparison of them would entail, can be taken to be firmly established.

34. Using the stock prediction given in the previous report, the estimated size of stock in 1979 given above implies that the 1976 year class must have been larger than originally thought, constituting some 90% by number of the spawning stock if the strength of older year classes are as assumed in the prediction. Data available indicated that 2-ringers made up about 57% of all 2-ringers and older herring in 1979.

35. Because of lack of independent evidence to support the results of the 1979 larval surveys, the high value obtained should be treated with some reserve. As an alternative approach, a stock prediction was made from the stock in number at 1 January 1978 given in the 1979 report, but correcting the 1976 year class so that it constituted 60% of the spawning stock in number in 1979. This prediction resulted in a spawning stock of 77 000 tonnes in 1979, compared to 52 000 tonnes and 45 000 tonnes in 1977 and 1978 respectively, all values referring to 1 September. Assuming that the strength of the 1977 and 1978 year class would be equal to the lowest recorded recruitment value, the prediction gives a mature stock at 1 January 1980 and 1981 of 114 000 tonnes and 143 000 tonnes respectively. Since this prediction is based on a much lower spawning stock in 1979 than that indicated by the larval surveys, and since recruitment values are assumed to be at the lowest recorded level, the estimates for 1980 and 1981 are likely to be underestimates.

36. Although there is some evidence of a recovery of the Division VIa stock, a conservative prediction indicates that the spawning stock in 1980 will not have reached the previously defined minimum level of 200 000 tonnes. Furthermore, there is no firm evidence that recruitment is sufficiently high to guarantee that recovery to 200 000 tonnes will take place with a limited fishery. On the basis of the criteria set out in Section C.1, there is therefore no reason to revise the advice previously given for 1980 that there should be no directed fishing for herring in Division VIa (excluding the Clyde).

37. However, since what evidence there is indicates the possibility that recovery might have proceeded further than estimated by the stock projection, all available effort should be utilised in 1980 to obtain further evidence on the size of the stock and on recruitment to it. The advice for 1981 will have to be reconsidered in the light of these new data.

#### C.5 Mourne Stock

38. The total nominal catch of herring of the Mourne stock in 1979 was 1 753 tonnes, compared to 2 548 tonnes in 1978. Some 2 000 tonnes of Mourne herring will probably be taken as a by-catch in the Manx fishery during 1980, prior to the time of spawning.

39. It has been advised for several years that the industrial fishery would have to be terminated if the Mourne stock was to survive. Early in 1979 the only reduction plant handling the industrial catch closed, and the fishery ceased. As a result, only 45 tonnes were taken in the industrial fishery in 1979, compared to 739 tonnes in 1978. Furthermore, because of the closure of this fishery, 0-group herring, for the first time for many years, were absent from the 1979 catches, and the catches of 1-group herring were substantially reduced.

40. A mean fishing mortality in 1979 was calculated for 2-9 ring fish from the estimated stock in numbers at each age on 1 January 1979, given in last year's report of the Working Group. The resulting value was 0.26. The stock estimates in 1980 and 1981 are heavily dependent on the assumption on recruit year classes, and it was considered unrealistic to attempt a stock prognosis beyond 1980. If no further industrial fishing takes place, it could be expected that the size of the spawning stock will increase fairly rapidly.

41. It has not been possible to advise what the optimal spawning stock should be for the Mourne herring, due to the fact that this stock was in a depleted state when the first assessment was carried out. There should, however, be positive evidence of a substantial recovery of the spawning stock before any directed fishery can again be contemplated. There is therefore no reason to change the advice previously given for 1980 that there should be no fishing for herring within 12 miles of the coast of Ireland between latitudes 53°20'N and 55°00'N.

#### D. HADDOCK AND WHITING STOCKS IN THE NORTH SEA

42. At its meeting in 1980, the North Sea Roundfish Working Group completely revised the data on which its assessments of North Sea haddock and whiting had previously been based. This was necessary because of illogicalities in the previous data base, and the new data base undoubtedly is likely to provide more consistent values of historic recruitments, and the spawning stock biomasses which generated these recruitments.



The changes in these data bases chiefly arose from making more realistic estimates of the age compositions of industrial by-catches of haddock and whiting for the period when there was no adequate sampling of these by-catches, and from more realistic assumptions about the levels of discarding by those countries which do not directly measure discards.

43. These changes in the data base will inevitably generate higher estimates of recruitment to these stocks, and higher estimates of the fishing mortality to which they are subjected in their early life. To a very large extent these two factors should counterbalance each other when it comes to a question of predicting future landings from these stocks, in terms of TACs. In the report of the North Sea Roundfish Working Group, however, these changes in the data base have resulted in almost doubling the estimated TAC for North Sea haddock in 1980 at the same exploitation rate, and increasing that of whiting by about 60%.

44. ACFM received the report of this Working Group only on the first day of its ad hoc meeting and did not have time to evaluate why this change in the data base produced results so different from what would be expected. The Working Group itself had suggested some uneasiness about these outputs in relation to TACs.

Under these circumstances ACFM would strongly recommend that management bodies should take no action in implementing changes in the TACs for North Sea haddock and whiting at this juncture. ACFM proposes to immediately put in hand further investigations of this matter, and to set up a sub-group to report on the outcome to its July meeting. If appreciable amendments of the 1980 TACs for these stocks then seem justified, ACFM will immediately inform all relevant management bodies, as was done, in similar circumstances, in relation to North Sea cod in 1979.

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## II. REPORTS OF THE MEETING 1-10 July 1980

### ADVICE CONCERNING REVISION OF 1980 TACs

#### 1. Herring in Skagerrak and Kattegat

Data available to ICES since the TAC of 40 000 tonnes in 1980 was advised in October 1979, would suggest that recruitment to this stock in 1980 is likely to be stronger than would have been expected in the light of the very low spawning stock which generated it. Indices of abundance of 1 ringed herring from the International Young Fish Survey in February 1980 would suggest that the 1978/79 year class is of average strength, and the 1977/78 year class, as measured by the acoustic survey carried out in September 1979, is stronger than had initially been feared from the results of the IYFS survey in February 1979. ACFM has reassessed the pelagic stock biomass measured by the acoustic survey in September 1979 because this was biased, due to the use of a constant factor to convert integrated echo-signals to fish biomass based on the target strength of herring of ca 100g. The integrated biomass consisted of a mixture of sprat and herring and accordingly a length dependent conversion factor is more appropriate. This reduces the estimated herring biomass from 277 000 tonnes used by the Herring Assessment Working Group for the Area South of 62°N to 200 000 tonnes.

Of this herring biomass, the 1977 year class is the dominant component. Using the stock in numbers per age group, estimated from this acoustic survey and the associated sampling of the population would suggest that the TAC of 40 000 tonnes previously recommended for 1980 would generate a rather low  $F$  of 0.18 on fully recruited age groups. The spawning stock in 1980 is then estimated to be 125 000 tonnes compared with spawning stock estimates of 10 000 - 50 000 tonnes in the years 1974-1979.

Although the estimated  $F$  generated by the previously recommended TAC of 40 000 tonnes is very low by comparison with estimated  $F$ s on this stock in earlier years, it should be pointed out that it is still above the  $F_{0.1}$  level at which it is advisable to fish herring stocks. ACFM also has considerable reservations about this assessment because (a) it is almost entirely based on one acoustic survey, with no previous experience from this area of the reliability of this technique; (b) it is inherent in the whole prognosis that the stock of the 1977 year class, as estimated by this survey in September 1979, will remain

in the area throughout 1980. This may not be a valid assumption as there is no previous experience of populations of three year old herring of this size in Division IIIa. In the light of these reservations about the validity of the assessment, ACFM, on purely biological grounds, would have preferred to await the results of the survey to be conducted in September 1980 before advising on any increase in the TAC.

If, however, management are of the opinion that the existing TAC demands a heavy and unwarranted restriction on fishing activity, ACFM would advise that the catch of herring in Division IIIa should not be increased beyond 50 000 tonnes in 1980. If the assessment quoted above is correct, this catch would entail fishing at the  $F_{max}$  level. In practice, the exploitation rate associated with this catch is likely to be above the  $F_{max}$  level because of the rather heavy discarding associated with herring fishing in this area under current restrictions on utilisation, minimum landing sizes, etc. ACFM could not, because of these factors and the dubieties associated with the assessment recommend a higher catch in 1980 than that given above.

## 2. North Sea Haddock and Whiting Stocks

In the assessment of North Sea haddock and whiting stocks, the North Sea Roundfish Working Group made radical changes to their data base by incorporating into it estimates of the more likely age composition of industrial bycatches for earlier years when there was no sampling of these and allowances for discarded catches in years when there was no sampling of discards. These changes were necessary to introduce more consistency into the data base; but largely because of these changes and to some extent because of changes in estimated fishing effort, their estimate of the TACs in 1980 was very different from those they had estimated last year and those which had been recommended by ACFM.

ACFM was concerned that it seemed illogical that changes in the data base largely introduced by the better estimation of discarded catches should subsequently reappear in the prediction of future catches as increased landings. It accordingly looked very critically at the procedure adopted by the North Sea Roundfish Working Group in predicting future catches. It would appear that the results produced by the Working Group largely originated from two sources of a somewhat unsatisfactory procedure:

- a) the Working Group's estimates of the proportion of both species which would be discarded in the 1980 and 1981 catches were based only on the proportions of each age group discarded in 1979. This was an atypical year when discarding was below the average of earlier years. There is no reason to think that this is indicative of a permanent change in discarding practice. Accordingly, ACFM took more realistic estimates of proportions discarded at age based on the average values for the period 1977-79;
- b) the inclusion of discards and more realistic age compositions of industrial landings has meant much larger estimates of the abundance of all year classes at initial recruitment to the stock. As estimates of future recruitment from the International Young Fish Surveys is based on the correlation between the indices of numbers caught by these surveys and the absolute values produced by VPA, this must mean that the predicted values are much higher than they would have been if used to predict from the old data base. The new prediction equation used by the Working Group has several unsatisfactory features and ACFM calculated a new one, which is based on a shorter series of the newer, more reliable estimates, which obviates these;
- c) the Working Group estimate of the fishing mortality rate on 1-group fish in 1979 appears to be atypically low - perhaps due to underestimation of the number discarded at this age in that year. ACFM used the mean value for the years 1977-79, which seems more likely to be realistic in their prediction of stock sizes and catches in 1980 and 1981.

It must also be stressed, as was done by the North Sea Roundfish Working Group, that this new data base although undoubtedly more consistent than the previous one is still, at this stage, subject to possible revision before the Working Group next meets to assess the 1982 TACs. In the light of the distinct possibility that such a revision may result in lower estimates of stock sizes, ACFM considers a cautious attitude should be adopted in any upward revision of the 1980 TAC for the North Sea haddock and whiting stocks.

However, on any basis such a revision is undoubtedly required because of higher estimates of recent year classes which had to be estimated as average when the 1980 TACs were originally assessed in 1979. ACFM would accordingly recommend that the 1980 TAC for the North Sea haddock should be revised to 90 000 tonnes and for North Sea whiting to 150 000 tonnes.

3. Haddock and Whiting Stocks in Sub-area VI

In Division VIa, no revision has been made of the data base. In this area there are no significant industrial fisheries generating bycatches and no data is currently available on discards, although this almost certainly takes place to some extent and the data base is likely to require some amendment in the near future.

Using the previous data base however, updated by the new data collected since the last assessment, it is clear that some revision is required of the TACs previously recommended for 1980 for Sub-Area VI haddock and whiting, largely due to higher estimates of recent year classes than the average values which had to be assumed in the previous assessments.

Using the same objectives, in relation to reducing the exploitation rates, as postulated by ACFM in its previous recommendations for TACs for these stocks in 1980, the revised values are 15 500 tonnes for Sub-Area VI haddock and 13 000 tonnes for Sub-Area VI whiting. These values are lower than those stated by the Working Group in its report, largely because the Working Group assumed that there would be no reduction in effort from 1979 to 1980.

### III. REPORT OF ACFM TO THE 19th ANNUAL MEETING OF NEAFC

#### INTRODUCTION

As requested by certain management bodies which receive advice from ICES, ACFM, in this report, gives the effects of various changes in fishing mortality in 1981 on the yield which can be expected in that year, and of the estimated effect of taking that catch on the stock which will remain to spawn in the following year. Advice in this form is given only for those stocks for which it is appropriate, and where the assessment data are adequate to permit it.

It is hoped that advice in this form will be found useful by the management bodies in formulating their fisheries regulations for 1981. ACFM has, however, adopted this change with some reservations because it considers that such advice could be open to misinterpretation and could result in adverse long-term effects on the stocks and on the fisheries which exploit them. Such illustrative indications of the effects of different changes in fishing mortality rates can show only the very short-term effects on yields and stocks. It is inevitable that increasing the fishing mortality rate in any one year will result in a higher yield than would have been taken in that year by a lower mortality rate. The longer term effect, however, will, in most cases, be a lower yield in subsequent years unless the fishing mortality rate is increased still further, and ultimately a lower yield irrespective of the level of fishing mortality applied.

The curves of spawning stock biomass in the subsequent year are perhaps more revealing than the yield curves, although they too suffer from the defect that they illustrate only the very short-term effects of an increased exploitation rate. The longer term effect must, if these enhanced fishing mortalities are maintained, be to drive the spawning stock down to successively lower levels each year, unless the stocks are temporarily increased by above average recruitment. And it should be appreciated that the chances of getting above average recruitment are likely to be seriously diminished once the spawning stock falls below a certain level.

It should also be appreciated that the curves of spawning stock biomass in the succeeding year give a rough indication of the stock which will be available for exploitation in that year, as a result of the management policy adopted in the preceding one. They are therefore roughly indicative of the effects of this policy on the catch rates which will be achieved in the following year. In the present situation of the fisheries reducing future catch rates in this way could have serious effects on their longer term economic viability. The short-term yield and spawning stock curves given in this report must be interpreted in relation to the long-term effects which sustained fishing at any chosen F value will have both on the yield and the biomass.

It is inherent in the response of stocks to management that a long-term policy is required, if the stocks are to give the optimum yield at an economic cost of harvesting it, rather than short-term expedients adopted to meet current economic and political problems. ACFM, in its report of June 1978, advocated a policy of gradually reducing the exploitation rate of stocks which were being fished excessively hard by about 10% per year until a more acceptable level of exploitation was reached. The Liaison Committee had in previous years adopted a similar, if less firmly defined, policy of reducing exploitation rates. Although the time scale is still rather short, it might be instructive at this stage to look at the exploitation rates of some such stocks, to see what progress has been made in

this respect. In the text table below are given the estimated mean fishing mortality rates for some of the more important stocks, over the period 1976-79, and the  $F_{max}$  as some indication of the goal which ought to be achieved. It should be appreciated that the precision of the estimates of fishing mortality declines as one approaches the final year. Where therefore the reduction achieved is small, it is rather dubious if anything has been achieved.

	Mean fishing mortality rates as estimated in 1980				$F_{max}$
	1976	1977	1978	1979	
Faroe haddock	.35	.34	.26	.22	.55
NE Arctic saithe	.76	.61	.37	.54	.42
North Sea cod	1.09	1.07	1.08	.95	.27
North Sea haddock	1.31	1.03	1.12	1.00	.33
North Sea whiting	1.13	.95	.84	.90	.28
Div. VIa cod	.83	.75	.72	.76	.30

These figures would seem to show that, in practice, for most of the heavily exploited stocks little real progress has been made in improving the situation. There would seem to be three main reasons for this: a) for the majority of stocks there has been little effective enforcement of TACs, as evidenced by the large number of cases mentioned in the assessments below where the TAC has been seriously exceeded; b) in many cases landings are a poor indicator of catches because of large-scale discarding and c) in too many cases the estimation by Working Groups and by ACFM of the TAC which can be taken at a given fishing mortality rate has been highly optimistic. It would seem clear that under these conditions a management policy of reducing  $F$  by 10% annually from a rather imprecisely known level can result in making little, if any, progress towards the defined long-term goal. Where, therefore, the state of the stocks permit greater reductions in the  $F$  values without very large reductions in the absolute size of the yields, ACFM has based its recommendations in this report on somewhat larger cut-backs of  $F$ .

In relation to their management policies, the responsible authorities should also be giving greater thought to the effects, both on yields and on the accuracy with which assessments can be carried out, of discarding. Collection of accurate estimates of discards in the various fisheries is very expensive in scientific man-power. As a result, reasonably adequate data are currently available only for the North Sea roundfish fisheries. The results from these are alarmingly high. Estimates of the weights of North Sea haddock and whiting which will be discarded in 1980 are 74 000 tonnes and 87 000 tonnes respectively and amount to more than half the expected landings. As these are predominantly small fish the resulting losses in long-term yields are considerably greater. Although estimates of discards are available only for these fisheries, it is likely that the losses resulting from discarding are considerable in a number of other fisheries. Managers should be concerned to minimise this problem, not only because of the resulting loss of yield, but also because of the effects on the accuracy of assessments. The best and perhaps only way to do so would be to increase minimum mesh sizes to an extent which would appreciably reduce the present incentives to discard. An increase in mesh size of 5 mm in the North Sea would not be expected to have any appreciable

effect. An increase to 90 mm, as advocated by the Liaison Committee and by ACFM for several years, would be expected to reduce the problem to a rather low level. It would seem obvious in the light of the only estimates available of the extent of discarding that the estimates previously given of short-term losses resulting from mesh increases must be exaggerated and of long-term gains minimised, because discarding was not taken into account in these assessments.

ACFM therefore finds it very disappointing that, despite advice given frequently in the past five years which stressed the advantages of mesh size increases in a number of fisheries, little progress has been made in putting this advice into practice. In a subsequent section of this report dealing with such measures, advice given in previous reports which has not been implemented is repeated in the hope that the climate may now have improved for taking more effective action on these very important matters. It should also be pointed out that the improvement in the exploitation pattern which would result from adopting them would mean, in the majority of cases, that the fishing mortality rates would have to be reduced less sharply to optimise the yield than if the existing exploitation pattern is maintained. The net disruption of current fishing activity is therefore likely to be less if action is taken to adopt these measures. This would also be a favourable time to implement these recommendations because the current improved recruitments to the North Sea and VIa roundfish fisheries would mean that any short-term losses which might arise as a result, would not result in any hardship to the fishing industry if they were adopted now.

#### A. REVIEW OF NOMINAL CATCHES IN NEAFC AREA, 1970-78

1. A general review of fish catches in the Convention Area from 1970 to 1978 is given in Tables 1-3. The tables, which are based on annual nominal catch 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, seaweeds 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.



A combined table of recent catches, as reported to ICES, and recommended TACs by areas and/or stocks is given on p. 70-73 (Table 4).

Region 1 (Table 1)

3. Having reached the record level of 6 301 000 tonnes in 1977, the total production of all species combined dropped by 880 000 tonnes (or 14%) to 5 421 000 tonnes in 1978. This figure, in addition to the sum of total catches of pelagic and demersal species in Sub-areas I, II, V and XIV, includes 10 000 tonnes of cartilaginous species and 19 000 tonnes of unsorted and unidentified fish, as well as the 17 000 tonnes of total catch from Sub-area XII, more than 70% of which consisted of Roundnose Grenadier.

4. In Sub-areas I and II the 1978 total catch of 3 458 000 tonnes of pelagic and demersal species combined was also far below the 1977 record level of 4 553 000 tonnes. This reduction was of such magnitude (by 1 095 000 tonnes, or 24%) that its effect on the total figure for the whole Region could not have been counteracted by moderate increases in the other Sub-areas. It should be noted, however, that the 1978 total catch was still nearly 12% above the average 1970-75 level.

The total catch of Pelagic Species decreased to 2 057 000 tonnes in 1978, or by 31% from the 1977 level. This resulted from reduced Capelin catches, which, at 2 036 000 tonnes, were 904 000 tonnes short of the record 1977 level. Herring catches, at 12 000 tonnes (of which 2 000 tonnes were taken in the White Sea), continued to be very low. The 9 000 tonnes of "Other Pelagic Species" consisted mainly of Sprat (nearly 56%) and Mackerel (more than 43%).

The 1978 total catch of Demersal Species of 1 401 000 tonnes continued the declining trend of recent years from the highest level, recorded in 1974, of 2 008 000 tonnes. In fact, the 1978 catch was the lowest in the 1970's, except for 1972. Catches of all major demersal species in 1978 were below the 1977 levels. Catches of Cod, at 733 000 tonnes, were 212 000 tonnes below the 1977 level and 15% below the average level of the 1970's. Catches of Haddock, at 97 000 tonnes, were 15 000 tonnes less than in 1977 and 38% below the average. Catches of Polar Cod, at 5 000 tonnes, continued to be negligible, in contrast to the situation in the early 1970's. Saithe catches of 154 000 tonnes continued to decline for the second consecutive year and were 36% below the average 1970-76 level. Redfish catches, at 124 000 tonnes, though much lower than the peak 1976 catch of 318 000 tonnes, were still 134% above the pre-1975 average level. Flatfish catches of 42 000 tonnes were the lowest in the 1970's and 6 000 tonnes less than in 1977; as in 1977, most of the catch (59%) consisted of Greenland Halibut. There was a further sharp increase in the "Other Demersal Species" category, where Blue Whiting predominated accounting for 74% of the total catch of 246 000 tonnes, with the shares of Norway Pout and Catfishes reduced to 7% each.

5. In Sub-area V the 1978 total catch of pelagic and demersal species combined increased further to 1 698 000 tonnes from the 1977 level of 1 605 000 tonnes. This was the highest level in the 1970's, and 32% above the average.

The total catch of Pelagic Species increased from 211 000 tonnes in 1970 to 871 000 tonnes in 1978, following a continued increase in Capelin catches from the average levels of 217 000 tonnes in 1970-72 and 449 000 tonnes in 1973-76, to 761 000 tonnes in 1977 and 833 000 tonnes in 1978. Herring catches (off Iceland) continued to increase for the fourth consecutive year, and reached 38 000 tonnes in 1978. Catches of "Other Pelagic Species" were negligible.

The total catch of Demersal Species of 827 000 tonnes in 1978 was 12 000 tonnes higher than in 1977, and 7 000 tonnes above the average level in the 1970's, notwithstanding a continuing decline in the major gadoid catches. Cod catches in 1978, at 363 000 tonnes, were the lowest in the 1970's and 28% below the 1970 level. The 63 000 tonnes of Haddock caught in 1978 were at about the average level, but 2 000 tonnes below the 1977 level. Saithe catches continued to decline from the high 1971-73 average level of 164 000 tonnes and, at 78 000 tonnes in 1978, were the lowest in the 1970's. Redfish catches showed a declining trend in 1976-77, which was accelerated in 1978 when the catch dropped to 45 000 tonnes, or by 24 000 tonnes from the 1977 level. Flatfish catches, at 21 000 tonnes, were 5 000 tonnes below the 1977 level and about 13% below the average level in the 1970's. As in 1977, Greenland Halibut dominated the catches (59% of the total). A marked increase in catches of "Other Demersal Species", which started in 1976, continued in 1978 with the total reaching 257 000 tonnes, nearly a fourfold increase over 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 173 600 tonnes in comparison with 3 000 tonnes in 1975. Norway Pout catches off Iceland were second in volume accounting, as in 1977, for 13% of the total in this category.

6. In Sub-area XIV the total catches of all species combined increased to 219 000 tonnes in 1978, 122 000 tonnes above the 1977 level, and more than four times higher than the average 1970-75 level. The increase was accounted for by Capelin catches which made up 85% of the total, having reached 186 000 tonnes from a zero level in 1975 (20 000 tonnes in 1976). After an explosive development in the Redfish fishery in 1976, when 114 000 tonnes were caught, the catches declined to 14 000 tonnes in 1977 and, at 19 000 tonnes accounted for approximately 9% of the total 1978 catch. Cod catches decreased further to 5 000 tonnes in 1978, and catches of Greenland Halibut barely exceeded 2 000 tonnes.

#### Region 2 (Table 2)

7. The total catch of all species combined, of 4 058 000 tonnes, recovered only slightly in 1978, after a sharp drop in 1977 to 3 937 000 tonnes from the record high level of 5 086 000 tonnes in 1976. The 1978 figure, in addition to the sum of total catches of pelagic and demersal species in Sub-areas IV, VI, VII and Division IIIa, includes 74 000 tonnes of cartilaginous species and 72 000 tonnes of unsorted and unidentified fish.

8. In Sub-area IV and Division IIIa the 1978 total catch of pelagic and demersal species combined decreased further, by 134 000 tonnes from the 1977 level, and, at 2 900 000 tonnes, was 11% below the average of the 1970's.

The total 1978 catch of Pelagic Species, of 746 000 tonnes, accounted for 63 000 tonnes of the decrease from the 1977 level. Herring catches decreased further to 108 000 tonnes (102 000 tonnes of which were taken in Division IIIa). Mackerel catches dropped sharply to 153 000 tonnes from the 1977 level of 259 000 tonnes and were 42% below the average of the 1970's. Sprat catches, at 477 000 tonnes, recovered after a sharp drop in 1977, but were only about 63% of the peak catch in 1975. Horse Mackerel catches, at 5 000 tonnes, remained low, and catches of "Other Pelagic Species" amounted to 3 000 tonnes.

The 1978 total catch of 2 154 000 tonnes of Demersal Species declined by 71 000 tonnes from the 1977 level. Cod was the only single species item whose catches increased substantially over the 1977 level, i.e. from 227 000 tonnes to 306 000 tonnes in 1978. Catches of Haddock, at 96 000 tonnes, were the lowest in the 1970's and 64 000 tonnes short of the low 1977 figure of 160 000 tonnes.

Whiting catches of 152 000 tonnes improved by 13 000 tonnes over the 1977 low level. Catches of Norway Pout continued to decline from the all-time record level of 833 000 tonnes in 1974 and amounted to 347 000 tonnes in 1978, i.e. 108 000 tonnes lower than in 1977. Catches of Sandeels, on the other hand, exceeded by 7 000 tonnes the previous record catch of 803 000 tonnes taken in 1977. Saithe catches of 140 000 tonnes, decreased by 50 000 tonnes from the 1977 level and became the lowest in the 1970's. Plaice catches, having decreased by 20 000 tonnes, returned to the low level of 124 000 tonnes of 1975. Sole catches, remaining at 15 000 tonnes in 1976-77, decreased to the lowest level of 11 000 tonnes in 1978. Catches of "Other Flatfish Species" of 30 000 tonnes were 16% above the average, although only 1 000 tonnes above the 1977 level; the major part of the catch consisting, as before, of Dab, Lemon Sole, Turbot and Flounder, in the order listed. The marked increase in catches of "Other Demersal Species", which started in 1977, continued in 1978 with catches reaching 138 000 tonnes, i.e. 274% above the average 1970-76 level. Most of the increase was due to a rapid development of the Blue Whiting fishery which yielded 92 000 tonnes in 1978, or 66% of the total in this category, in comparison with 2 000 tonnes reported in 1976.

9. In Sub-areas VI and VII the total 1978 catch of pelagic and demersal species combined increased by 227 000 tonnes over the low 1977 level of 785 000 tonnes. It exceeded by 6% the average level of the 1970's although it was still about 259 000 tonnes below the high 1975-76 average level.

A great part of this increase could be attributed to increased total catches of Pelagic Species from 470 000 tonnes in 1977 to 633 000 tonnes in 1978, though the 1978 catch was still 179 000 tonnes short of the high 1975-76 average level. Most of the increase was due to the record Mackerel catches, which at 488 000 tonnes, were 181 000 tonnes higher than in 1977 and 85% above the average. Declining Herring catches amounted to only 66 000 tonnes in 1978, 34 000 tonnes of which were taken in Division VIa. Sprat catches were the highest in the 1970's, but since the 1978 catch still constituted a small figure of 32 000 tonnes, it could not significantly affect the total. Horse Mackerel catches declined even further in 1978, down to 26 000 tonnes, from the record level of 181 000 tonnes in 1976, and were 72% below the average. Catches of "Other Pelagic Species" remained at 21 000 tonnes in 1978; Pilchard accounted for 80% of the total, with 80% of the catch being reported for Division VIIe.

The total catch of Demersal Species, of 379 000 tonnes in 1978, showed some recovery after a drop in 1977 to 315 000 tonnes from the record level of 482 000 tonnes in 1976. This was mainly caused by the record catch of 226 000 tonnes of "Other Demersal Species", where Blue Whiting was a leading species (77 000 tonnes, or 34% of the total), followed by Saithe (36 000 tonnes, or 16%) and Norway Pout (26 000 tonnes, or more than 11%). Cod catches increased to 36 000 tonnes in 1978 and were nearly 10% above the average. Haddock catches continued to decline and, at 24 000 tonnes in 1978, were 53% below the average. Whiting catches of 43 000 tonnes were 3 000 tonnes short of the 1977 level and 16 000 tonnes below the 1976 record level, although still above the average. Hake catches remained at the low level of 17 000 tonnes, as in 1977. Flatfish catches decreased further to 33 000 tonnes, which is nearly 8% below the average, with Megrin and Plaice making up, as before, more than half of the total (32% and 28% respectively); Sole catches accounted for 13% of the total.

### Region 3 (Table 3)

10. The total production of all species combined, after an increase from the lowest level of 625 000 tonnes in 1974 to 723 000 tonnes in 1977, dropped by 85 000 tonnes in 1978 to 638 000 tonnes, which is 14% below the average level in the 1970's. This figure, in addition to the sum of total

catches of pelagic and demersal species in Sub-areas VIII, IX and X, includes 7 000 tonnes of cartilaginous species and 23 000 tonnes of unsorted and unidentified fish.

The 1978 total catch of Pelagic Species of 441 000 tonnes decreased by 72 000 tonnes from the 1977 level and was 8% below the average. The major reduction occurred in catches of Horse Mackerel, which dropped from 191 000 tonnes in 1977 to 114 000 tonnes in 1978 and became 24% lower than the average figure. Mackerel catches decreased further to 29 000 tonnes in 1978 (excluding 8 000 tonnes of Chub (=Spanish) Mackerel catches, which were included in pre-1977 figures). Pilchard was the only single species item that, at 162 000 tonnes, showed an increase over the 1977 level, thus surpassing by 5% the average level in the 1970's. Catches of "Other Pelagic Species" decreased from 158 000 tonnes in 1977 to 136 000 tonnes in 1978, but were still 17% above the average.

As before, Anchovy was the predominating single species in this category accounting for more than 38% of the total; Albacore made up nearly 22%.

The 1978 total catch of Demersal Species, at 167 000 tonnes, although 14 000 tonnes below the 1977 level was still slightly above the average. Hake catches, at 29 000 tonnes in 1978, were the lowest in the 1970's and 17 000 tonnes below the 1977 level. Catches of "Other Demersal Species", at 138 000 tonnes, were however, the highest on record during the period under consideration. There was, again, a change in species' composition within this category: shares of Seabreams and Blue Whiting decreased to 11% and 12%, respectively, whereas Monk and Megrin accounted for 12% and 8% of the total in 1978.

The decrease in total catches of pelagic and demersal species combined from 694 000 tonnes in 1977 to 608 000 tonnes in 1978 followed the trend in the grand total catch.

## B. REGION 1 FISHERIES

### B.1 Atlanto-Scandian Herring

11. The Working Group on Atlanto-Scandian Herring met in Bergen 12-14 May 1980 to assess the state of the Atlanto-Scandian herring.

#### B.1.1 Norwegian spring spawners

12. Recent catches and recommended TACs, and management put into practice are given below in thousand tonne units:

1977			1978		1979			1980		1981
Recom. TAC	National TAC	Reported catches	National TAC	Reported catches	Recom. TAC	National TAC	Reported catches	Recom. TAC	National TAC	Rec. TAC
0	10	12.7	7.5	9.8	0	0	2.9	0	10	0

13. The officially reported catches of the Norwegian spring spawners have been very low in recent years as shown in the text table above. As pointed out in last year's report less and less faith can be placed in these reported catches. The Atlanto-Scandian Herring Working Group has tried to

estimate the unreported catches, and in their catch in number by age data about 10 000 tonnes of such catches are included each year for 3 years old and older herring. Juvenile herring are often a considerable proportion of the sprat catches but due to inadequate sampling of these catches the Working Group did not have proper data to calculate catch in number by age for the juvenile herring. In addition the Working Group concluded that the estimates of unreported catches were so uncertain that the catch in number by age data could not be used for stock assessment purposes.

14. As in previous years, the Norwegian tagging project, and the age distribution obtained in the associated experimental fishery, were the basis for the assessment of the stock. This project was started in 1975 and about 30 000 herring have since been tagged annually. The experimental fishing on the spawning grounds in 1980 yielded 78 tags, from just over 2 million herring which were effectively screened for tags.

The spawning stock has a northern and a southern component. Sixty tags were recovered from the northern component while eighteen were recovered from the southern one. These returns come from tagging experiments carried out in 1975-78 and were used to calculate the total annual mortality coefficient ( $Z$ ) and the spawning stock abundances for both components. According to this assessment the total spawning stock, herring 4 years and older, was in 1980 about 320 000 tonnes. It was estimated that the northern component was 230 000 tonnes whereas the remaining 90 000 tonnes belonged to the southern one. The northern component has remained at this same level of abundance since 1977, while the southern component has increased considerably. This is in good agreement with the different age compositions of the two components, which indicate improved recruitment to the southern one. Thus the overall rate of recovery has been only about 30 000 tonnes per year during the period 1977-80. It should be noted that prior to the collapse of the stock the spawning stock biomass was between 5-10 million tonnes. Thus the present level of abundance, as well as the recruitment, are still at a very low level compared with earlier periods.

15. It has been shown (Dragesund, Hamre and Ulltang, 1980) that the recruitment was drastically reduced at spawning stock sizes below 2.5 million tonnes. The Advisory Committee on Fishery Management has recommended that the long-term aim should be to rebuild the stock to at least this order of magnitude. It has also stated 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. When this does happen care should 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.

16. On this basis, and in the light of current evidence of very slow stock recovery, ACFM can only repeat its advice of last year, and recommend that there should be no directed herring fishery in 1980 and 1981. It is further recommended that by-catches (e.g. in the sprat fishery) should be limited as far as possible, and that these catches should be more adequately sampled.

In light of the fact that the stock is still in a state of depletion, and that there is neither evidence of a substantial increase in the spawning stock, nor of recovery of recruitment to earlier levels, the ACFM has noted with concern that a directed fishery for 10 000 tonnes will be allowed in 1980. This could seriously affect the rate of recovery of the stock, especially if one takes into account the difficulties experienced, for example in 1977, in enforcing TACs of this magnitude.

B.1.2 Faroese spring spawning herring

17. In 1979 herring were occasionally reported as a by-catch in the trawl fishery, indicating that a small amount of herring stayed on the Faroe plateau throughout the year. An experimental fishery, using gill nets, north of the Faroes in August-September yielded no herring. In the Faroese 0-group survey in 1979 98 0-group herring were caught compared to 262 in 1978 and 7 in 1977.

18. The results of investigations on the bank spawning herring at the Faroes in 1978 and 1979 show this component to be at a very low level and ACFM recommends that a directed fishery for this component should be totally prohibited.

B.1.3 Icelandic spring and summer spawners

19. No signs of recovery of the Icelandic spring spawning herring have been observed and the fishery in 1979 was entirely based on Icelandic summer spawners. No fishery for spring spawners should take place at Iceland in 1981.

20. Recent landings and TACs, in thousand tonnes, are given below for Icelandic summer spawners:

1977		1978		1979		1980
Catches	TAC	Catches	TAC	Catches	TAC	TAC
28.7	25	37.1	35	44.9	35	45

21. 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 most recent years, 1975-79, the adult F has increased from 0.08 to 0.23. The adult stock biomass increased sharply in 1975 to about 150 000 tonnes. In 1978 there was a further increase to about 200 000 tonnes. These increases were mainly due to the recruitment of three year classes of 1971, 1974 and 1975 which appear to be of about average strength compared to the period 1954-63 of high and steady recruitment.

22. The present level of stock abundance is well within the range of spawning stock biomass of 150-300 000 tonnes during the 1954-63 period of high and steady recruitment (Jakobsson, in press).

23. A TAC for 1980 has been set at 45 000 tonnes. This will generate an F on the adult age groups in 1980 close to the  $F_{0.1}$  level which for this stock, for the present exploitation pattern and weight at age in 1979, is about 0.22.

24. It is recommended that for 1981 the TAC should be calculated on the basis of the results of the 1980 echo abundance survey and using an F close to  $F_{0.1}$ . If, however, a severe reduction in recruitment is detected, the TAC should be set well below this level.

B.2 North-East Arctic Cod and Haddock

25. The Arctic Fisheries Working Group met in May 1980 to assess TACs for 1981 for cod and haddock.

B.2.1 North-East Arctic cod

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

1977			1978			1979			1980	1981
Rec. TAC	Total quota	Actual catch	Rec. TAC	Total quota	Actual catch	Rec. TAC	Total quota	Actual catch	Rec. TAC	Rec. TAC
850	850	905	850	850	699	600	700	428*	390	?

\* Preliminary figure

27. Final figures for cod landings in 1978 amounted to 698 715 tonnes, about 14 500 tonnes higher than the preliminary figure used in the previous report. This is 151 285 tonnes (about 18%) lower than the total TAC, including Murman cod, of 850 000 tonnes and represents a substantial reduction in yield compared to 1977 (905 301 tonnes). Preliminary figures for the 1979 fishery indicate a further reduction of about 39% to a level of 427 500 tonnes. This reduction in catch was reported from all areas, being particularly pronounced in Sub-area I (-57%) and Division IIb (-53%). The catch taken in Sub-area I, about 182 000 tonnes, is the lowest on record since 1960. The further reduction in catch from Division IIb is a continuation of the trend observed in 1978 when the catch dropped by 84% from the 1977 level.

28. The reduced catch in Sub-area I might be partially explained by a more westward distribution of cold water masses and a corresponding westward movement of the cod concentrations, resulting in low stock density in this area. Consequently, fishing activity of the different fleets adapted to the new distribution pattern. This trend had already been observed in 1978 and was intensified in 1979. The total international effort on cod, estimated in the conventional way, decreased by about 32% in Sub-areas I and II.

Catch per unit of fishing effort figures continued to decline in 1979, apart from those of the United Kingdom fishery in Division IIa. United Kingdom effort in that Division was reduced by 50% compared to 1978, to the lowest level on record, and it might be presumed that United Kingdom fishermen under these circumstances, concentrated their effort in the part of the season when catch rates were highest. Therefore, the slight increase in cpue of this fishery in Division IIa cannot be interpreted as indicating an increase in stock abundance.

29. Stock abundance has been independently estimated from a Norwegian acoustic survey, as was also done in 1978 and 1979. The results of these surveys indicate large reductions in the biomasses of young cod from 1978 to 1979, and again from 1979 to 1980. Preliminary results of the USSR groundfish surveys, in April-May 1979 and 1980, indicate comparable reductions in these abundance indices of cod.

30. Based on the correlation of the VPA results from last year's report, and the USSR young fish survey indices for recruits at age 3, the year classes 1976 and 1977 have been estimated as poor from earlier surveys. The most recent survey has confirmed these results. The year classes 1978 and 1979 would, so far, seem to be even poorer. This would mean that there are four consecutive poor year classes entering the fishery. Comparably low levels of recruitment over such a long period have previously been recorded only for the year classes 1965-68.

B.2.2 North-East Arctic haddock

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

1977			1978			1979			1980	1981
Rec. TAC	Total quota	Actual catch	Rec. TAC	Total quota	Actual catch	Rec. TAC	Total quota	Actual catch	Rec. TAC	Rec. TAC
110	120	110	150	150	95	206	206	101*	55-78	?

\* Preliminary figure

32. The final figure for the catch of haddock in 1978, at 95 422 tonnes, differs only slightly from the preliminary figure given in the previous report. The catch in 1978 is 14 736 tonnes (-13%) less than the catch of 1977. The preliminary catch figure for 1979 of 101 429 tonnes shows an increase of about 6 000 tonnes over the 1978 level. This increase is exclusively due to the higher catch in Division IIa, where it is 7 000 tonnes (+23%) higher than in 1978.

33. As for cod, year class abundance estimates are available from the Norwegian acoustic surveys, which are indicative of the mortality rates of young haddock in 1978 and 1979. The USSR young fish survey indices indicate that the 1976 year class is of about average strength, whereas the preliminary estimates so far available of the year classes 1977, 1978 and 1979 would suggest that they are poor.

34. Catch per unit effort data for 1979 were higher in all areas than in 1978. This is particularly true of the Norwegian data for Sub-area I, which increased by a factor of about 3, and was close to the 1973 level. This may have been at least partially due to the westward shift in the distribution of haddock in 1979. United Kingdom catch per unit effort data were, as for cod, probably not comparable with previous years, due to the low effort by the United Kingdom fishery in 1979.

The strong 1975 year class was the main component of the 1979 catches and significant contributions were also made by the 1974 and 1976 year classes, which were estimated from the USSR survey data to be moderate. The increase in the recruitment of these year classes to the exploited stock would also have played a part in increasing the catch per unit effort.

B.2.1-B.2.2 Assessments of the state of the stocks and future TACs for cod and haddock

35. The Working Group could not produce compatible estimates of fishing mortality rates for 1979, for either cod or haddock, from the two sources of information available to it.



The catch per unit effort data from the United Kingdom trawl fishery, which has been used in the past to estimate total international fishing effort for both species can no longer be relied on for this purpose, for the reasons stated above. If this is done in the conventional way, the resulting fishing mortality estimates for 1979 for both species are only about 1/3 to 1/5 of those estimated from the Norwegian acoustic surveys. One would expect fairly close agreement between the fisheries independent survey data and the data collected from effort and catch composition of the commercial fisheries, when treated in this way. The differences are too large to be accounted for by normal sources of error in either estimate.

36. Such major differences in these parameters would result in similarly large differences in projected stock sizes in 1980 and 1981, and in the projected catches which could be taken from them. In view of these discrepancies in the data available to it, the Working Group could not proceed further. It felt that this problem might have wider implications for ICES' assessment work, and that it should therefore seek advice from ACFM on how it should proceed on these assessments.

ACFM advised the Arctic Fisheries Working Group to take the following line:

1. In estimating fishing mortalities and stock sizes in 1979 and 1980 more weight should be given to reliable survey results, particularly if two independent surveys are in reasonable agreement, than to fishery dependent data.
2. Adjustments should be made to the estimates of total international effort given by the Working Group. The possibility of underestimation of total international effort derived from cpue data for 1978 and 1979, due to the considerable change in the distribution of cod and haddock, should be fully evaluated and corrected for if necessary.
3. In view of possible errors or biases in the estimated age composition of commercial catches, age data reported by national laboratories should be examined by the members of the Working Group prior to its next meeting. This examination should include: (a) comparison of time and location of samples taken, in relation to season and area of the catches to which the data from these samples were to be applied; and (b) interpretation of age structures on the otoliths.
4. In evaluating the assessments, and the TACs for 1981, due consideration should be given to the mixed fishery on cod and haddock in the area.
5. The Arctic Fisheries Working Group should meet at ICES headquarters for 3 (4) days prior to the Statutory Meeting (1-3(4) October 1980) to assess TACs for North-East Arctic Cod and Haddock according to the advice given by ACFM.

### B.3 Redfish in Region 1

37. The Working Group on Redfish and Greenland Halibut in Region 1 met at ICES headquarters from 18-25 March 1980 to:

- (a) assess TACs for 1981 for redfish and Greenland halibut,
- (b) estimate effective mesh sizes in use for redfish,
- (c) consider the scientific feasibility of producing assessments for redfish and Greenland halibut on a total stock basis in the Iceland-Greenland-Davis Strait area.

### B.3.1 Redfish in Sub-areas I and II

38. Recent catches and recommended TACs in thousand tonnes:

	1976	1977	1978		1979		1980	1981
	Actual catch	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch*	Rec. TAC	Rec. TAC
Golden redfish ( <u>S. marinus</u> )	49	40	20	32	22	25	19	19
Beaked redfish ( <u>S. mentella</u> )	269	146	130	93	135	85	81	70
Total	318	186	150	125	157	110	100	89

\* Preliminary

39. Total catches of redfish in the North-East Arctic region decreased continuously from 318 000 tonnes in 1976, which is the highest catch figure on record, to 125 000 tonnes in 1978 (Table 5).

Preliminary figures for 1979 indicate a further reduction in redfish catches to a level of 110 000 tonnes, which is 47 000 tonnes lower than the recommended total TAC of 157 000 tonnes.

This reduction in catch from 1978 to 1979 was reported for all areas (Sub-area I, Divisions IIa and IIb) and for both S. mentella and S. marinus (Tables 6-9).

The total catch in Sub-area I decreased from 5 000 tonnes in 1978 to 3 000 tonnes in 1979. A reduction of catch from 72 000 tonnes to 62 000 tonnes was observed in Division IIa. In Division IIb, the catch in 1979 was 45 000 tonnes compared with 48 000 tonnes in 1978.

#### Sebastes marinus

40. Since no data were available on fishing effort, or from survey results, the terminal fishing mortality in the VPA was estimated from a catch curve analysis. According to this analytical assessment the average fishing mortality on age groups 13 and older, in the period 1965 to 1973, fluctuated around 0.045, following the trend in catches.

Since 1974, when catches increased considerably compared with the previous level, the mean F was estimated to increase to about 0.13 for the 1974-78 period. For 1979 average fishing mortality was taken to be 0.13.

Total stock biomass has decreased steadily from 316 000 tonnes in 1974 to 215 000 tonnes in 1979, whereas in the preceding period, the stock biomass seems to have been relatively stable. Spawning stock biomass declined continuously from 244 000 tonnes in 1974 to a level of 176 000 tonnes in 1979.

#### Sebastes mentella

41. A VPA was carried out to estimate the state of this stock. The input F was calculated on the basis of total fishing effort values, which were derived from the catch per unit effort figures in the USSR trawl fishery. These catch per unit effort data show a steady decrease since 1976, when the

highest figure on record was observed. The results from the VPA show that the weighted average fishing mortality for age groups 13 to 21 was low in the period 1965 to 1974, and fluctuated around an average value of 0.10. Since 1975 the exploitation has shifted towards younger ages, and in addition the total level of fishing mortality has increased considerably in the period 1975-77 to an average of 0.55. Following the trend in the total fishing effort the estimated average fishing mortality for the years 1978 and 1979 decreased to a level of around 0.28. Both the total stock biomass, and the spawning stock biomass increased considerably during the period 1965 to 1975. However, since 1975 the spawning stock biomass has declined steadily from 177 000 tonnes to a level of 68 000 tonnes in 1979.

A similar declining trend in the total stock biomass was observed until 1977. According to the results of the assessment, however, the total stock size has remained fairly stable in the period 1977-79.

#### Total allowable catches

##### Sebastes marinus

42. Catches for 1981 have been calculated for different levels of fishing mortality. The catch predictions are based on the assumption that the 1980 TAC for S. marinus of 19 000 tonnes will be taken. This catch level will generate a fishing mortality of 0.115 on age groups subject to maximum exploitation in 1980.

Under all options of fishing mortality considered for 1981 the spawning stock biomass is expected to decrease from 1981 to 1982. A reduction of the fishing mortality in 1981 to the  $F_{0.1}$  level of 0.10 would result in a catch of 16 000 tonnes. However, in view of the fact that S. marinus is taken mainly as a by-catch in the fishery for cod, it seems questionable that the catch level of this species in 1981 could be limited to 16 000 tonnes. Maintaining the 1980 fishing mortality of 0.12 in 1981 would provide a catch of 19 000 tonnes. Under this option the decrease in the spawning stock biomass would be only marginal, while the total stock biomass would be expected to increase slightly. Furthermore a TAC of 19 000 tonnes in 1981 would be close to the estimate of likely by-catches of S. marinus in the fishery for cod.

43. The ACFM therefore recommends a TAC of 19 000 tonnes of Sebastes marinus in 1981. It further recommends that no directed fishing for this species should be allowed in 1981.

##### Sebastes mentella

44. Catch predictions were made for 1981 using four options of fishing mortality as reference points. It was assumed that the catch in 1980 would be 81 000 tonnes, the level recommended for that year. This catch in 1980 would be achieved by a fishing mortality on age groups subject to maximum exploitation of 0.23. This corresponds to  $F_{max}$ .

45. In the light of stock biomass considerations and in particular spawning stock biomass, ACFM considers that a reduction of 20% on the 1980  $F$  value is advisable in 1981, that is at a value of 0.18. This fishing mortality will allow a TAC of 70 000 tonnes in 1981. The total stock biomass and the spawning stock biomass will increase from 1981 to 1982 by about 8% and 12%, respectively.

This option was selected by ACFM since it avoids an unnecessary hardship on the fishery in 1981 compared to the 1980 situation and since it is in accordance with the management strategy of reducing the fishing mortality towards  $F_{0.1}$ .

The ACFM therefore recommends a TAC of 70 000 tonnes of Sebastes mentella in 1981.

Enforcement of redfish TACs in Sub-areas I and II

46. The ACFM reconsidered the note on enforcement of redfish TACs given in previous reports. It was agreed to reiterate the recommendation given in paragraph 30 of the report of June 1978 (Coop.Res.Rep., No.85).

B.3.2 Redfish in Sub-areas V and XIV

47. Recent catches and recommended TACs in thousand tonnes:

	1976	1977	1978		1979		1980	1981
	Actual catch	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch*	Rec. TAC	Rec. TAC
Golden redfish ( <u>S. marinus</u> )	94	53	90 <sup>1)</sup>	48	58	77	58	60
Beaked redfish ( <u>S. mentella</u> )	95	31		18	12	23	7	25
Total	189	84	90	66	70	100	65	85

\* Preliminary

1) Precautionary TAC for total redfish

Total catches of redfish from the Irminger Sea stock complex decreased steadily from 189 000 tonnes in 1976 to 66 000 tonnes in 1978. In 1979 preliminary catch figures show an increase to 100 000 tonnes. Compared to 1978 the catch increased in all three areas (i.e. Divisions Va, Vb, and Sub-area XIV), particularly in Divisions Va and Vb (Table 10).

In Division Va the total catch went up from 35 000 tonnes in 1978 to 65 000 tonnes in 1979 as a result of increased Icelandic effort. In Division Vb the catch increased from 10 000 tonnes in 1978 to about 14 000 tonnes in 1979, which is the highest catch on record for this Division. In Sub-area XIV the total catch increased insignificantly and was at a level of 21 000 tonnes in 1979.

In addition the distribution of catches by species, areas and nations for the period 1970-79 is given in Tables 11-13. These catches were estimated according to the method applied by the Working Group.

State of the redfish stocks

48. As in previous assessments, no data were available on effort, catch per unit of effort, or survey results which could give reliable fishing mortality estimates for 1979. Therefore, only qualitative information on changes in fishing effort, and area distribution, could be considered and evaluated against earlier situations. Because of the poor data base, it should be pointed out that the assessments for S. marinus and S. mentella in this area are less accurate than those for other species.

Sebastes marinus

49. The F on age groups subject to maximum exploitation in 1979 was taken to be the same as estimated for the period 1967-70. A new exploitation pattern was applied in the present assessment. The exploitation

pattern used in previous assessments was derived from a cohort analysis using average length data over several years in which the high catches of small redfish taken in 1976 have been included. Since the length composition of the catches has now reverted to the pre-1976 pattern, the exploitation pattern for the present assessment had to be revised. This was done on the basis of the relative fishing mortality per age group in 1975. Trends in fishing mortality and stock size did not change markedly from the results of the previous assessment.

Calculated average fishing mortality on age groups 16 and older in the period 1968 to 1971 fluctuated without trend around 0.20, followed by a decrease to about 0.11 in the 1972-74 period. Mean F then increased again to 0.19 in 1976, caused by high exploitation in this year. Following the trend in catches fishing mortality decreased to about 0.10 in the period 1977-78. For 1979 average fishing mortality was estimated as 0.19.

The biomass of the exploited part of the stock was remarkably stable in the period 1967 to 1979 when it fluctuated insignificantly between 803 000 and 857 000 tonnes. For 1979 total stock biomass was estimated as 817 000 tonnes.

Spawning stock biomass declined continuously from 452 000 tonnes in 1967 to the lowest level on record of 303 000 tonnes in 1972. Since then it has increased again to 375 000 tonnes in 1978. For 1979 the spawning stock biomass was estimated as 416 000 tonnes.

#### Sebastes mentella

50. An analytical assessment was made, using the same fishing mortality for 1979 as in last year's assessment for 1978. In the light of the very small 1978 catch the small reduction in fishing mortality for 1978 in the present VPA was in agreement with the opinion expressed by the Working Group that in last year's assessment the terminal F had been overestimated. The results from the VPA are not very different from the previous assessment.

Average fishing mortality on age groups 12 to 24 fluctuated without trend around a mean value of 0.083 during the period 1968 to 1971. It then increased to a level of 0.101 in the 1972-75 period. In 1976 F increased further to 0.263. Following the trend in catches F decreased again in 1977 and 1978. For 1979, F was estimated as 0.081.

Both spawning stock biomass and total biomass decreased continuously during the period 1967 to 1978. This downward trend in total recruited biomass continued in 1979. The estimated spawning stock biomass for 1979 indicates that the steady decline since 1967 did not continue in 1979. However, at present, this value is very much dependent on the estimated fishing mortality for 1979, and it would be premature at present to consider this as a termination of the trend.

#### Total allowable catches

##### Sebastes marinus

51. For catch predictions the new exploitation pattern was applied, since the fleets now engaged in the fishery for S. marinus are expected to maintain a relatively stable fishing pattern.

The total catch in 1980 of S. marinus from the Irminger Sea stock complex was assumed to be of the same order of magnitude as in 1979, possibly slightly higher. In the absence of management measures limiting the catches for 1980 in Sub-areas V and XIV, it is to be expected that the increasing trend in effort observed in 1979 will continue. On this basis a catch figure of 80 000 tonnes in 1980, associated with an F of 0.467 on age groups subject to maximum exploitation, was applied in the catch predictions.

Based on this assumption several options have been considered. On the basis of an  $F_{0.1}$  of 0.18, the estimated catch for 1981 would be 32 000 tonnes. This option, however, would impose unacceptable hardship on the fishery. Fishing at an  $F$  of 0.35, the fishing mortality at which the yield per recruit curve approaches the maximum level, would result in a catch of 60 000 tonnes in 1981. This option reduces the  $F$  in 1981 by 25% compared to 1980 and is therefore in line with ACFM's general management strategy to bring fishing mortality stepwise towards  $F_{0.1}$ . With a catch of 60 000 tonnes in 1981 the total stock biomass in 1982 is expected to decrease slightly below a level of 800 000 tonnes. However, this should, at present, not be interpreted as the start of a downward trend, since the reduction in total recruited biomass is relatively small, and within the range of past fluctuations.

52. The ACFM therefore recommends that a TAC of 60 000 tonnes of *Sebastes marinus* for 1981 should be introduced in Sub-areas V and XIV.

*Sebastes mentella*

53. Since it cannot be expected that the total catch of *S. mentella* in 1980 will be limited by fisheries regulations, and considering the possibility that effort on redfish may increase, a catch of 25 000 tonnes in 1980 was assumed. This is slightly above the 1979 level. This catch will generate a fishing mortality of 0.41 on age groups subject to maximum exploitation in 1980.

Catch predictions for 1981 were made using several options of fishing mortality in 1981. Fishing at the  $F_{0.1}$  level would provide a catch of 22 000 tonnes in 1981.

Maintaining the 1980 fishing mortality, equal to 0.40, on age groups subject to maximum exploitation, would result in a catch of 25 000 tonnes in 1981.

Under both options the spawning stock biomass, and the total stock biomass in 1982 are expected to be above the 1977-79 level. In view of the uncertainties connected with this analytical assessment, it should be pointed out that a catch level of 25 000 tonnes is still below the average historic catch for the period 1965-78 and could also be considered as a precautionary TAC.

54. The ACFM therefore recommends a TAC of 25 000 tonnes of *Sebastes mentella* in 1981 in Sub-areas V and XIV.

B.4 Greenland Halibut in Region 1

B.4.1 Greenland halibut in Sub-areas I and II

55. Recent catches and recommended TACs in thousand tonnes:

1976	1977	1978		1979		1980	1981
Actual catch	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch*	Rec. TAC	Rec. TAC
36	29	40	25	25	17	14	12

\* Preliminary

The total catch of Greenland halibut reached a maximum in 1970 of 89 000 tonnes. From 1971 to 1973 the landings declined steadily to 30 000 tonnes, but appeared to stabilise from 1974 to 1976 between 36 000 tonnes and 38 000 tonnes. From 1976 catch levels once again declined to 17 000 tonnes in 1979, the lowest catch recorded in the last 12 years (Table 14).

#### State of the stock

56. Average fishing mortality on age groups 7 to 11 decreased steadily from 0.54 in 1970 to a level of 0.29 in 1973. It then increased again continuously throughout the period 1974-78 to a value of 0.77. For 1979 average fishing mortality was estimated as 0.40 following the trend in effort.

The Working Group assumed fishing mortalities on 3-6 years old fish in 1979 which gave an abundance of 3 year olds in 1976-79 close to the average for 1970-75. Since the VPA showed a lower abundance of 3 year olds in 1973-75 than in 1970-72 and since the spawning stock has shown a rather dramatic decline from 1970 onwards, ACFM concluded that it was rather dangerous to assume that the number of 3 year olds increased from 1973-75 to 1976-79. Accordingly a new assessment was made based on the assumption that the number of 3 year olds in 1976-79 was close to the average for 1973-75.

The biomass of the exploited part of the stock decreased continuously from 302 000 tonnes in 1970 to 78 000 tonnes in 1978, followed by an increase to 105 000 tonnes in 1980. The spawning stock in 1980 (14 400 tonnes) is 13% of what it was in 1970 (127 000 tonnes).

#### Total allowable catch

57. It was assumed that the TAC of 14 000 tonnes in 1980 will be taken. This catch would be achieved by a fishing mortality on age groups subject to maximum exploitation of 0.26.

Some increase in the total stock biomass and the spawning stock biomass is expected in 1981 compared to 1979 and 1980. A further increase in the spawning stock is expected in 1982. This is, however, to a large extent dependent on the strength of the 1973 and later year classes, which even in the revised assessment may be overestimated.

It seems clear that the present spawning stock is low, and will be so in the next few years. The possibility of recruitment failure due to a low spawning stock would appear to be real.

58. The management strategy for this stock should be to reduce fishing mortality stepwise from the estimated 1980 level of 0.3 to  $F_{0.1}$  (0.14). Aiming at reaching  $F_{0.1}$  in 1983, the TAC for 1981 could be set at 12 000 tonnes; this corresponds to a fishing mortality of about 0.24. ACFM accordingly recommends a TAC of 12 000 tonnes for Greenland halibut in Sub-areas I and II for 1981.

#### B.4.2 Greenland halibut in Sub-areas V and XIV

59. Recent catches and recommended TACs in thousand tonnes:

1976	1977	1978	1979		1980	1981
Actual catch	Actual catch	Actual catch	Rec. TAC	Actual catch*	Rec. TAC	Rec. TAC
6	17	14	15	23	15	15

\* Preliminary

In the period 1968-75 total nominal catches for all areas combined ranged from 20 000 tonnes to 36 000 tonnes. In 1976 the catch dropped to a low level of 6 000 tonnes, but increased to 17 000 tonnes and 14 000 tonnes in 1977 and 1978 respectively. During 1979 catches increased to near the level of the early 1970s, at 23 000 tonnes.

State of the stock and total allowable catch

60. No new data were available at the time of the Working Group meeting. It was not therefore possible to provide any new analytical assessment for this stock.

In a previous assessment the expected long-term yield at  $F_{0.1}$ , as derived from the yield per recruit curve, was estimated to be 15 000 tonnes. A catch level of 15 000 tonnes is also below the average historic catch over the last 10 years.

61. Therefore the ACFM recommends that the TAC for Greenland halibut in Sub-areas V and XIV should be set at a level of 15 000 tonnes in 1981.

Assessment of effective mesh size and effects of changes of mesh size in the redfish fisheries in Sub-areas I and II

62. Based on available length and age compositions of catches from the period 1967-78 the effective mesh sizes used in trawl fisheries for S. marinus and S. mentella have been estimated.

The essence of the method is that the simulated relative length (or age) distribution of the catches in each of the fisheries is compared with the observed relative length (or age) distribution. The mesh sizes of the fisheries are systematically changed, until the sum of the squared distances between the observed and the estimated relative length distribution are minimised. The outcome is the estimation of the effective mesh size.

The estimated effective mesh size was close to that found for cod and haddock by the Arctic Fisheries Working Group. It must be pointed out, however, that the data base (age and length data, catch split between S. mentella and S. marinus) was poor for the present mesh assessment. Furthermore, there are many uncertainties about the discarding practice and the selective properties of the gear. These problems mean that the estimates of the effective mesh sizes should only be taken as indications.

63. In the second stage of the assessment the effects of a mesh size change are estimated. This method compared the simulated age distribution of two different sets of mesh sizes. The method computes the changes of the yields until it stabilises the new long-term average, corresponding to the effective mesh size. The results indicate that there would be no substantial changes in the long-term yield of redfish if the effective mesh size was increased by up to 35 mm above the average effective mesh size used in the period 1967-78.

It was concluded that the model required further work, particularly on the data base, by improving the input parameters.



Feasibility of assessing redfish and Greenland halibut of East and West Greenland as a single unit

Redfish

64. The main spawning area for redfish in the Iceland-Greenland region is in the Irminger Sea. The redfish fry drift with the Irminger Current southward along the East Greenland coast and, to some extent, around Cape Farewell to West Greenland waters. Some of the redfish fry off West Greenland might also originate from spawning areas south and southeast of Cape Farewell. Tagging experiments carried out in the period 1956-69 show some migration of adult redfish from West to East Greenland. Therefore there is at least some connection between the Irminger Sea stock and the West Greenland stock as the drift of fry shows, although the magnitude of this recruitment to the West Greenland stock is not established. It is, however, uncertain to what degree the spawning southwest of Iceland, and that south of Cape Farewell, are connected and to which of these two spawning areas the West Greenland redfish migrate for spawning.

In view of these uncertainties the opinion at present is that the West Greenland stock should not be included in the assessment of the Irminger Sea stock.

Greenland halibut

65. The information available on the distribution of immature and mature fish, the spawning areas and migrations of Greenland halibut in the West Greenland and East Greenland area was evaluated.

It was concluded that these stocks were probably not linked. A more thorough scientific investigation of the matter should, however, be carried out before a final conclusion is reached.

B.5 Fish Stocks at the Faroes

66. Following a resolution from the 67th Statutory Meeting of ICES, the Working Group on Fish Stocks at the Faroes was convened at ICES headquarters from 31 March to 2 April 1980 to assess TACs for 1981 for cod and haddock.

B.5.1 The Faroe Plateau stock of cod (Sub-division Vb<sub>1</sub>)

67. Recent catches (see also Table 15) and recommended TACs in thousand tonnes:

1975	1976		1977		1978		1979		1980	1981
Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch*	Rec. TAC	Rec. TAC
37	26	40	30	36	28	27	26	23	22	14

\* Preliminary

In the catch data given above, appreciable catches, reported as taken in 1978 and 1979 from Division Vb by one country as a by-catch of a redfish fishery, are not included; and these catches were also excluded from the data on which the assessment was based. The grounds which these vessels fished, within Division Vb, could not have given the cod catches which were reported, and these vessels did not fish, according to surveillance reports, on other grounds in the Faroes area where cod catches could have been taken. It can only be assumed therefore that these cod catches were taken in some area other than Division Vb.

68. Fishing effort by Faroese trawlers in 1979 continued at a high level but the total fishing effort by all gears showed a reduction of 25% from 1977 to 1979. This was used to estimate an input F for 1979 in the VPA, and in the subsequent estimation of future catch levels.

The large changes in the fishing pattern at the Faroes in recent years, including two increases in minimum mesh sizes, a system of closed areas and a large change in the composition of fleets fishing the area would be expected to raise problems when comparing a long time-series of data.

69. The fishing mortality on this stock is considerably in excess of the  $F_{max}$  value, with the current exploitation pattern. Moreover the catch rates reported from the commercial fisheries in the last three years are considerably lower than would be expected from the estimated stock sizes in these years. This might suggest that recent stock sizes are overestimated.

70. In the light of this danger it would seem advisable to adopt a cautious approach in recommending a TAC for this stock in 1981. ACFM would accordingly recommend that the Faroe Plateau cod stock in 1981 should be fished at the  $F_{max}$  level, which would entail a TAC in that year of 14 000 tonnes.

#### B.5.2 The Faroe Bank stock of cod (Sub-division Vb<sub>2</sub>)

71. Recent catches and recommended TACs in thousand tonnes:

1975	1976		1977		1978		1979		1980	1981
Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch*	Rec. TAC	Rec. TAC
2	2	2	2	2	2	5	2	2	3.3	2

\* Preliminary

A long enough series of data are not yet available to allow an analytical assessment of this stock. In recommending TACs in the past, a TAC of 2 000 tonnes has been advised for Faroe Bank, based on historical catch data (Table 16). In last year's report, 3 300 tonnes was recommended for 1980. In 1978, there was a sharp increase in fishing effort on the Faroe Bank resulting in a catch well above recent levels. This seems to have had a marked effect on catch rates of cod in 1979, which in the longline fishery have decreased to 56% of the 1978 level. A major part of the Bank has been closed to trawl fishing in 1979. In the light of the decline in catch rates, which seems to have resulted from the high catches taken in 1978, it

would seem that the sustainable yield of this cod stock is about 2 000 tonnes and ACFM would recommend a TAC at this level in 1981.

B.5.3 Faroe haddock (Division Vb)

72. As in former years the Plateau and Bank stocks of haddock have been assessed as one unit.

Recent catches and recommended TACs in thousand tonnes:

1975	1976		1977		1978		1979		1980	1981
Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch*	Rec. TAC	Rec. TAC
21	17	26	17	26	23	19	20	12	20	15

\* Preliminary

73. Fishing effort on haddock in Division Vb declined further in 1979. The haddock stock is at present mainly exploited by smaller Faroese longline vessels. The effort reduction for haddock for the whole of Division Vb was 25% from 1977 to 1978 and a further 25% from 1978 to 1979. The corresponding decrease in landings was from 19 200 tonnes in 1978 to 12 343 tonnes in 1979 (Tables 17 and 18).

74. However, the decline in landings was much more severe on the Faroe Bank than on the Faroe Plateau; in the former the landings in 1979 were only 27% of those in 1978. The catch rates by longline on Faroe Bank showed a decline to about 50% of those in 1978 whilst on the Plateau the decline in catch rates was much smaller at about 14%. On the Faroe Bank it would appear that, as for cod, the haddock stock has been seriously reduced by the high catches taken in 1978.

75. The level of fishing mortality in 1979 for the Division Vb haddock population as a whole was, at the current exploitation pattern, well below the value giving the maximum yield per recruit, and closer to the  $F_{0.1}$  level. The spawning stock is estimated to be at a high level. No firm data are available on recruitment of recent year classes but there are indications that recruitment from the 1976-78 year classes has been weak. The catch prediction was carried out assuming recruitment at 75% of the long-term average value. Assuming the TAC previously recommended for 1980 is taken, and that the present satisfactory level of fishing mortality is maintained in 1981, a yield of 15 000 tonnes is to be expected. ACFM would accordingly recommend that the TAC for haddock in 1981 for the whole of Division Vb should be 15 000 tonnes.

76. In the light of the drastic reduction in the catch rate of haddock in 1979 on the Faroe Bank, which would suggest that the haddock population there has been heavily reduced, ACFM would suggest that the proportion of this TAC taken from the Faroe Bank should be reduced appreciably from the average proportion of recent years.

C. SAITHE (COALFISH) IN REGIONS 1 AND 2

77. The Saithe Working Group met at ICES headquarters 28 April - 2 May 1980 to assess TACs for saithe stocks in 1981. The Working Group was also asked to advise on any management measures which seem necessary to improve the exploitation pattern of saithe stocks in various areas.

78. Recent catches and recommended TACs, in thousand tonnes, are given below:

Stock	1978		1979		1980	1981
	Rec. TAC	Actual catch	Rec. TAC	Actual catch*	Rec. TAC	Rec. TAC
Sub-areas I and II	160	154	153	166	122 <sup>1)</sup>	123
Sub-area IV and Div. IIIa	200	142	200	115	129	127
Division Va	60	50	58	63	54	72
Division Vb	40	28	31	27	34	29
Sub-area VI	32	32	32	22	31	27

\* Preliminary

1) The TAC could be 129 000 tonnes if purse seine landings are restricted to 38 000 tonnes

Earlier assessments have been updated by the use of revised 1978 data and provisional data for 1979. The changes in landings from the provisional 1978 figures were less than 5% for all areas. The age compositions available for 1979 represented 90-97% of the landings in the different areas.

79. The assessments of these stocks are subject to variance due to inadequacy of data, or due to data not being available to the Working Group. Especially for two stocks inadequate sampling of catches in former years introduces variances into stock estimates, but for all 5 stocks the estimation of total fishing effort levels for the most recent years is made difficult, due to lack of useful catch/effort data. Fishery independent data on stock size and recruitment are also not available. Attention should also be paid to the difficulties which arise, both in assessing the present situation and in forecasting the future, when large-scale changes are taking place in the composition and behaviour of the fishing fleets taking part in the fisheries.

80. Total landings from all areas combined fell by 13 000 tonnes from 406 000 tonnes in 1978 to 393 000 tonnes (provisional) in 1979 (Table 19). Landings increased in the North-East Arctic and at Iceland, fell slightly at Faroe, and were substantially reduced in the North Sea and west of Scotland. Although quota restrictions may have reduced the effort of some countries in some areas, the changes in the landings appear chiefly to reflect changes in the stock biomasses.

State of the saithe stocks and catch predictions

C.1 North-East Arctic (Table 20 and Figure 1)

81. Fishing in 1979 by non-coastal states was restricted by quotas, and landings by these countries were reduced by 38% from 1978. However, in 1979 landings by non-coastal states made up only 12% of the total. The rest was Norwegian landings which were not restricted by quotas and which increased by 25 000 tonnes from 1978, thus accounting for the overfishing of the TAC. Information, which was not available last year, shows that the number of boats participating in the Norwegian purse seine fishing for saithe, which accounted for about half of the total 1979 landings, did not change substantially from 1974 to 1978. For other gears there is no detailed information, but it is unlikely that there have been great changes in the Norwegian saithe fisheries in recent years.

82. On this assumption, the average  $F_s$  at age generated by the Norwegian fisheries in 1974-76 were taken as the basis for the input  $F_s$  in 1979, and were adjusted up by the numbers at age caught by other countries in 1979. If fishing mortality continues at the estimated 1979 level, of 0.54 for the most heavily exploited age group, landings in 1980 are estimated to be 140 000 tonnes; that is 18 000 tonnes above the recommended TAC. As long as there are no restrictions on the Norwegian fisheries it seems reasonable to use 140 000 tonnes in 1980 as the basis for predictions for 1981. For all options of landings in 1981, unless  $F_s$  increase, spawning stock biomass will increase. For the present exploitation pattern  $F_{max} = 0.42$ . To bring the exploitation down to  $F_{max}$  in 1981, the TAC would have to be 123 000 tonnes. This corresponds to a reduction in effort of 22%.

83. For this stock a substantial increase in the long-term yield can only be achieved by improving the exploitation pattern. Most of the landings of young saithe come from purse seiners. Landings by purse seine have averaged 75 000 tonnes annually in the period 1974-79, and were 77 400 tonnes in 1979. A major reduction in saithe fishing by purse seiners would be the most effective way of improving the exploitation pattern. If the  $F_s$  generated by purse seiners are deducted from the current  $F_s$ , the resulting exploitation rate and pattern will have a current  $F$  by gears other than purse seine close to  $F_{0.1}$ , and the yield per recruit will increase by 23%.

For 1981 the most realistic goal to pursue would seem to be to bring the fishing mortality down to  $F_{max}$  under the present exploitation pattern, and ACFM thus recommends that the TAC for 1981 for saithe in the North-East Arctic (Sub-areas I and II) should be 123 000 tonnes.

C.2 North Sea, Skagerrak and Kattegat (Table 21 and Figure 2)

84. Landings fell by 27 000 tonnes, to 115 000 tonnes in 1979. Of these, 1 635 tonnes were reported by-catches from industrial fisheries. The fishery in 1979 was subject to quota regulations, but this had little effect on the landings, which were only 57% of the TAC. The great changes in the fisheries which have taken place following the extension of jurisdiction by coastal states, and the fact that relevant data on effort are not available, makes it difficult to estimate the present level of exploitation. Comparing the 1978 and 1979 landings, a reduction in effort is indicated for some countries. Using the same input  $F$  values as last year, a trend in  $F_s$  was produced which was consistent with what was believed to be the trend in fishing effort. These  $F$  values were therefore adopted by the Working Group as input  $F_s$  for 1979. The 1979 exploitation

pattern gives an  $F_{\max}$  of 0.22, compared to the 1979 level of 0.35, on age groups subject to maximum exploitation. The predicted catch for 1980 for  $F_{80}$  at the same level as  $F_{79}$  is 126 000 tonnes, compared to a TAC of 129 000 tonnes.  $F$  has therefore been assumed to be unchanged in 1980. Spawning stock biomass is expected to change little in the period 1977-82.

85. Aiming at a stepwise reduction towards  $F_{\max}$  the ACFM recommends that the TAC for North Sea, Skagerrak, and Kattegat saithe (Sub-area IV, Division IIIa) for 1981 should be 127 000 tonnes.

This corresponds to a fishing mortality of 0.30, or a reduction in effort level of 14%.

86. There is not much to be gained in this stock, in the long-term yield, from a practicable improvement in the exploitation pattern. Fishing for saithe with purse seine in the North Sea is carried out only by vessels from Norway. Landings have averaged 8 600 tonnes over the last six years. It is predominantly age groups 2 and 3 which are exploited by this fishery. The total  $F$  at age due to the purse seine fishery has been deducted from the 1979  $F$  at age. The resultant exploitation pattern gives a yield per recruit curve which, for the current level of exploitation, shows an expected gain in yield of 5% if purse seine fishing for saithe was banned. In view of the small gain this would not appear to be justified.

ACFM's proposed increase of mesh size in the North Sea to 90 mm will affect the exploitation pattern of saithe only to a very minor extent. Any increase in mesh size which would achieve an appreciable gain for saithe would be unacceptable for many of the other species fished by regulation large meshed gear in this area.

### C.3 Iceland (Table 22 and Figure 3)

87. Landings increased by 14 000 tonnes to 63 000 tonnes in 1979, thus reversing a steady decrease in landings after 1971. Due to a temporary ban on cod fishing, trawler effort was diverted towards saithe and redfish. Icelandic gill net catches also increased by 26% in 1979. These changes have slightly changed the exploitation pattern, and the input  $F$  values for 1979 were chosen bearing this in mind.

With the 1979 exploitation pattern, largely determined by a minimum mesh size of 155 mm,  $F_{\max}$  is 0.58. The level of fishing mortality in 1979 is estimated to be 0.4.

Assuming that the fishing mortality will be at the 1979 level in 1980, corresponding to a catch of 67 000 tonnes, the catch at the same  $F$  level in 1981 will be 72 000 tonnes.

Correspondingly the spawning stock biomass, which has declined since 1969, is expected to increase slightly in 1979, to decrease in 1980, and then increase again in 1981.

88. The ACFM recommends that the TAC for saithe at Iceland (Division Va) in 1981 should be 72 000 tonnes.

### C.4 Faroe (Table 23 and Figure 4)

89. Landings fell by 900 tonnes to 27 200 tonnes in 1979 of which 81% was taken by Faroese vessels. Catch per unit effort for Faroese trawlers indicates an 8% reduction in total effort from 1978 to 1979. A trial VPA indicates an exploitation pattern for recent years with a maximum fishing mortality at ages 4-6. The Faroese trawl fishery, which

accounts for about 70% of the catches, exploits during the summer mainly younger age groups. There has been an increase in fishing effort in this part of the fishery, which is consistent with an increase in  $F$  values on ages 4-6. The Working Group therefore felt that it was reasonable to assume that  $F$  on ages 4-6 was about 50% higher than on older ages. The resultant exploitation pattern gives a current fishing mortality for these age groups of 0.4,  $F_{\max}$  at 0.54 and  $F_{0.1}$  at 0.22.

90. With this exploitation pattern, forecasts are to a higher degree affected by the assumptions on the strength of recruiting year classes than previously. It has been assumed that the 1976 and subsequent year classes are average.

Assuming that the TAC for 1980 of 34 000 tonnes will be taken, the 1979 level of fishing mortality in 1981 will give a catch of 29 000 tonnes. This level, in between  $F_{\max}$  and  $F_{0.1}$ , will give an approximately stable spawning stock size. The Advisory Committee on Fishery Management thus recommends that the TAC for Faroe saithe (Division Vb) for 1981 should be 29 000 tonnes.

#### C.5 West of Scotland (Table 24 and Figure 5)

91. Landings fell by 9 900 tonnes to 21 600 tonnes in 1979, the lowest since 1971. Landings were reduced for all countries which contribute substantially to the catch. The input  $F$  values used last year gave, when used for 1979, weighted mean  $F$ s for the ages 3 to 14 which were consistent with the trend in total effort, based on French data. It was therefore decided to adopt this input set for 1979. The current level of  $F$  is 0.35 on the age group subject to maximum exploitation, and this is approximately at the  $F_{0.1}$  level. Predicted landings for 1980 are 25 400 tonnes for the current  $F$ . To take the TAC of 39 000 tonnes recommended by EEC for 1980 would require that  $F_{80}$  is 60% higher than in 1979. The Working Group felt that this was unlikely, and it was assumed that  $F_{80}$  would be at the same level as in 1979. Spawning stock size has been declining since 1973. The decline may stop in 1982 with fishing mortalities at the current level in 1980 and 1981. The current level, between  $F_{\max}$  and  $F_{0.1}$ , would give a catch in 1981 of 27 000 tonnes.

92. The ACFM recommends that the TAC for saithe west of Scotland (Sub-area VI) for 1981 should be 27 000 tonnes.

There is not much to be gained in this stock, in the long-term yield, from a practicable improvement in the exploitation pattern. The present proposed increase in mesh size in this area will affect the exploitation pattern of saithe only to a very minor extent. The comments made in this regard in paragraph 86 are also applicable to this area.

#### D. BLUE WHITING IN REGIONS 1 AND 2

93. The Blue Whiting Working Group met at the Institute of Marine Research, Bergen, 5-10 May 1980 to: (a) assess the current exploitation rate of the blue whiting stocks; (b) advise on the biological need for, and form of, any regulatory action; (c) collate and evaluate the results of the 1979 blue whiting surveys; and (d) to coordinate the surveys in the remainder of 1980.

The total landings of blue whiting have increased considerably in recent years, from approximately 100 000 tonnes in the period 1971-75 to 1 055 000 tonnes in 1979 (Tables 25-30). Blue whiting is now fished throughout the year. The historic series of landings data are given below:

Total landings of blue whiting 1970-79 in thousand tonnes

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Landings	38	76	77	103	108	109	156	266	598	1 055

94. Although there are suggestions of different blue whiting stocks in the northeast Atlantic it is impossible, at the present state of knowledge, to define appropriate stock boundaries. The Working Group therefore decided to treat the entire northeast Atlantic as a single assessment unit (Figure 6), except for the southern area (Division VIIg-k, Sub-area VIII and Division IXa).

95. Ageing of blue whiting is a difficult task and there are at present several unsolved problems in this connection. However, in order to make a first step towards estimating exploitation rates, the Group agreed to use, at face value, age distributions brought to the meeting by members of the Group. Errors arising from this will affect catch curve analysis, VPA, and yield per recruit analysis. The age compositions available represented 80-90% of the landings from northern areas in the period 1973-79.

Total mortality coefficients (Z) were estimated by catch curve analysis based on Norwegian samples (mostly from research vessels) taken from the spawning stock in Sub-area VI in the years 1973 - 1979. It appeared that recruitment to the spawning stock was complete at an age of 8 years. The mean Z calculated for these years was 0.27.

The large increase in catches of blue whiting from 1975 onwards may have to some extent affected the age compositions for the most recent years. However, assuming that fishing mortality was at a low level compared to natural mortality at least until 1978, the method would still be valid for estimating Z in previous years. The estimated mean Z can be taken as a first approximation to the natural mortality rate, although it might be a slight overestimate. It was therefore concluded that natural mortality on the mature age groups could be in the range 0.2-0.3.

96. Quantitative acoustic surveys of the spawning areas west of the British Isles have been made every year since 1972. Three different methods have been used during these surveys to convert back scattering intensity from fish to an equivalent weight, or number, of fish:

- (a) On the Norwegian surveys empirical values obtained from single fish echoes during the surveys have been used.
- (b) On United Kingdom surveys target strength measurements of dead blue whiting suspended in the beam of the echo sounder have been used.
- (c) United Kingdom in situ estimates have also been made (Robinson, 1980, 1981).

The Working Group could not find any way to compare the results obtained using the different methods. The Norwegian estimates are, on average, consistently lower than those from the United Kingdom surveys (standardised with reference to a target strength of -32dB/kg). Excluding extreme values the earlier surveys indicate a range of spawning stock biomass from 2-15 million tonnes, the mean for all of them being 8.5 million tonnes. An intercalibration between the Norwegian and Scottish vessels taking part in the survey in 1980 gave a correlation coefficient of 0.84 between the ships. This indicated that the distribution of densities recorded by the ships is likely to be similar.



97. The surveys in 1979 did not cover the area south of 55°30'N.

Estimates of total biomass are 14.8 million tonnes based on the Scottish survey (standardised to -32dB/kg) in the first three weeks of April, and 7.9 million tonnes based on the Norwegian survey in late April. The two surveys carried out in 1980 yielded a combined estimate of 6.1 million tonnes for the whole spawning area.

An estimate of the spawning stock biomass west of the British Isles based on historic larval data from the Continuous Plankton Recorder Surveys over the period 1958-78, and on the abundance of eggs as determined from research vessel hauls made with a Longhurst-Hardy Plankton Recorder during the period 1974-78 was available. The average estimate, for all these years combined, was 10 million tonnes.

98. Trial VPA runs, using a natural mortality rate of 0.2 and 0.3 were made. The values of M and of input values of F chosen have a marked effect on the estimates of stock size over the whole range of years, and the VPA is therefore difficult to interpret. The results of the echo surveys indicate an adult stock size of about 6 million tonnes in 1980. With the exploitation pattern used for 1979 an adult stock size, from VPA, of this level would be produced with an F of approximately 0.25 on age groups 9 to 14 in 1979. However, in view of the uncertainties associated with the assessment this estimate must be regarded as a very provisional one.

99. Yield and spawning stock per 2 year old recruit curves, based on weight at age data provided by Working Group members and the same relative Fs at age as assumed in the VPA for 1979, are given in the Working Group report. The curves should be interpreted with great caution since there may be large errors both in the weight at age data and the assumed relative Fs.

100. In view of the very rapid increase in the catches ACFM would wish to stress that if this continues the upper limit of how much can safely be removed will soon be reached. Although it is not possible to give any exact figure for the long-term sustainable yield, at present, the rate of increase in effort in this fishery should be brought down, until such a figure is available. Effort should not be allowed to grow to a level which has subsequently to be reduced drastically when the accumulated stock has been fished down.

It should also be kept in mind that a further large increase in effort will depress catch rates, especially in the fishery on feeding blue whiting, and will reduce the mean size of fish in the catches. This will hamper the use of this species for human consumption markets.

#### E. REGION 2 FISHERIES

##### E.1 Herring and Sprat Stocks

##### E.1.1 Division IIIa herring

101. Recent catches<sup>1)</sup>, and recommended TACs, in thousand tonnes are given below:

1977	1978	1979		1980	1981
Actual catch	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Rec. TAC
115	88	45 <sup>2)</sup>	66	40 <sup>3)</sup>	?

1) Catch figures from the Working Group report.

2) Based on advice from a Danish-Swedish Study Group and agreed upon by Sweden, Norway and EEC.

3) Revised to 50 000 tonnes in July 1980.

102. As mentioned in last year's report 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.

Samples of herring for stock separation are regularly taken by Denmark and Sweden. The analysis includes meristic characters (VS, K<sub>2</sub>), length measurements, otolith measurements, and electrophoresis on muscle, heart, eye and liver. Some of the resulting material is presented in the report of the Working Group on Division IIIa Stocks (Doc. C.M.1980/G:3), but most of it is undergoing a more detailed analysis. A Herring Otolith Workshop, in September 1979, concluded that a component of herring with large first growth zones, similar to those of herring spawning in autumn both in the northern and central North Sea, was present in a number of samples of 1-ring herring from the Skagerrak, but was virtually absent from both 1- and 2-ring herring examined from the Kattegat, and in 2-ring herring from the Skagerrak (C.M.1979/H:66). An extensive analysis of additional material at the Swedish Research Institute in Lysekil has been conducted since the Otolith Workshop, but the results were not available at this meeting of the Working Group.

At present it appears from meristic characters that adult North Sea herring are virtually absent from Division IIIa. Formerly the Skagerrak was, in certain periods, an important overwintering area for North Sea herring. The spring spawning stocks seem to make up the bulk of the adult herring stock in Division IIIa at present.

103. The preliminary catch figures for 1979 show that the agreed TAC was seriously overfished (Table 31). The catch in Skagerrak was 18 974 tonnes (TAC = 10 500 tonnes), and in Kattegat 46 609 tonnes (TAC = 35 000 tonnes). The total for Division IIIa was 65 583 tonnes compared to an agreed TAC of 45 500 tonnes. The TACs set seem, however, to have had some restrictive effects. The main fishing countries had long periods when directed fishing was prohibited, and catches decreased by about 22 000 tonnes from 1978 to 1979.

Because of the quotas, and minimum landing sizes of 20 cm and 18 cm in the Skagerrak and Kattegat, respectively, a certain amount of discarding at sea is bound to have taken place. Many of the bigger vessels have sorting machines on board to sort the catch into market categories, and a part of the smallest market category may be discarded, together with unmarketable fish. No precise value of the amount of discards is available, but for the assessments an estimate of about 8 000 tonnes has been added to the reported catch figure for 1979. The total catch for 1979 would then have been about 73 700 tonnes.

104. The results of the international young fish surveys in Skagerrak-Kattegat in 1980 show that the abundance index of 1-group herring was very close to the mean for the years 1972-78, which would indicate that this year class is of average strength. It should be pointed out that the indices for this age group include both spring and autumn spawned progeny as no clear distinction between these has yet been possible at this age. The heaviest concentrations of 1-ringers in 1980 were, however, encountered in the southern part of the Kattegat, where meristic characters and mean lengths would indicate a predominance of spring spawners.

The 1978 year class which was virtually absent from the catches of the IYFS in February 1979, was reasonably abundant during the acoustic survey in September 1979. Compared with the strength of the same age group in the acoustic survey in 1976 (year class 1975), the 1978 year class would appear to be 3-4 times less abundant.

105. An acoustic estimate of the biomass of herring in Division IIIa in September 1979 was presented to the Working Group. The total herring biomass was estimated as 277 000 tonnes. 2-group herring (1977 year class) dominated. The Working Group made a VPA, and a prognosis, based on this acoustic estimate, and the information on recruitment given above. However, it appears from the report of the survey that a constant factor was used to convert integrated echo signals into biomass, and that this factor was based on target strength measurements of herring of around 100 g (Hagström *et al.*, 1979). It also appears from the report that a considerable proportion of the integrated biomass was other species of fish, which were subtracted from the estimated biomass according to catch composition of trawl hauls. Since the other fish were chiefly sprat, with a lower conversion factor than herring, both total biomass and herring biomass were overestimated by the procedure adopted.

Introducing a length dependent conversion factor C into the calculation, rather than one based on herring target strength, the herring biomass in September 1979 is estimated to be about 200 000 tonnes, instead of 277 000 tonnes as given in the Working Group report.

106. 2-group herring (1977 year class) were the dominant age group in this acoustic biomass. The stock in numbers at age obtained from this revised survey estimate was used as input for a VPA which was run back to 1974. The calculated numbers of 0-group of the 1977 year class was  $5.5 \times 10^9$ , compared to  $6.6 \times 10^9$  as given in the Working Group report. Since the latter estimate was higher than the 0-group strength of any of the preceding year classes for which there are VPA estimates, the Working Group decided to set the 1977 year class at the same strength as the 1974 year class as 0-group ( $5.8 \times 10^9$ ). The older year classes were adjusted downwards to the same extent. The revised acoustic estimate gives a strength of the 1977 year class slightly below the 1974 year class. No adjustments have therefore been made, and the acoustic survey estimate has been taken as the starting point for both the VPA and the prognosis. The spawning stock (3-ringers and older) in 1979 was estimated to be 23 000 tonnes, and fishing mortalities in 1979 to be 0.25 on 1-ringers, 0.44 on 2-ringers and 0.7 on 3-ringers and older. The fishing mortality on 0-ringers was set at 0.12 which gives a year class strength slightly below the mean for the 1974-76 year classes. VPA estimates of fishing mortalities for the years 1974-77 are very high ( $>1$ ) on 1-ringers and older fish in all years. The fishing mortality on 1-ringers seems to have decreased in 1978 while fishing mortality on 2-ringers and older remained at a very high level (mean  $F_{2-8} = 1.3$ ).

107. A prognosis based on the 1979 stock, estimated as described above, would suggest that the TAC recommended for 1980 will generate an F on fully recruited age groups (3-ringers and older) of 0.18. The spawning stock in 1980 was calculated to be 125 000 tonnes, compared to spawning stock sizes of 10 000 - 50 000 tonnes during the years 1974-79. This very significant increase is due solely to the high estimated number of 3 years old recruit spawners of year class 1977. The 1977 year class as 0-group was estimated to be only slightly above average. Its high value as recruit spawners must therefore be seen against the background of the regulations introduced in 1978 and 1979 restricting catches of juvenile herring.

It should be stressed that all the estimates referred to above are based on the assumption that the 2-ringers, observed in Division IIIa during the acoustic survey in 1979, will remain in the area in 1980. If this is accepted, and if it is accepted that the acoustic estimate is not a heavy overestimate, revision of the 1980 TAC can be considered, since it would entail a very large reduction in fishing mortality, from 0.7 on 3-ringers and older in 1979 to 0.18 in 1980.  $F_{max}$  for the 1979 exploitation pattern

is 0.24, and this F would generate a catch of 52 000 tonnes in 1980. It is therefore recommended that any revision of the TAC for 1980 should not exceed 50 000 tonnes. Management bodies were advised accordingly by an advance notice given on 7 July 1980<sup>1)</sup>

108. A decision on the TAC for 1981 should not be taken before a further survey, in September 1980, has been carried out. This survey would give both an estimate of the number of the 1977 year class left in the area in 1980, an estimate of the 1979 year class, which is of vital importance for projections of the catch in 1981 and of the spawning stock biomass in 1982.

Statement in response to letter from the Norwegian Ministry of Fisheries

109. In a letter to ICES dated 9 June 1980, the Norwegian Ministry of Fisheries asked ICES to consider whether herring fisheries in Norwegian fjords in Division IIIa, and perhaps some similar populations on the Swedish coast, should not be assessed separately and be subject to separate management regulations.

This request would appear to be associated with the situation which arose during the early 1970s, when NEAFC was responsible for all fishery management in the northeast Atlantic and was considering TAC regulation of North Sea herring fisheries. At that time the dominant component of the Skagerrak herring population was autumn spawning herring of North Sea origin, and the herring population in the Skagerrak and Sub-area IV were assessed and managed as one unit stock. The populations fished in the Norwegian fjords in the Skagerrak were spring spawning herring, clearly not associated with the population then being managed by NEAFC. Accordingly the Norwegian fjord fisheries were granted a dispensation from the NEAFC regulation of North Sea herring.

The current situation is radically different. The herring population in Division IIIa is now subject to separate assessment and management from that in Sub-area IV. This is because although there may be some admixture of autumn spawning herring the dominant herring population in Division IIIa appears now to be of spring spawning fish. Within this Division there is a very large number of spawning sites in the coastal areas of Norway, Sweden and Denmark. There is, however, no evidence to suggest that these sites maintain discrete populations generated by their own reproduction. There is some evidence to suggest that, after spawning, the populations from these sites migrate into more open waters of Division IIIa and intermingle. Under these circumstances it would be virtually impossible to assess, or manage, these populations as individual units even if there were clear evidence that they were discrete stocks.

110. A similar request in relation to cod has been considered by the Division IIIa Working Group and the results of ACFM's interpretation of that report are given in paragraph 140 (page 53).

E.1.2 Herring in the North Sea and Channel (Sub-area IV and Divisions VIId and VIIe), Division VIa, Celtic Sea (Tables 32-35)

111. In a report, issued in May 1980, ACFM presented the results of the most recent assessment that has been done on the herring stocks in these three areas, and advised that the prohibition of directed herring fisheries on these stocks should be maintained throughout 1980. No new data

<sup>1)</sup> see page 12.

have been available since these assessments were done and at this stage it would be premature to make any prediction of the prospects for a limited re-opening of these herring fisheries during 1981. Any statement on this must await the analysis of the data collected from larval sampling and from the recruit surveys which will be carried out in the autumn and winter of 1980/81.

#### E.1.3 Clyde herring

112. In 1979 the TAC recommended by ACFM for this stock was taken during a shorter fishing season than in previous years. Some new data are available on the association between Clyde herring and those in adjacent areas, but these are not yet sufficient to justify any change in the management policy so far adopted, of managing the herring population in this area as a separate unit. ACFM would recommend that the TAC for Clyde herring in 1981 should be set at the same level as in 1980, that is 2 000 tonnes.

#### E.1.4 Herring by-catches

113. ACFM has for some years requested member countries to submit detailed data on the seasonal and areal distribution of herring by-catches in the sprat fisheries in order to make it possible for ACFM to advise on practicable methods of reducing the mortality generated by the sprat fishery on juvenile herring. At its May 1980 meeting ACFM had reason to believe that these data would be submitted to its July meeting 1980.

114. On the basis of the limited data which were, in fact, submitted it is only possible to give by-catches of herring in the sprat fisheries by statistical rectangles on an annual basis as average values for only one year (Figure 7). This figure shows that the highest by-catches are taken in areas which are well known as nursery areas for herring. ACFM, however, had to accept that due to seasonal and annual variations of by-catches the data so far submitted are not sufficiently detailed to give advice on what areas should be closed to sprat fishing to effectively reduce the herring by-catches, unless these areas are very large and closed for the entire year.

115. The large differences of the average percentage by-catches between areas, shown in Figure 8, indicate, however, that it would be possible to conduct a sprat fishery on a much lower total by-catch rate than is experienced at present. The annual average by-catch rate was above 10% in some statistical rectangles in 1979. This suggests that in some catches the by-catch rate must have been well above the current 10% limit.

The ACFM therefore recommends that the maximum permissible by-catch rate of herring in the sprat fishery be reduced to 3%. The overall annual percentage was 3.6% in 1979. It is, however, realised that such a reduction in by-catch rate will require intensification of the present enforcement.

116. ACFM must stress that the present fishing mortalities generated on juvenile herring by the sprat fisheries are unacceptably high, and are retarding the recovery of the North Sea herring. It is therefore strongly recommended that the by-catch rates be closely monitored by much more frequent inspection of sprat landings, and of catches at sea. The by-catch limitation should be enforceable on landings or part of landings,

monitored at sea, as is envisaged in some management bodies draft regulations. Such a monitoring system must be followed up by real time closing of areas where by-catch rates exceed the maximum level.

The only alternative management action to achieve a reduction in the absolute size of the herring by-catch would be to reduce the sprat TAC drastically or, as stated above, by permanently closing large areas to industrial fishing. ACFM would accordingly recommend that the by-catch of herring in any sprat landing, or part landings, should not exceed 3% by weight of the total catch landed or on board the vessel at any given time.

E.1.5 West of Ireland herring (Division VIIb,c)

117. The relationship between herring taken in Division VIa and in Division VIIb,c was discussed in the 1979 report of ACFM. No new information is available at present on this question. The catches in Division VIIb,c in 1978 and 1979 were 7 500 tonnes and 15 000 tonnes respectively (Table 36). There are no data available to estimate stock size. Because of the dangers of overexploitation in Division VIIb,c, ACFM can only reiterate the advice given in the previous report. It is recommended that precautionary TACs of 7 000 tonnes should be set, for both 1980 and 1981, in this area and that these should be properly enforced. The TAC recommended for this area in 1979 was exceeded by more than 100%.

E.1.6 Herring in Division VIIj (southwest Ireland)

118. Revised catch figures for 1978, and preliminary figures for 1979 indicate that the catch in this Division has risen from 3 500 tonnes in 1978 to 5 000 tonnes in 1979. Lack of reliable catch and effort figures has prevented any stock size estimate being made for this area. ACFM can only reiterate its advice given in the previous report. It would seem desirable to stabilise the fishery at about the level of recent catches. ACFM recommends that a TAC should be set at 6 000 tonnes. Such a TAC should also prevent inaccurate reporting of the position of capture of catches taken in other areas.

E.1.7 Irish Sea herring (Division VIIa)

119. Recent catches<sup>1)</sup> and recommended TACs, in thousand tonnes:

1977		1978		1979		1980	1981
Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch*	Rec. TAC	Rec. TAC
12	15	9	11	11	12	10	6

\* Preliminary

1) Catch figures taken from the Working Group report

The reported catch from the North Irish Sea in 1979 was about 12 300 tonnes, of which 10 100 tonnes were attributed to the Manx stock, and 1 800 tonnes to the Mourne stock (Tables 37 and 38). The balance could not be attributed to stock.

120. About half the catch in number of Manx herring were 2-ring fish (1976 year class), the proportion of 3-ring fish was higher than in 1978, but older fish were scarce. The catches from the Mourne stock were dominated by 1-group herring. Because of the cessation of the industrial fishery in Division VIIa in February 1979, 0-ring herring, for the first time for many years, were not present in any of the catches.

121. In the past fishing mortality and stock size for the Manx stock have been estimated from VPA, with an input  $F$  derived from effort data. Because of administrative control of the daily catch per boat in 1978 and 1979, there is no comparable measure of fishing effort for these years which is likely to reflect the fishing mortality rate. The number of herring larvae found on the 1979 survey was the lowest recorded in the last 6 years. VPA runs, with a range of  $F$  values in 1979 from 0.3 to 0.7 all showed a serious decline in spawning stock biomass, from about 56 000 tonnes in 1974 to 22 000 - 26 000 tonnes in 1977. The lower input  $F$ s gave a substantial increase in spawning stock from 1977 to 1979, while  $F = 0.7$  gave a spawning stock biomass in 1979 of about 23 000 tonnes, that is about the same level as in 1977. Since the larval observations indicated a low spawning biomass in 1979 it was concluded that  $F = 0.7$  was the most likely value in 1979. It must, however, be stressed that the available data do not permit any accurate assessment to be made.

122. Accepting an  $F$  of 0.7 for 1979, the  $F$  in 1978 is estimated to have been 0.64. This is more than twice the value assumed in last year's assessment. The fishery is now heavily dependent on the strength of the recruiting year class, and it is urged that a cautious, rather than an optimistic, TAC should be applied until there is firm evidence of a recovery of the spawning stock biomass. If the TAC recommended for 1980 is taken, an  $F$  of 0.3 in 1981 would generate a catch of about 5 000 tonnes in that year. The spawning stock size in 1982 is then estimated to return to the 1979 level, after a further decline to 19 000 - 20 000 tonnes in 1980-81. All these calculations are heavily dependent on assumptions of recruitment. These have been estimated from a spawning stock/recruitment line through the point corresponding to the geometric mean of historical VPA values of spawning stock and recruitment, and the origin. This approach is considered to be an appropriate one during periods of low spawning stock sizes.

123. If no further industrial fishing takes place on the Mourne stock, it would be expected that the size of this stock will increase fairly rapidly. As stated in the report of ACFM in May 1980, there should, however, be positive evidence of a substantial recovery of the spawning stock before any directed fishery can again be contemplated.

124. However, some by-catches of the Mourne stock will be taken in the fishery on the Manx stock. Based on the estimates of the catches from these two stocks in 1979 a catch of 5 000 tonnes of Manx herring will generate by-catches of about 1 000 tonnes of Mourne herring. Accordingly ACFM recommends a TAC of not more than 6 000 tonnes of herring in 1981 in Division VIIa.

125. It is also recommended that herring fishery in the North Irish Sea be prohibited from 22 September to 16 November each year to protect the spawning shoals.

In order to protect the juvenile component of the Manx stock it is recommended that directed herring fishing should be prohibited in a zone extending 12 miles from the British coast, between latitudes 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 also be continued in 1981.

E.1.8 North Sea sprat

126. Recent catches<sup>1)</sup> and recommended TACs, in thousand tonne units, are given below:

1977		1978		1979		1980	1981
Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch*	Rec. TAC	Rec. TAC
450	304	400	378	400	380	400	400

\* Preliminary

1) Catch figures taken from Working Group report

The total catch of North Sea sprat in 1979 was 380 000 tonnes which is at the same level as in 1978 (Table 39). The main feature in 1979 was an increased fishery in Division IVb east and a corresponding decrease in Division IVb west.

127. For North Sea sprat there is very little supporting information on which to base the selection of input fishing mortality in order to carry out a VPA. Three annual VPAs with input F on 1- to 3-ring fish of 0.5, 1.0 and 2.0 were prepared. Input F values on 4- and 5-ring fish were selected by trial and error, to ensure broad internal consistency within the body of the analysis, judged by similarity of F values on 1-, 2- and 3-ring fish in the same year. The three assumptions lead to quite different conclusions about the state of the stock. If  $F = 0.5$ , the situation is stable, and the spawning stock is high. If  $F = 1$  the stock is declining, and fishing mortality has increased sharply over the last three years. If  $F = 2$ , the stock is on the point of complete collapse. All three VPA assessments are internally consistent and no choice can be made between them without using some sort of independent information.

128. During the winter of 1979/80 acoustic surveys were carried out by research vessels from the United Kingdom and Norway. The surveys in January 1980 were the first carried out under ICES coordination. Very low abundances of sprat were recorded along the United Kingdom coasts. The survey of the offshore area showed, however, large concentrations in the south-eastern part of the North Sea in January 1980, and Norwegian observations suggested a marked southeastward shift of the distribution compared to November 1979.

The total biomass of the North Sea sprat stock in January 1980 was estimated to be about 660 000 tonnes of 1-group and 350 000 tonnes of older fish. This estimate of the biomass of older fish was at the same level as calculated from the VPA at 1 January 1980 (2-ringers and older), if one assumes an input F of 0.5 in 1979. It was therefore decided to accept the analysis based on an F in 1979 of 0.5, as being the most likely to be correct. It should be clearly recognised, however, that due to the limited experience with acoustic sprat surveys covering a wide area, and because of uncertainties about the value of acoustic target strength of sprat, this estimate of F in 1979 may easily be in error.

Judging from the observed ratio of recruitment to spawning stock biomass over the years for which data are available, and the calculated spawning biomass per recruit for various F levels, it was concluded that the stock should be managed to maintain a fishing mortality of 0.5. At this level of fishing



mortality the stock should be able to replace itself, whereas at higher levels of  $F$  the stock could be in danger of collapse. If recruitment continues around its average value for the period 1974-78, the long-term average yield, at an  $F$  of 0.5, will be in the region of 400 000 tonnes, as estimated previously. However, since the fishery is almost entirely dependent on the catch of 1-ringers, the appropriate TACs would fluctuate considerably.

The TAC for 1980 has been set at 400 000 tonnes. If the acoustic estimate of 1-group fish is correct in indicating a high recruitment, this TAC is likely to be taken.

129. Bearing in mind, however, the uncertainties of the acoustic survey data, and also uncertainties about natural mortality at various ages, which could make any comparisons between VPA and survey data misleading, one should take a rather cautious approach. ACFM therefore recommends that the TAC for North Sea sprat should be set at the estimated long-term average yield of 400 000 tonnes for both 1980 and 1981.

130. Although the Working Group this year was able to make some prognoses on sprat for 1980 and 1981 based on the acoustic survey results, the uncertainties are too large to give confidence in basing advice on this analytical assessment, and the TACs recommended above still have the character of precautionary TACs. Even if the acoustic estimate from January 1980 is valid, it would still be extremely difficult to set a reliable TAC for 1981. This is because the fish which will be 1-group in 1981 were still not born at the time of the survey, and guesses of their abundance would have to be made. The 1-group, on average, makes up a high percentage of each year's catch. Problems arise therefore both from difficulties in obtaining reliable estimates of the stock, and of incoming recruitment, and from the large time lag, at present, between the assessment and its implementation.

131. The results of the Norwegian acoustic surveys in November 1979 and January 1980 in the offshore waters of the North Sea show that an acoustic technique to estimate the incoming year class is worth persevering with. Problems arise, however, because the depth distribution of small sprat is not adequately known, there is no adequate measure of target strength for this size group, and because the sampling methods used so far may not provide a representative estimate of the true size distribution.

Since some experience has been gained in making acoustic estimates of the adult sprat stock in winter (January-February), it is recommended that these surveys should continue. The timing of such surveys should cover one month, in the period December-February, when sprat tend to assemble in overwintering concentrations. Wide coverage is needed and this is most likely to be achieved by international cooperation under the auspices of ICES.

Acoustic surveys of juvenile and adult sprat, each winter, should be evaluated as soon as possible after they occur and the results made available to ACFM. It should then be possible for the TAC for the current year to be adjusted. Shortening the present advisory and administrative procedures may be necessary for proper management of this stock.

#### E.1.9 Herring discards

132. Management arrangements using TACs, combined with minimum landing sizes for a number of herring stocks, have led to an increasing amount of fish being discarded at sea. Mechanical sorting machines have been installed on board fishing vessels in some areas, which enables them to exploit herring shoals containing a high proportion of undersized fish. Catches of large amounts of fish, especially small fish, which are thrown

back into the sea dead, will strongly reduce both future yield and spawning stock size, and will also reduce the recovery rates of stocks which are being rebuilt. Furthermore discards are not reported, and unreported catches of fish, mainly 0-1 group, can seriously bias the stock assessments.

It is recommended that consideration should be given to reducing discards at sea, for example by closing areas during periods when the catch of undersized fish is high. Furthermore, reporting systems should be improved in order to get reliable data on discards.

## E.2 Stocks in Division IIIa

133. The Working Group on Division IIIa Stocks met from 24 to 28 March 1980 to: 1) evaluate any new data available on stock components in Division IIIa herring; 2) assess TACs for 1981 for cod, whiting, haddock, plaice and sprat in Division IIIa; 3) examine any data available, with particular emphasis on tagging data, which might provide estimates of migration rates, particularly of cod and herring, between Division IIIa and the Baltic.

The results of the study on Division IIIa herring are given in paragraphs 101-108.

### E.2.1 Sprat in Division IIIa

134. Landings in 1979 from Division IIIa (excluding Norwegian fjord landings) amounted to 79 400 tonnes (Table 40). Thus, the landings were 6 000 tonnes greater than in 1978, despite prolonged periods of fisheries prohibitions in some national fisheries.

135. In September 1979, an acoustic survey, covering about 40% of the total area in Division IIIa, was carried out to estimate sprat and herring stocks. An estimate of sprat biomass of about 130 000 tonnes was obtained from this survey. A comparison with a similar survey carried out in 1976 would suggest that the stock in 1979 was about twice that present in the area in 1976. The results of the International Young Fish Survey in February 1980 would suggest that the 1979 year class, which is expected to be the main component of the sprat catches in 1980, is a strong one, comparable with those of 1974 and 1977.

136. The stock situation for sprat in Division IIIa therefore looks reasonably promising but it must be pointed out, as discussed for herring in paragraph 105, that the accuracy of the acoustic survey is completely unknown and the data series for the International Young Fish Survey is too short to gauge the adequacy of the index as a predictor of year class strength.

137. In view of the dubieties about the stock position mentioned above, and in the light of the fact that the main component of the sprat catches in 1981 would be expected to be the 1980 year class, about which nothing is currently known, ACFM would recommend a sprat TAC of 70 000 tonnes in 1981 in Division IIIa. This preliminary TAC will be subject to revision, at the next mid-term meeting of ACFM, in July 1981, in the light of the data obtained from the acoustic survey in September 1980 and from the International Young Fish Survey in February 1981. In the first half of 1981 not more than 25 000 tonnes should be taken; the residual of this TAC or of any revision of it, being retained for the second half of the year.

## E.2.2 Cod in Division IIIa

138. A re-appraisal of tagging experiments carried out in Division IIIa and in adjacent waters gave no adequate basis for estimating emigration rates between Division IIIa and the Baltic or between Division IIIa and the North Sea. The only feature which was clearly demonstrated by these data was that there was little, if any, exchange of cod between the population of cod in the Norwegian coastal area of the Skagerrak and that in the remainder of Division IIIa. The implications of this for management are discussed below.

### Cod in the Skagerrak

139. The landings of cod from the Skagerrak decreased by almost 9 000 tonnes from those of 1978 to a total of 17 150 tonnes in 1979, mainly due to the effects of quota restrictions enforced in that year (Table 41).

Data on the age compositions of Skagerrak cod catches are only available for 1978 and 1979, and the other parameters necessary for an analytical assessment are largely unknown. A TAC for this stock can only be advised on a precautionary basis. There are indications that the 1979 year class may be a strong one. Retention in 1981 of the TAC of 17 500 tonnes previously advised for 1980, is likely, therefore, to result in some reduction of the fishing mortality rate.

140. As mentioned in paragraph 138 above, there is evidence that the cod in the Norwegian coastal area have little connection with those in the remainder of the Skagerrak. On this basis there would, therefore, be justification for setting separate TACs for Norwegian coastal cod and for the cod population in the remainder of the Skagerrak. As there are no data which would allow any judgement of the relative exploitation rates in these two areas, this can only be done on historical catch data. In the period 1970-79 catches of Norwegian coastal cod have fluctuated between 5% and 15% of the total annual Skagerrak catch, with a mean value of 9%. ACFM would, accordingly, recommend a TAC of 1 600 tonnes be set for cod in the Norwegian coastal area of the Skagerrak and one of 16 000 tonnes for the remainder of the Skagerrak in 1981.

### Cod in the Kattegat

141. Landings reached 14 860 tonnes in 1979, some 1 500 tonnes higher than in 1978 (Table 42), despite the imposition of some closed seasons, and a higher minimum landing size by Denmark. The latter may only have increased discarding as it was not associated with an increase in minimum mesh size. The assessment of the current rate of exploitation of this stock can only be based on the reduction of fishing mortality which would have been produced in 1978, if the Danish fishery had been closed in the same periods in that year as in 1979. On this basis, the fishing mortality rate would have been 0.86 in 1978 and 0.77 in 1979; it should be noted, however, that the estimates are unlikely to be very precise. If they are approximately the correct values, however, they would suggest that the current exploitation rate is about twice the  $F_{max}$  value and that the reduction in fishing mortality rate will be small in 1980 if the TAC agreed for that year is adhered to.

142. As stated in paragraph 139, there is some evidence that the 1979 year class, which will recruit to the exploited stock in 1981, is a strong one; but its absolute strength cannot be quantified. In view of the many dubieties about the assessment, and the current high exploitation

rate of the stock, ACFM would recommend retention of the same TAC (16 400 tonnes) as in 1980. This might be expected to reduce the fishing mortality rate to a value of about 0.7.

E.2.3 Haddock in Division IIIa (Table 43)

143. It is not clear to what extent the haddock populations in Division IIIa and in the North Sea are interlinked. Growth rates are very different in the two areas and the landings from the two areas have fluctuated independently. It seems likely that some of the recruitment to Division IIIa is generated in the North Sea, but the strength of the influx of juvenile haddock may not be related to the strength of the North Sea year class. Landings of haddock in 1979 were only 4 700 tonnes, little more than half the agreed TAC.

There are no data from which to assess the state of this stock or from which to predict future landings. In view of the very low landings in 1979, it will seem that a much lower TAC than in 1979-80 is advisable. ACFM would, accordingly, recommend a TAC of 4 500 tonnes for haddock in Division IIIa in 1981.

E.2.4 Whiting in Division IIIa (Table 44)

144. Landings in 1979 declined sharply, from 49 000 tonnes in 1978, to 18 000 tonnes, mainly due to a prohibition of a directed industrial fishery during 1979, and a closure of the Danish whiting fishery for one month.

145. There are no data on which an analytical assessment can be based for this stock. There are some indications that recruitment by the 1979 year class may be strong, but as for cod, this cannot be quantified. ACFM would recommend a TAC for whiting in Division IIIa, of 22 000 tonnes in 1981, based on historic catch levels in the 1970s.

E.2.5 Plaice in the Skagerrak (Table 45)

146. Landings in 1979, at 11 800 tonnes, were 2 200 tonnes less than in 1978. Data are only available on this stock for the last two years and as a result no analytical assessment can be made. ACFM can, therefore, only recommend continuation of the precautionary TAC of 14 000 tonnes, as in 1979 and 1980, into 1981.

E.2.6 Plaice in the Kattegat (Tables 46 and 47 and Figure 9)

147. Landings in 1979 showed a decrease of 3 000 tonnes from 1978 to a level of 10 000 tonnes in 1979.

Any assessment of the current state of the stock and of future catches is greatly handicapped by a complete lack of fishing effort data. The assumption was made that the exploitation rate and pattern in 1979 were the same as in 1969-71 when catches, and their age composition, were similar to those of recent years. This would suggest that the weighted mean  $F$  on age groups 3-5, which provide most of the catch, is about 0.6. On this basis, which must be rather imprecise, the current spawning stock would be at about the same level as in 1969-70. If the fishing mortality is maintained at the level assumed for 1979, landings would be expected to be about 8 000 tonnes. There are some indications that the 1976 year class may be stronger

than assumed in the prediction. If this should prove to be so, the 1981 TAC will require revision, but meantime ACFM would recommend a TAC for Kattegat plaice of 8 000 tonnes in 1981.

### E.3 Cod, Haddock and Whiting Stocks

148. The North Sea Roundfish Working Group met from 14-18 April 1980 to: "assess TACs for 1981 for cod, haddock and whiting in Sub-areas IV, VI and VII (excluding Divisions VIIa, VIIf and VIIg). The Working Group should also consider what additional data would be required to provide more realistic sub-divisions of the total TACs for these species for Sub-area VI between Divisions VIa and VIb".

#### E.3.1 Sub-area IV

149. Recent landings (see Tables 48-50) and recommended TACs in thousand tonnes:

Year	1976			1977		1978		
Species	Rec. TAC	NEAFC TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Agreed TAC	Actual catch
Cod	130-210	236	214	220	185	210	236	261
Haddock	106-155	206	208	165	151	105	109	90
Whiting	160	189	197	165	120	111	168	103

Year	1979				1980			1981
Species	Rec. TAC	Agreed TAC	Revised TAC	Actual catch*	Rec. TAC	Agreed TAC	Rev.TAC Jul.80	Rec. TAC
Cod	183	183	247	252	200	200	-	190
Haddock	83	83	-	85	66	69	90	120
Whiting	85	85	111	133	100	105	150	150

\* Preliminary

#### Data base

150. The data base for most stocks extends back to 1960. However, detailed examination of the historic data series has shown that they are not consistent over the whole time period. In particular, improvements in data collection in recent years have resulted in more extensive data becoming available for the industrial fisheries, and for discards. Thus, whereas in recent years the age compositions included industrial by-catches and discards, these are not included for all countries in the earlier years when such data were not available. In addition, it appears that there have been variations in the method of processing the age composition data from year to year.

During the last year, it has been possible to make some improvements for some of the earlier years to the estimates of industrial by-catches and

of discards. The resultant revised age compositions have been used in the assessments made at this meeting. As a consequence, there are a number of changes in the estimates of year class strengths, and of fishing mortality on the younger age groups, in some of the earlier years. There are likely to be further changes after the completion of the revision of the data base.

For cod an extensive revision of data was not possible, and to have a consistent data series it was decided to omit discards from the VPA. The haddock and whiting data were revised to make full provision for by-catches and discards. However, the revision of the data base is not yet completed. The data for haddock and whiting are likely to be subject to only minor revisions, whereas the cod data base will have to be revised throughout.

The data base on fishing effort was extended compared to last year. Thus, new information compelled changes in trends, assumed for the fishing mortalities in recent years.

#### The state of exploitation

151. Although it is not possible to give any precise estimates of the current levels of fishing mortality, the available evidence indicates that there has been at best only a slight reduction in fishing mortality levels on these species. However it is quite clear that fishing mortality on all species is very high ( $F = 0.9$  to  $1.0$  on age groups subject to maximum exploitation) and greatly in excess of the values of  $F_{max}$ , which for the three species are in the range of  $0.2$  to  $0.3$  for the current exploitation patterns.

The 1976 year class of cod was about double average abundance. Subsequent year classes, as predicted from International Young Fish Surveys (IYFS) are about average. For haddock both the 1975 and 1976 year classes were very poor, but those of 1977 and 1978 appear to be about average, whilst the IYFS indicates above average abundance for the 1979 year class. The recent whiting year classes (1976-79) all appear to be of about average abundance.

The adult stock biomass of haddock reached, in 1978, its lowest level for many years but it is expected to improve substantially as the more abundant year classes attain maturity. For cod and whiting the adult stock biomasses give no cause for concern.

#### Estimation of TACs for 1980 and 1981

152. Estimates of the 1978 and 1979 year classes at age 1 were available from the International Young Fish Surveys. These values, back-calculated to age 0 where appropriate, were used in the catch predictions. For the 1980 year class average values, based on VPA estimates, were used. Values for fishing mortality in 1979 have been based on average values for the period 1974-76, adjusted according to the estimated changes in fishing effort in 1979 compared to 1974-76. These values together with the 1979 catch data have been used to estimate stock sizes at the beginning of 1980.

The fishing mortalities generated by the fisheries for reduction purposes, where cod, haddock and whiting appear as by-catches, are assumed to be unaffected by the recommended TACs.

#### North Sea cod

153. The agreed TAC for 1980 is 200 000 tonnes. To take this quantity will require a 14% reduction in fishing mortality, which is not inconsistent with management objectives.

TACs in 1981, and estimates of spawning stock biomass at 1 January 1982, are plotted graphically over a range of values for fishing mortality in 1981 expressed relative to the value in 1979 in Figure 10.

The cod stock is still exploited well above the  $F_{\max}$  level which is about 20% of the present level of fishing mortality. ACFM considers that a further step towards the  $F_{\max}$  level should be taken and recommends a 20% reduction of the 1979 level of fishing mortality. The TAC recommended for 1981 is therefore 190 000 tonnes. This would increase the spawning stock biomass substantially over the 1979 level.

#### North Sea haddock and whiting stocks in 1980

154. In the assessment of North Sea haddock and whiting stocks, the North Sea Roundfish Working Group made radical changes to their data base by incorporating into it estimates of the more likely age composition of industrial by-catches for earlier years when there was no sampling of these, and allowances for discarded catches in years when there was no sampling of discards. These changes were necessary to introduce more consistency into the data base; but largely because of these changes, and to some extent because of changes in estimated fishing effort, their estimate of the TACs for 1980 was very different from those they had estimated last year, and those which had been recommended by ACFM.

ACFM was concerned that it seemed illogical that changes in the data base, largely introduced by the better estimation of discarded catches, should subsequently re-appear in the prediction of future catches as increased landings. It accordingly looked very critically at the procedure adopted by the North Sea Roundfish Working Group in predicting future catches. It would appear that the results produced by the Working Group largely originated from two sources of a somewhat unsatisfactory procedure: a) the Working Group's estimates of the proportion of both species which would be discarded in the 1980 and 1981 catches were based only on the proportions of each age group discarded in 1979. This was an atypical year when discarding was below the average of earlier years. There is no reason to think that this is indicative of a permanent change in discarding practice. Accordingly, ACFM took more realistic estimates of proportions discarded at age based on the average values for the period 1977-79; b) the inclusion of discards and more realistic age compositions of industrial landings have meant much larger estimates of the abundance of all year classes at initial recruitment to the stock. As estimates of future recruitment from the IYFS are based on the correlation between the indices of numbers caught by these surveys and the absolute values produced by VPA, this must mean that the predicted values are much higher than they would have been if used to predict from the old data base. The new prediction equation used by the Working Group has several unsatisfactory features, and ACFM calculated a new one, which is based on a shorter series of the newer, more reliable estimates, which obviates these; c) the Working Group estimate of the fishing mortality rate on 1-group fish in 1979 appears to be atypically low - perhaps due to under-estimation of the number discarded at this age in that year. ACFM used the mean value for the years 1977-79, which seems more likely to be realistic, in their prediction of stock sizes and catches in 1980 and 1981.

It must also be stressed, as was done by the North Sea Roundfish Working Group, that this new data base although undoubtedly more consistent than the previous one is still, at this stage, subject to possible revision before the Working Group next meets to assess the 1982 TACs. In the light of the distinct possibility that such a revision may result in lower estimates of stock sizes, ACFM considers a cautious attitude should be adopted in any upward revision of the 1980 TAC for the North Sea haddock and whiting stocks.

However, on any basis such a revision is undoubtedly required because of higher estimates of recent year classes which had to be estimated as average when the 1980 TACs were originally assessed in 1979. ACFM would, accordingly, recommend that the 1980 TAC for the North Sea haddock should be revised to 90 000 tonnes and for North Sea whiting to 150 000 tonnes.

#### North Sea haddock in 1981

155. In the estimation of the 1979 fishing mortality, the revised effort data suggest that the 1974-76 level of fishing mortality had been reduced by about 15% in 1979.

The strengths of the 1978 and 1979 year classes at age 1 were estimated, as described above, at 1.3 and 2.5 million fish respectively.

Of the total haddock caught in 1979 the percentages, by number and weight respectively, discarded at sea were 35% and 29%, and those taken as by-catches in industrial fisheries were 40% and 5%.

The ACFM advises that a further step towards  $F_{max}$  be taken in 1981. The spawning stock biomass appears to be at about the level of the early 1970s. The reservations related to the ongoing process of revising the data base suggest that the advice should be cautious and ACFM recommends a TAC of 120 000 tonnes for 1981, based on a 10% reduction of the fishing mortality rate from 1980 to 1981.

Curves of yields in 1981 and spawning stock biomasses in 1982 at various levels of  $F$  in 1981 as a proportion of that in 1979 are given in Figure 11.

#### North Sea whiting in 1981

156. The strength of the 1978 and 1979 year classes were estimated from the IYFS to be 1.9 and 2.4 million fish at age 1.

The fishing mortalities for 1979 were, on the basis of the available effort data, assumed to be at the 1974-76 level. The split of the fishing mortality into its components, i.e. human consumption fishery, discards and fishery for industrial purposes, was as for haddock done on the basis of the 1977-79 average split.

The proportions in 1979 by number and weight respectively were: discards 47% and 46%, and industrial by-catch 36% and 20%.

The fishing mortality level is still well above the  $F_{max}$  point and ACFM recommends that this should be reduced. A 10% reduction in 1981 compared to the 1980 situation would seem appropriate. ACFM recommends that the TAC applicable for 1981 be set at 150 000 tonnes.

A figure of yields in 1981 and spawning stock biomasses in 1982 at various levels of  $F$  in 1981 relative to that of 1979 is given in Figure 12.

#### E.3.2 Sub-area VI

157. Recent catches (see Tables 51-56) and recommended TACs in thousand tonnes:



Year	1976		1977		1978		1979	
Species	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch*
Cod	14	19	19	13	12.2	14.3	10.4	16.6
Haddock	23	62	18	22	12	21.7	11.0	17.1
Whiting	13	25	22	17	17	14.7	12.0	16.4

Year	1980		1981
Species	Rec. TAC	Rev.TAC Jul.80	Rec. TAC
Cod	12.1	-	10
Haddock	11.5	15.5	18
Whiting	10.5	13.0	14

\* Preliminary

#### State of exploitation

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

There appears to have been little change in fishing mortality rates in recent years, and as catches in 1979 exceeded the TACs by substantial amounts the fisheries are effectively unregulated. For cod current fishing mortality rates ( $F = 0.76$ ) are greatly in excess of the  $F_{max}$  value of 0.3, but for haddock and for whiting the current yield per recruit curves are asymptotic.

#### Catch predictions for 1980 and 1981

159. In the VPA, fishing mortality rates in 1979 were taken to be at the same level as in the period 1974-76. For 1980 it was thought unlikely that the recommended TACs would be adhered to, and it was therefore assumed that fishing mortality rates would be unchanged.

No direct data on pre-recruit year class strengths are available, but estimates of the abundance of recruiting year classes of haddock and whiting have been obtained from a correlation with North Sea year class strengths. For cod the recruiting year classes have been assumed to be of average abundance.

#### Division VIa cod

160. If fishing mortality is unchanged in 1980 the expected landings will be 13 600 tonnes. Assuming unchanged fishing mortality in 1980, estimates of TACs for 1981 and of spawning stock biomass at 1 January 1982 have been plotted graphically for a range of  $F_{81}/F_{79}$  ratios (Figure 13).

If there is no change in fishing mortality there will be a declining trend in spawning stock biomass and at 1 January 1982 this would be reduced to about 50% of the 1979 level. The exploitation level is well above the  $F_{max}$  point and ACFM therefore advises a 20% reduction in the fishing mortality rate from the 1979 level. This will bring the spawning stock size to the long-term average, in 1982. Making allowance for catches of cod taken in Division VIb (mean catches 1977-79 = 500 tonnes), ACFM recommends a TAC of 10 000 tonnes for 1981.

The curves of yield in 1981 and spawning stock biomass in 1982 at various levels of  $F$  in 1981 are given in Figure 13.

#### Division VIa haddock

161. The TAC for 1980 applies to the entire Sub-area VI and was revised to 15 500 tonnes. The landings from Division VIb are expected to be around 2 500 tonnes.

The spawning stock biomass appears to be at a steady level. The assessment of the stock in Division VIa, assuming a 10% reduction of the 1980 fishing mortalities as a further step towards  $F_{0.1}$  would yield 15 500 tonnes. Making allowance of 2 500 tonnes for haddock landed from Division VIb, ACFM recommends a TAC of 18 000 tonnes for the whole of Sub-area VI in 1981.

The curves of yield in 1981 and spawning stock biomass in 1982 at various levels of  $F$  in 1981 are given in Figure 14.

#### Sub-area VI whiting

162. The TAC for 1980 was revised to 13 000 tonnes. The estimated fishing mortality for 1981 was reduced by 10% which gives a forecast landing of 14 000 tonnes. The level of fishing mortality is well above  $F_{0.1}$ . No trends are apparent in the spawning stock biomass. The ACFM therefore recommends that the TAC for 1981 be 14 000 tonnes which would represent a reduction of about 27% of the  $F$  in 1979.

The curves of yield in 1981 and spawning stock biomass in 1982 at various levels of  $F$  in 1981 are given in Figure 15.

#### Sub-area VII (excluding Division VIIa)

163. Data were available to enable the Working Group to do, for the first time, a VPA for cod in Division VIIId. However, the results of this assessment are difficult to interpret because the interrelationships with cod in adjacent Divisions are not sufficiently well understood. Thus, for cod, haddock and whiting in Sub-area VII (excluding Division VIIa), the only recommendation can be for precautionary TACs based on catches recorded in previous years (Tables 57-62). These would be:

#### Sub-area VII (excluding Division VIIa):

Cod	=	9 000 tonnes
Haddock	=	9 000 tonnes
Whiting	=	18 000 tonnes

#### E.4 Flatfish Stocks in the North Sea (Sub-area IV) and the Channel (Divisions VIIId and VIIe)

164. The North Sea Flatfish Working Group met in Copenhagen from 17 to 22 March 1980, with the following terms of reference:

"to assess TACs for sole and plaice in the North Sea and Channel for 1981".

In addition, and after consultation with the Chairman of ACFM, a second term of reference was added:

"evaluate any new data available on mesh selection in beam trawls for these species, and advise accordingly".

#### E.4.1 North Sea sole

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

1977			1978			1979			1980		1981
Rec. TAC	NEAFC TAC	Actual catch	Rec. TAC	EEC TAC	Actual catch	Rec. TAC	EEC TAC	Actual catch	Rec. TAC	EEC TAC	Rec. TAC
6.7	12.5	18.2*	8	10	20.3*	13	15	22.5**	14	15	?

\* Including estimates of non-reported landings

\*\* Preliminary and including estimated non-reported landings.

166. No major changes occurred in the fleets fishing for North Sea sole in 1979. The Group included the unreported landings in the assessment. The 1979 TAC of 15 000 tonnes was exceeded by some 7 500 tonnes (Table 63).

167. Due to the cold winter of 1979 the year classes 1977 and 1978 were reduced by an unusually heavy natural mortality to a strength as 1-group recruits of 39 and 66 millions, respectively. Average recruitment for the period 1957-76 was estimated to be about 102 million.

168. In 1980 the 1979 year class will recruit to the exploited stock. This year class appeared to be very abundant, both on the continental and English coasts as 0-group. A subsequent survey carried out in April 1980 again indicated that this may be a strong year class. But no significant correlation has yet been demonstrated between indices from these surveys and estimates of year class strength from VPA. Therefore no evaluation of the strength of this year class could be made when the Working Group met.

The strength of the 1979 year class may be a decisive factor in setting a TAC for 1981, because this TAC, and the residual spawning stock biomass in 1982, could be almost doubled if this year class is as strong as the preliminary indications suggest. The strength of this year class can only be quantified from the results of the September 1980 survey.

169. ACFM would therefore recommend that a decision on the TAC for North Sea sole in 1981 be deferred until it meets in October 1980.

E.4.2 North Sea plaice

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

1977			1978			1979			1980	1981
Rec. TAC	NEAFC TAC	Actual catch	Rec. TAC	EEC/Norway TAC	Actual catch	Rec. TAC	EEC/Norway TAC	Actual catch	Rec. TAC	Rec. TAC
71	99.9	118*	115	115	112*	120	120	143**	112	105

\* Including estimates of non-reported landings

\*\* Preliminary and including estimated non-reported landings

The 1979 total catch is the highest so far recorded. It exceeded the TAC by 19% (Table 64).

171. For the 1968-76 year classes, the relation between the VPA stock number at age 1 for males and females combined, and the 1-group pre-recruit estimates in the "Tridens" surveys was calculated. The estimates for the 1977 and 1978 year classes from these surveys indicate average recruitment.

Fishing mortality for 1980 was assumed to be the same as in 1979. On this basis the catch in 1980 is now expected to be 137 000 tonnes. This is higher than the figure estimated last year for retention of the 1978 fishing mortality rate in 1980.

If  $F_{81} = F_{80} = F_{79}$  the expected catch is 127 000 tonnes. If  $F_{81} = 0.8 F_{79}$  the expected catch is 105 000 tonnes. Spawning stock will fall below the 1979 level for either option.

The yield curve is more or less flat-topped, and it is clear that a yield equivalent to the equilibrium yield at the present  $F$  could be obtained with only  $0.6 F_{79}$ , with a corresponding equilibrium stock biomass of 226 000 tonnes of female spawning stock. A TAC for 1981 based on  $F_{81} = 0.8 F_{79}$  would achieve the minimum biomass objective in the short term, and would be a suitable step towards the long-term objective.

172. In order to prevent a decline of the spawning stock biomass below the 1980 level in 1982, ACFM recommends a 20% reduction in  $F$  in 1981 to a value of about 0.3 for the combined sexes. This would correspond to a TAC of 105 000 tonnes in 1981.

The curves of yield in 1981 and spawning stock biomass in 1982 at various levels of  $F$  are given in Figure 16.

E.4.3 Sole in Division VIId

173. The assessment of sole in Division VIId is seriously hampered by the existence of unreported landings. The reported landings have increased continuously from 840 tonnes in 1975 to almost 1 600 tonnes in 1979 (Table 65).

An estimate of the level of total fishing effort relative to that in 1979 was evaluated for the period 1975-79. It appears from this index that the total effort in 1975 was very similar to that in 1979. The increase of catches may be ascribed to the good 1975 and 1976 year classes. The French 0-group survey indicates that the 1979 year class may be abundant. These fish will be recruited to the fishery in 1981, and to the spawning stock in 1982.

Due to unreported landings and the bias as a result in any analytical assessment, ACFM recommends a TAC of 1 200 tonnes, based on historic catches. This is close to the 1976-77 level.

#### E.4.4 Sole in Division VIIe

174. Catches have increased from 616 tonnes in 1976 to 1 088 tonnes in 1979 (Table 65). No information is available of unreported landings but they are thought to be appreciable and therefore hamper any analytical assessment.

Data on fishing effort were available for the period 1969-79 only from the United Kingdom. United Kingdom fishing effort in 1979 was about 35% higher than in the period 1972-76.

Last year a TAC of 780 tonnes was set for Division VIIe sole in 1980. On the basis of this year's assessment, fishing effort would decrease by 26% if this TAC is adhered to.

For the same reasons as for sole in Division VIId, any analytical assessment is of doubtful accuracy. ACFM would therefore recommend that the exploitation level in 1981 should not be allowed to increase appreciably. A TAC of 1 000 tonnes might be expected to achieve this, and ACFM recommends accordingly.

#### E.4.5 Plaice in Divisions VIId and VIIe

175. Landings increased from 3 260 tonnes in 1978 to 3 465 tonnes in 1979 (Table 66). The increase occurred in Division VIId, and in the landings of each nation from that area, except the United Kingdom.

The non-reported landings are considered to be at levels which prevent analytical assessment on which a TAC can be based. Moreover, the available basic data are also unsatisfactory, due to the poor sampling for age, and to the unquantified problem of migration between the English Channel and the North Sea.

There are some indications that a local stock component may exist in Division VIIe. ACFM accordingly recommends that at its next meeting the Flatfish Working Group should investigate the feasibility of including Division VIId (and possibly also Division VIIe) plaice into the North Sea assessment.

Meanwhile, for 1981, ACFM recommends a TAC of 800 tonnes for Division VIIe plaice and one of 2 200 tonnes for Division VIId plaice on the basis of recent catch statistics.

#### Mesh selection of beam trawls

176. At present 92% of the sole landings from the North Sea are caught by beam trawl.

The 1974 mesh assessment, using the method of Gulland (1961), was based on data obtained from Dutch beam trawlers in 1973. Since that time, the structure of the beam trawl fleet, particularly in the Netherlands, has changed

drastically in that the size and horse power of the vessels have increased, and the fishing gear has changed.

As the selectivity of the beam trawl for flatfish is likely to be a function of the trawling speed (horse power), the number of chains attached to the groundrope, the mesh size, catch composition (fish, benthic organisms, etc.), fishing ground, and season, a repetition of selectivity experiments for plaice and sole under the present conditions is urgently required.

Selectivity experiments are planned for 1980 by Belgium, the Netherlands, and the Federal Republic of Germany. This experimental fishing will take place in various areas, on "dirty" and "clean" grounds, at different times of the year, and under other variable conditions.

The results of these experiments will be considered by the Working Group at its 1981 meeting.

#### E.5 Irish Sea and Bristol Channel Stocks

177. The Irish Sea and Bristol Channel Working Group met from 17-25 April 1980, 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.

The continuing shortage of information on fishing effort, particularly from Ireland, hindered the Working Group in making the assessments requested of it. Biological data are still inadequate in many respects, particularly for the gadoid stocks in the Celtic Sea, and the Working Group was unable to meet their terms of reference in this regard. On the other hand, the availability of catch data for the first time from the Isle of Man is welcome and they have been incorporated into the assessments. In view of the rapid increase in total demersal landings in the Isle of Man, efforts should be made to record all landings, rather than only those to processors, and to give the nationality of the vessels involved.

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

Stock or fishery	1977			1978			1979			1980		1981
	Rec. TAC	NEAFC TAC	Actual catch	Rec. TAC	EEC TAC	Actual catch	Rec. TAC	EEC TAC	Actual catch**	Rec. TAC	EEC TAC	Rec. TAC
Cod VIIa	-	-	8.05	8.60	8.60	6.27	7.3	7.3	8.37	5.0	5.0	5.0
Whiting VIIa	-	-	10.20	-	-	10.40	10.0	10.0	9.89	10.0	10.0	8.0
Plaice VIIa	4.00	4.15	2.90	4.00	4.00	3.23	2.5	2.5	3.39	2.5	2.5	2.0
Plaice VIIf	0.40	0.64	0.33	0.40	0.39	0.39	0.4	0.4	0.39	-	-	-
Plaice VIIf+g	-	-	0.76	-	-	0.92	-	-	0.86	0.7	0.7	0.6
Sole VIIa	1.40	1.67	1.15	1.40	1.39	1.10	1.4	1.4	1.63	1.3	1.3	1.5
Sole VIIf	0.40	0.70	0.37	0.60*	0.59	0.34	0.4	0.4	0.42	-	-	-
Sole VIIf+g	-	-	0.96	-	-	0.78	-	-	0.95	1.0	1.0	1.0

\* Reduced to 350 tonnes.

\*\* Preliminary.

E.5.1 Irish Sea cod

179. In 1979, catches exceeded the TAC of 7 300 tonnes, having increased to 8 371 tonnes from the 1978 level of 6 271 tonnes (Table 67). The catch rate in the French cod fishery rose by 30% and by 7% in the English/Welsh fleet. Fishing effort by Northern Ireland vessels, which accounted for 23% of the total catch, fell by 29%, but in view of the increase in their catch it seems unlikely that this decline represents a decrease in the fishing mortality generated by that fishery.

The average level of fishing mortality on the Irish Sea cod stock increased from 1978 to 1979, which is also consistent with the trend in total demersal fishing effort. The catch of juvenile cod per unit of fishing effort indicates that this increase in mortality has been accompanied by a shift in the exploitation pattern towards 1 year old and 2 year old fish.

180. In its 1979 report the ACFM pointed out that greater benefits could be obtained by improving the exploitation pattern than by making an overall reduction in fishing mortality, and recommended that an increase in the minimum landing size to 45 cm should be implemented as soon as possible. In the light of the increased mortality on juvenile cod this increase in minimum landing size is essential. Since the effective mesh size in use, in at least part of this fishery, is almost certainly smaller than the regulation 70 mm, the latter should be fully enforced in order to give full effect to the proposed minimum landing size and to minimise discards. It should also be pointed out, however, that juvenile cod tend to be concentrated in discrete areas. So an increased minimum landing size should not give rise to severe discarding problems.

As a result of the worsening of the exploitation pattern in 1979, the yield per recruit curve now indicates that the  $F_{max}$  conditional on this exploitation pattern is at a lower level than that indicated in last year's report, and corresponds to 40% of the present fishing mortality rate.

181. In forecasting landings, it has been assumed that fishing mortality in 1980 will be the same as in 1979, in the continued absence of regulation by international agreement. The catch in 1980 will thus be 7 400 tonnes, leaving a total stock biomass of 15 000 tonnes, and a spawning stock biomass of 7 000 tonnes at the beginning of 1981. Forecasts of catches and stock sizes for a range of 1981 fishing mortalities are given in Figure 17.

182. The present level of fishing mortality is high (0.8) in relation to that corresponding to the maximum yield per recruit (.32), and the stock biomass is still low. No effective reduction in fishing mortality would seem to have been achieved. In order to initiate a rebuilding of the stock the ACFM recommends a TAC in 1981 of 5 000 tonnes. If recruitment in 1980 and 1981 is average, this TAC will leave a spawning stock biomass of 10 000 tonnes, and a total stock biomass of 19 000 tonnes at the beginning of 1982.

At least 50% of these forecast catches consist of 1 year old and 2 year old fish, for which average strength has been assumed. Figure 17 shows the 95% confidence limits for the 1981 catch resulting from two high or two low recruitments in 1980 and 1981. Evidence from young gadoid surveys suggest that the 1979 year class is a strong one.

E.5.2 Irish Sea whiting

183. The 1979 catch (9 900 tonnes, see Table 68) was in agreement with the TAC of 10 000 tonnes (which had been recommended as a

precautionary TAC, the average of recent annual catches, in the absence of sufficient data to calculate a TAC for 1979). The assessment this year has been based on the assumption that fishing effort remained constant from 1978 to 1979.

There have been no great fluctuations in total stock biomass, although recent levels have been lower than those of the 1972-76 period. However, the yield per recruit curve, calculated on the basis of the present exploitation pattern, shows that  $F_{max}$  is about 40% of the present fishing mortality rate.

Assuming that the fishery will continue to be without regulation by international agreement, and that fishing mortality in 1980 will remain at the 1979 level, a catch of approximately 10 000 tonnes will be taken in 1980. This will leave a total stock biomass of 13 000 tonnes at the beginning of 1981. Forecasts of catches and stock sizes for a range of 1981 fishing mortalities are given in Figure 18.

184. The current levels of fishing mortality are high (1.07) in relation to  $F_{max}$  (0.4) and the ACFM recommends a TAC in 1981 of 8 000 tonnes. If recruitment in 1980 and 1981 is average, this TAC will leave a spawning stock biomass of 15 000 tonnes and a total stock of 18 000 tonnes at the beginning of 1982.

Although the available information on whiting discards in the Nephrops fishery was not adequate to incorporate into the assessment, there is reason to believe that significant quantities of whiting are discarded in the whitefish fishery as a result of meshes smaller than 70 mm being used. Any continuing use of mesh sizes smaller than 70 mm will reduce the benefit to the stock of the catch limitations discussed above.

#### E.5.3 Irish Sea plaice

185. The 1979 catch (3 390 tonnes, see Table 69) exceeded the TAC of 2 500 tonnes. The level of exploitation on this stock increased during the years 1971-75, compared to 1964-70 when stock biomass was higher, but when catches were around the average for the whole period. As noted in earlier ACFM reports, the stock biomass has been declining since the late 1960s; this trend appears to have halted in 1977.

The yield per recruit curve calculated from the present exploitation pattern shows that  $F_{max}$  is 35% of the present fishing mortality rate.

Assuming that the fishery in 1980 will continue to be essentially unregulated by international agreement, and that exploitation in that year will be at the 1979 level, the 1980 catch is calculated to be 3 000 tonnes. The total stock biomass remaining at the beginning of 1981 will be 6 000 tonnes and the spawning stock biomass will be 4 600 tonnes. The 1980 TAC recommended by the ACFM is 2 500 tonnes. For 1981, catches for a range of fishing mortalities are shown in Figure 19.

186. The present fishing mortality rate (0.8) is high relative to  $F_{max}$ , and stock biomass is still at a low level. There has been no effective reduction in the exploitation since ACFM first recommended management action on this stock. ACFM therefore recommends that the 1981 TAC should be set at an  $F$  level of 0.5 with the objective of reducing it as quickly as is practicable to 0.3 which is the value of  $F_{max}$  for the current exploitation pattern. ACFM accordingly recommends a TAC of 2 000 tonnes in 1981. Spawning stock biomass should then be 5 000 tonnes in 1982, and total stock biomass 7 000 tonnes.



E.5.4 Celtic Sea plaice (Divisions VIIIf and VIIg)

187. The 1979 catch (863 tonnes) was around the level of the annual catch in the last six years (Table 70). The catch in Division VIIIf (385 tonnes) equalled the TAC.

The stock biomass has been declining slowly and now stands at about 60% of the 1970 level. Although the 1975 and 1976 year classes appear to be strong, the projected stock biomass will decline slightly in 1980 and 1981 if present mortality rates are maintained. The yield per recruit curve, conditional on the present exploitation pattern, indicates that maximum yield per recruit would be obtained at a fishing mortality rate of 40% of the present F.

Assuming that fishing mortality remains at its 1979 value in 1980 a catch of 800 tonnes should be taken. This is 100 tonnes higher than the recommended TAC. A 1980 catch of 800 tonnes will leave a total stock biomass of 1 900 tonnes and a spawning stock of 1 200 tonnes at the beginning of 1981. For 1981, catches corresponding to a range of fishing mortalities are shown in Figure 20.

188. The present level of fishing mortality (1.0) is high in relation to  $F_{max}$  (0.4), and projected spawning and total stock biomasses will decline in 1980 and 1981. The ACFM therefore recommends a 1981 TAC of 600 tonnes, which is calculated to correspond to a fishing mortality rate of 0.8. Spawning stock biomass at the beginning of 1982 will be 1 200 tonnes, and the total stock biomass will be 1 900 tonnes.

E.5.5 Irish Sea sole

189. The 1979 catch (1 629 tonnes) was the highest since 1971 and 48% higher than in 1978 (Table 71). The 1979 TAC was 1 400 tonnes. Catch rates were higher in 1979 than in the previous year, and total effort was lower. Although the total stock biomass went down by 25% from 1970 to 1976, there is evidence from Belgian and United Kingdom catch per unit effort data that the abundance of sole in 1979 had returned to around the 1970 level. Recruitment has fluctuated from year to year but the general trend since 1970 has been upwards.

As with other Irish Sea stocks, it is assumed that the fishery in 1980 will continue to be unregulated by international agreement and that the 1979 level of exploitation will continue. This will yield a catch in 1980 of 1 600 tonnes, with a total stock biomass of 7 400 tonnes and a spawning stock of 6 600 tonnes at the beginning of 1981. This catch compares with the recommended TAC of 1 300 tonnes. For 1981, catches have been calculated for a range of values of fishing mortality as shown in Figure 21.

190. The stock is at present fully exploited, in terms of the yield per recruit curve, conditional upon the current exploitation pattern, and fishing mortality should not be allowed to rise further. The ACFM therefore recommends a TAC in 1981 of 1 500 tonnes. This will leave a spawning stock biomass of 6 000 tonnes at the beginning 1982, and a total stock biomass of just over 7 000 tonnes.

E.5.6 Celtic Sea sole (Divisions VIIIf and VIIg)

191. The 1979 catch of 954 tonnes was slightly higher than in 1978 (780 tonnes, see Table 72). The catch in Division VIIIf (424 tonnes) equalled the TAC. Total fishing effort went down slightly. This

stock has been declining steadily, not because of overexploitation but as a result of the gradual disappearance of the strong year classes of 1959, 1960 and 1963. This decline slowed down markedly in 1977. The 1976 year class, which recruited in 1978, is one of the strongest on record.

On the assumption that the level of fishing mortality will remain unchanged from 1979 through 1980, the 1980 catch will be 1 000 tonnes, which is the same as the recommended TAC. The total stock biomass at the beginning of 1981 will have increased to 7 700 tonnes and the spawning stock biomass will have increased to 7 100 tonnes. Catches for 1981 have been calculated for a range of values of fishing mortality and are shown in Figure 22.

192. The stock is optimally exploited in terms of the yield per recruit curve. In order to maintain this situation, the ACFM recommends a 1981 TAC of 1 000 tonnes.

#### E.5.7 Celtic Sea cod and whiting (Divisions VIIIf and VIIg)

193. No biological information is available on cod in the Celtic Sea, of which almost 3 500 tonnes were taken in 1979 (Table 73).

Whiting catches have been about 6 000 tonnes annually (Table 74). Although the data are insufficient to calculate stock size and hence a TAC, the exploitation pattern is similar to that of Irish Sea whiting. The Celtic Sea stock may thus benefit from a reduction in fishing mortality.

TACs for these stocks are incorporated in the recommendations given in paragraph 163.

#### E.5.8 Haddock in the Irish Sea and the Celtic Sea (Table 75)

194. No biological information on this species was available to allow the ACFM to make any recommendations, and it is unlikely that such information will appear in the future. Again recommendations are incorporated in paragraph 163.

#### E.5.9 Total demersal fish production in the Irish Sea and Bristol Channel

195. Figure 23 shows the annual total demersal fishing effort and total demersal catch per unit effort since 1954. Although effort was about the same in 1979 as in 1978, the general trend throughout the period has been upwards. Catch per unit effort went down in 1979, as did the total demersal catch. In Figure 24, total annual yield from Divisions VIIa and VIIIf is plotted against total demersal fishing effort.

196. These figures demonstrate that the demersal fishing effort is currently at too high a level; the single species assessments discussed in the foregoing sections, with the exception of sole, came to the same conclusion. In the absence of any system of directly controlling fishing effort, the only way to reduce it would be to introduce a second-tier TAC. The ACFM therefore repeats its advice of last year, that the limiting of total demersal fishing effort in the Irish Sea and Bristol Channel, whether by a second-tier quota, or by some other method, ought to be given serious consideration. Total fishing effort by demersal gears should certainly not be allowed to rise any further.

A second-tier total demersal TAC, which would include the single species TACs, would provide a means of preventing diversion of effort onto species not covered by an individual TAC. In view of the generally heterogeneous nature of the Irish Sea and Bristol Channel fisheries such a dual system of TACs would

be better than a series of single species TACs alone; particularly in the situation where several of these cannot be analytically assessed. It would not only take more account of interaction between species and between fisheries but would also focus attention on the broad overall pattern and level of fishing required to exploit all of the available resources. Such an overview tends to get lost in single species assessments.

## F. STOCKS IN REGIONS 2 AND 3

### F.1 Eastern and Western Mackerel Stocks

197. The Mackerel Working Group met in Copenhagen, 28 April - 3 May 1980 to 1) assess the mackerel stocks in Sub-areas III, IV, VI, VII and VIII, 2) further consider the area and time period during which the fishery in Sub-area VI should be closed to protect the North Sea stock, and 3) to re-examine the period and area of closure in Sub-area VII to reduce the fishing mortality on juvenile fish.

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

198. Recent catches of mackerel and recommended TACs, in thousand tonnes:

1977		1978		1979		1980	1981
Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch*	Rec. TAC	Rec. TAC
220	261	145 <sup>1)</sup>	153	145 <sup>1)</sup>	158	0(50) <sup>2)</sup>	?

\* Preliminary.

1) 100 000 tonnes of this to be taken north of 60°N and west of 2°E.

2) A nil TAC preferred; not more than 50 000 tonnes if this unacceptable.

The landings in 1979 were 158 500 tonnes which is about 9% higher than the recommended TAC (Table 76). It should be noted, however, that only about 20% of the total catch was taken from the area north of 60°N and west of 2°E.

199. The Working Group has, in previous years, based their assessment mainly on analysis of tag returns from the Norwegian tagging experiments. The tagging data have been used both to estimate the proportions of the catches in Sub-area IV coming from the North Sea stock and Western stock respectively, and to estimate mortalities and stock size for the North Sea stock. Analysis of tag data, particularly by comparing changes in tag densities from one year to the next in Sub-area IV, and from Sub-area IV during the summer to Division VIa during the next winter, show that the results are not easily interpreted. Some of the difficulties can be explained by postulating a component of mackerel which has not been tagged, either in the Western area or in the North Sea. Until problems of this type have been solved, the tagging results cannot be utilised for assessment of the North Sea mackerel stock. Therefore, no analytical

assessment can be done for the stock at this juncture. It seems very unlikely, however, that the stock situation is any better than estimated last year. Indices from egg surveys give evidence of a declining spawning stock in the North Sea. Age compositions of catches from the commercial fishery in 1979 show that the 1977 year class is probably very weak. There is thus no sign of improved recruitment, and the present stock situation is likely to continue or to deteriorate.

200. The recommendation for 1981 will therefore probably not be very different from that given for 1980. ACFM will, however, give its final advice for 1981 at the October meeting, when more results from investigations carried out in 1980 will be available.

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

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

1977		1978		1979		1980	1981
Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch*	Rec. TAC	Rec. TAC
250	326	450	504	435	606	330	(293-353) <sup>1)</sup>

\* Preliminary

1) Subject to revision at a later stage

The provisional catch for 1979 is approximately 606 000 tonnes, which is 102 000 tonnes more than for the previous year, and 171 000 tonnes more than the recommended TAC (Table 77). About 54 000 tonnes were unofficially reported but were not allocated on a national basis.

202. No changes were made in the assessment technique. Input F values for the VPA for 1979 were selected to obtain a stock size of 3 year old and older fish in 1977 as estimated by the egg survey done in that year. This gave an F of 0.25 on the fully recruited age groups in 1979. There are indications that exploitation has shifted towards younger age groups, and the VPA provided some support for this change in 1978. The F on 0-group was substantially increased in the input exploitation pattern for 1979.

The new analysis confirms that the 1977 year class is very weak. The 1976 year class is very strong. The 1978 year class appears to be strong, and the first indications of the 1979 year class suggest that that year class is also strong.

The VPA indicates a considerable reduction in stock size between 1978 and 1980, due to the weak 1977 year class and the overshooting of the recommended TAC in 1979. In the stock prognosis it was assumed that the 1979 year class was of average strength for the 1971-78 year classes. The recruitment of the 1980 year class in 1981 has been taken from the lower 16% percentile of the frequency distribution of recruitment. The catch in 1980 was assumed to be 550 000 tonnes, which was the best estimate which could be made of

the likely catch in the absence of effective international enforcement. This would result in an F of 0.22 in 1980. Thus the Fs in 1979 and 1980 are likely to be far in excess of the value of 0.15 which ACFM considers advisable. There is no reason to change the advice given previously that this stock should be fished at an F of 0.15. Although the stock is not in immediate danger of collapse, the trend is exactly that which has led to collapse in other pelagic fisheries, and the present level of catches cannot be sustained. An F of 0.15 would give a catch of 353 000 tonnes in 1981 from this stock.

203. The Western area TAC will depend on to what extent there will be a fishery for mackerel in the North Sea. If there is no fishery for mackerel in the North Sea, the Western area TAC would be equal to the Western stock TAC, i.e. 353 000 tonnes. If, on the other hand, 17% of the Western stock TAC is taken in Sub-area IV, which corresponds to the mean proportion of the stock TAC recommended for that area in previous years, the Western area TAC would be 293 000 tonnes.

Final advice cannot be given before the October meeting of ACFM, when the advice for the North Sea stock will be given. Furthermore, at that meeting results will be available of the 1980 egg survey in the Western area, which will allow ACFM to reconsider the estimated stock for 1980 on which this assessment of the stock TAC is based.

204. An analysis was presented which confirmed what was said in last year's report (Coop.Res.Rep., No.93, para. 212) about the potential gains by taking a higher proportion of the TAC in Division VIa.

In last year's report it was also said that consideration should be given to restricting the winter fishery in a defined area off southwest England, to the period mid-December to mid-February in order to decrease the catches of small mackerel. Data provided by United Kingdom and Netherlands show that such a regulation would to some extent have the desired effect although the absolute quantity of small fish (< 30 cm) caught would still be high in this fishery.

205. ACFM accordingly recommends that fishing for mackerel by vessels using pelagic trawl and/or purse seine gear should be permitted in that part of Division VIIe north of 49°30'N and west of 5°W, and in that part of Division VIIIf south of 50°30'N, only during the period mid-December to mid-February, commencing in 1980.

At the moment no data are available which allow any assessment of the selectivity of trawls or purse seines for mackerel. Until such data are available no exemption should be made for gears with mesh sizes above a certain level. If selectivity experiments are done on mackerel such exemptions might be made. ACFM would accordingly stress the importance of obtaining good estimates of selection parameters for mackerel.

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

206. The Working Group on Assessment of Hake Stocks met at ICES headquarters in Copenhagen from 12 to 17 May 1980 "to assess TACs for hake and to estimate the effects of the EEC Commission's proposals regarding mesh regulations for both Recommendation 1 fisheries and Nephrops fisheries in NEAFC Region 3".

### Recent catches

207. Recent nominal catches, as estimated by the Working Group, and recommended and adopted total TACs for hake in NEAFC Regions 2 and 3, in thousand tonnes, are as follows:

Year	Catches	Total TACs	
		Recommended	Adopted
1977	67	-	-
1978	64	-	-
1979	70*	63	63
1980	-	40	50

\* Preliminary

The catches of 64 000 tonnes to 70 000 tonnes during 1977, 1978 and 1979 are well below the catches in the period 1972-76, which ranged from 92 000 tonnes to 115 000 tonnes. The 1979 catch was 10% higher than the adopted total TACs.

### Data base

208. The lack of adequate data for catch, length and age composition, and the uncertainty in biological parameter estimates have greatly hindered the assessment of the hake stocks. Landings data reported to ICES are erroneous in many cases; information on discards or illegal landings, and on by-catches in the Nephrops fisheries, which take large amounts of small hake, is very limited.

Two stocks, the "Northern" and the "Southern" stocks, were identified as in last year's report.

Before the hake stocks became so heavily depleted defining directed hake fisheries could have been done quite easily. In the current depleted state of the hake stocks the Working Group has not yet been able to do this. The question will however be re-examined at its next meeting, along lines suggested by ACFM.

#### F.2.1 Northern stock

209. The estimated catches, TACs recommended and adopted, and mesh sizes recommended and in use after 1975, in the Northern stock are as follows:

Year	Estimated catches (10 <sup>3</sup> t)	TAC (in 10 <sup>3</sup> t)		Mesh size (mm)			
		Recommended	Adopted	Recommended		In use	
				IVa+VIa, VII	VIIIa,b	IVa+VIa,VII	VIIIa,b
1975	74.5			70	60	40-80	40-50
1976	67.3			70	60	40-80	40-50
1977	51.2			70	60	60-80	40-60
1978	49.9			70	60	70-80	40-60
1979	51.4	43	43	70	60	70-80	40-60
1980	-	30	40	80	80	70-80	40-60
1981	-	30	-	80	80	-	-

In 1979, the catch of 51 400 tonnes exceeded the TAC of 43 000 tonnes by about 20%, and was at about the same level as the 1977 and 1978 catches (Tables 78 and 79).

210. For a value of natural mortality of 0.20 the virgin biomass is at a maximum at ages between 7 and 9. Ages of first capture for mesh sizes of 40, 60 and 80 mm are approximately 1, 2 and 3 years old respectively. Yield per recruit analyses for males and females, and for mesh sizes between 40 and 80 mm, indicate  $F_{max}$  values ranging from .14 to .28.

Taken together, these results suggest a very high fishing mortality on young hake (less than 25 cm) due, mainly, to the very small mesh sizes in use. Also, it appears that current levels of  $F$  are too high to achieve maximum yield per recruit. Average immediate losses for a change to a minimum mesh size of 80 mm are about 11% to 15% of the 1979 catch, depending on the values of the selection factor used. Losses ranging from 10% to 70% can occur in those components of the fishery still using mesh sizes of 40 to 60 mm.

Long-term gains from increasing mesh sizes from 40 to 80 mm were not calculated, but as an illustration the yield per recruit analysis at an  $F$  of 0.4 would give a gain of 70% or more.

211. As concluded in previous reports, and supported by the results given above, the adoption of a minimum mesh size of 80 mm for this fishery is again recommended. A precautionary TAC for 1981 of 30 000 tonnes (i.e. the same as recommended by ACFM last year) should cause a reduction in fishing mortality. Limitation of the catch will also avoid possible increases in fishing effort, which might occur if the industry attempted to compensate with increased effort for losses due to changes in mesh sizes.

ACFM accordingly recommends a TAC of 30 000 tonnes in 1981 for hake in Sub-area VII and Divisions IVa, VIa and VIIa,b.

The Group identified five species (gurnard, whiting, blue whiting, Norway lobster and octopus) for which a mesh size increase to 80 mm might result in long-term losses. However, in 1978 ICES reported data indicating that these species amounted to 12% of the total demersal catch of 193 600 tonnes in Sub-area VIII, where mesh sizes of 40 to 60 mm are in use. (In Divisions IVa and VIa and in Sub-area VII, where mesh sizes of 70 to 80 mm are in use, the catch of these five species represented 31% of the total 1978 demersal catch of 753 000 tonnes.)

#### F.2.2 Southern stock

212. The estimated catches, TACs recommended and adopted, and mesh size recommended and in use after 1975 in the Southern stock, are as follows:

Year	Catch in 10 <sup>3</sup> tonnes	TAC (in 10 <sup>3</sup> tonnes)		Mesh size (mm)	
		Recommended	Adopted	Recommended	In use
1975	31.9			60	40
1976	26.1			60	40
1977	15.6			60	40
1978	14.2			60	40
1979	18.1	20	20	60	40
1980	-	10	10	80	40
1981	-	8.5	-	80	-

213. Total catches decreased from around 30 000 tonnes for the period 1972-75 to 15 000 tonnes in 1977-79 (Tables 80 and 81).

Numbers of young fish caught in 1978 appear to be well below the annual catches of young fish before 1978. Survey data for 1977-79 confirm the decline in recruitment shown by the length composition of commercial catches.

Curves of virgin biomass, and yield per recruit, for the Northern stock are also applicable to the Southern stock as growth parameters are the same, and the natural mortality coefficient is also the same.

In addition to the general conclusion that the mesh size in use is too small, and fishing effort is too high, the drastic decline in recruitment in the last three years gives cause for serious concern about the depletion of this stock.

Assuming an increase in mesh size to 80 mm, substantial immediate losses for trawlers, which caught 55% of the total 1979 hake catch, are indicated. Long-line and gill-net fisheries (45% of the 1979 catch) will not be affected. The resulting total immediate loss was estimated to be 16% of the 1979 catch.

214. The adoption of an 80 mm mesh size is urgently required in this fishery to reduce the very high fishing mortality on small hake and ACFM recommends accordingly. As small hake have a seasonally and geographically restricted distribution, closed areas and seasons for trawl fisheries would also reduce the fishing mortality on the young individuals.

215. ACFM recommends a precautionary TAC for hake in Divisions VIIIc and IXa for 1981 of 8 500 tonnes. If the mesh increase to 80 mm cannot be implemented in that year, ACFM would recommend that trawling should be banned on hake nursery grounds during the period when juveniles constitute a high proportion of the catch. The appropriate areas, and periods, will be notified to the relevant management bodies at the next meeting of ACFM, in October 1980.

#### G. NORTH ATLANTIC SALMON

216. At the request of the Canadian Government and the EEC Commission, the Working Group on North Atlantic Salmon met from 15-18 April 1980, 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-water fisheries and stocks. In addition, it was asked to describe the regulations for the control of commercial and sport fisheries for North Atlantic salmon.

##### Origin of Salmon at West Greenland

217. Results of previous analyses of tag recaptures, updated at this meeting, scale characteristics and biochemical characters showed that the relative proportions of North American and European salmon at West Greenland varied from year to year in the 1969-78 period between 34 and 51% of North American origin and 66 and 49% of European origin, the unweighted average for the 1969-78 period being 41% North American origin and 59% European origin. In 1979, further samples from research vessel catches indicated 47% North American and 53% European salmon while commercial samples indicated 50% North American and 50% European, suggesting that the proportions determined from research vessel material underestimate the North American component in the commercial catch. Nevertheless, in the absence of



data from the commercial fishery in all years, average values for 1969-78 from research material of 41% North American and 59% European salmon were used by the Working Group for assessing the effects on returns to North American and European stocks.

#### Biological Characteristics of West Greenland Stock

218. Results of recent analyses confirmed earlier results which showed that the exploited stock at West Greenland was composed almost entirely of 1 sea winter fish (over 90%), 75% of which were females, 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 and 1979. This trend was also evident in both Scottish and Newfoundland commercial catches. These recent analyses also indicated that salmon of European origin at West Greenland were on the average 3 cm longer and 0.5 to 0.6 kg heavier than salmon of North American origin in 1978 and 1979.

#### Effects of West Greenland Fishery on Home-Water Stocks and Catches

219. The Working Group reviewed the earlier assessment of the ICES/ICNAF Working Party in the light of the latest data and results of recent investigations, paying particular attention to the following three factors which could affect the estimates of losses to North American and European home-water stocks:

- a) the mortality generated by fishing at West Greenland but not recorded as catch (non-catch fishing mortality);
- b) the magnitude of the natural mortality rate of salmon during its sea phase;
- c) differences in the size (weight) and subsequent growth of salmon of North American and European origin in the West Greenland catch, had they not been caught but allowed to return to home waters.

#### Non-catch fishing mortality

220. Analyses of data and estimates were provided for the various forms of non-catch fishing mortality both at West Greenland and in home waters. In view of the uncertainty about the magnitude of some of the components of this source of mortality, the Working Group used upper and lower values of 0.1 and 0.3 respectively for non-catch mortality in its assessments.

#### Natural mortality rate in the sea

221. At the time of the earlier assessment, no reliable estimate of this parameter was available, so that lower and upper limits of 0.02 and 0.1 per month were used, within which the true value was believed to lie. The results of a new method of estimating natural mortality based on the hypothesis that the natural mortality rate of salmon in the sea varies inversely with weight at age was used by the Working Group. Data for the River Bush (N.Ireland) supported the inverse relation hypothesis, although the Working Group considered that further tests of the model are required. Estimates of natural mortality rates occurring between the sizes of salmon associated with West Greenland and home-water fisheries of Sandhill river (Labrador) ranged between 11% and 14% while those for Bush river data ranged between 2.3% and 8.6%. These values are lower than those used in the earlier assessment. Based on these values, the Working Group adopted for use in its assessments, survival rates between West Greenland and home-waters of 80-90% for North American salmon and 90-95% for European salmon.

Change in weight of salmon between West Greenland and home waters

222. In the previous assessments, a value of 50% was used for the increase in mean weight of salmon between West Greenland and home waters in both North America and Europe. Use of scale analysis made possible the separation of North American and European salmon during research sampling programmes at West Greenland and thus determination of separate mean weights. From these, weight increases between West Greenland and North American home waters for 1- and 2-sea winter salmon and for previous spawners were estimated at 58%, 20% and 52% respectively. Similarly, the weight increase of 1 sea winter European salmon between West Greenland and home waters was calculated as 29%.

Results of Assessments

223. The Working Group estimated the loss, in weight, of salmon to home-water stocks in North America and Europe respectively resulting from the fishery at West Greenland, using the above revised parameters of natural mortality rate and growth between West Greenland and home waters, and incorporating the estimates of non-catch fishing mortality at West Greenland. The results are given in the text table below.

Estimated losses to home-water stocks in North America and Europe resulting from a reported West Greenland catch of 1 191 tonnes

Catch at West Greenland	Continent of origin-proportion	Non-catch fishing mortality rate at West Greenland	Survival rate between West Greenland and Home Waters	Losses to Home Water Stocks (tonnes)
1 191	N. America 0.41	0.1	0.85	641
	Europe 0.59	0.1	0.90	985
			Total	1 626
1 191	N. America 0.41	0.1	0.90	678
	Europe 0.59	0.1	0.95	1 040
			Total	1 718
1 191	N. America 0.41	0.3	0.85	824
	Europe 0.59	0.3	0.90	1 267
			Total	2 091
1 191	N. America 0.41	0.3	0.90	872
	Europe 0.59	0.3	0.95	1 337
			Total	2 209

On the basis of these calculations, the Working Group concluded that for each tonne of European origin salmon in the reported catch at West Greenland, from 1.29 to 1.75 tonnes would be lost, on average, to European home-water stocks. Similarly, for each tonne of North American origin salmon in the

reported catch at West Greenland from 1.47 to 2.00 tonnes would be lost to North American stocks. Thus, the combined loss to home waters per tonne of reported catch at West Greenland is likely to be from 1.37 to 1.85 tonnes. These assessments of losses to home-water stocks refer only to the immediate, direct effect, and take no account of any possible longer-term effects on smolt production and year class strength resulting from a decrease in spawning stock size.

The Working Group was unable to arrive at a recommended optimum combination of mesh size and times of fishing season to minimise the effects of the West Greenland fishery on home-water stocks, but it did make a number of general observations.

The Working Group noted that the earlier assessment assumed that only a proportion of any additional salmon returning to home waters, due to a reduction in West Greenland catch, would be taken in the home-water fisheries, the remainder contributing to additional spawning escapement. It was noted that one of the main principles of managing salmon stocks is to limit catches to permit optimal spawning escapement. Should sufficient additional salmon return to home waters from West Greenland, due to a reduction in the West Greenland catch, the desired level of spawning escapement could be achieved with less restraint on home-water exploitation rates. The Working Group therefore concluded that the estimated changes in the quantity of salmon returning to home-water catches, rather than changes in home-water catches, is a more appropriate measure of the effect of Greenland catches.

#### Norwegian Sea Long-Line Fishery

224. The summary of the changes in the fishery and the statistics of the Norwegian Sea long-line fishery and the biological features and composition of the exploited stock is similar to that found in the Report of the Working Group on North Atlantic Salmon for 1979 and in the Report of the ICES Advisory Committee on Fishery Management, 1979 (Coop. Res.Rep., No.93) with only minor changes resulting from updating the 1979 data. However, the Working Group considered that in view of the earlier start of the fishing season, and the fact that non-catch fishing mortality is known to occur in the long-line fishery, the loss to home-water stocks per tonne of reported catch taken in the fishery under present conditions would not be less, and might be greater, than that estimated in earlier assessments.

#### Home-Water Fisheries

225. Catches of all the main salmon-producing countries, except Norway, increased in the early 1960s, and showed a marked decrease in 1978 and 1979. The Norwegian catch increased substantially in 1979 from a low level in 1978. The low catches in the Canadian, Irish, and British fisheries in 1978 and 1979 suggest a relatively low strength of the 1977 smolt age class. This is supported by the relatively small catch taken in the West Greenland fishery in 1978. The decrease in catches in the mid-1970s is also reflected in the catch per unit effort data for the Irish fishery, suggesting that it was mainly due to a decrease in stock abundance, although caution must be exercised in interpreting catch per unit effort data in a broad area.

#### Salmon Fishery Regulations

226. The Working Group's deliberations on this subject are as summarised in the ACFM Report of 1979 (Coop.Res.Rep., No.93).

## H. FISHING GEAR REGULATIONS

### H.1 Nephrops

227. The Nephrops Working Group met from 15-18 January 1980 to:

- a) evaluate the applicability of available models to the Nephrops fisheries;
- b) draw up plans for increasing research effort to provide reliable estimates of growth rates, natural mortality rates, fishing mortality rates, selection factors and survival rates of discards for this species in all areas;
- c) reconsider previous conclusions reached by ACFM in relation to the effects of mesh increases for Nephrops fisheries, both in relation to Nephrops itself and for white fish stocks exploited by vessels using mesh sizes currently permitted for Nephrops fishing.

228. In its consideration of objective a) the Nephrops Working Group evaluated the model of Jones (1974), which it had previously used for assessing the effects of mesh size changes, and that of Conan and Morizur (1979) which had been presented at the 1979 Statutory Meeting of ICES. Comparison of the outputs of these two models suggests that they give similar conclusions when compatible input parameter values are used in each of them, and that differences in the estimated effects of mesh increases in Sub-area VII do not therefore arise from the models but from the different estimates of input parameters.

229. The outputs, in terms of calculated long-term gains or losses, are very largely dependent on the value assumed for natural mortality (M). Other input parameters, such as selection factors, growth rates etc. have a relatively minor effect within the likely range of values of these parameters. If M is 0.2 overall long-term gains, in all cases examined, will result, while an M of 0.4 will result in no significant change. This analysis, therefore, merely confirms ACFM's previous advice on this topic.

230. Fairly good estimates of M are available for Nephrops stocks at Iceland of 0.2 and off the east coast of Scotland, again of 0.2. In view of the major differences in ecological conditions in these two areas which give similar estimates, it would seem rather unlikely that values for Sub-area VII would be more than twice as high. The method used by Conan and Morizur to derive their estimate of 0.6 for Sub-area VII is open to a number of criticisms and as a result Conan was asked to produce, as an appendix to the Working Group report, a detailed description of his derivation of this estimate. This has not been done.

231. The Nephrops Working Group, in relation to objective b) above, did suggest some research techniques which might be applied in getting further estimates of M and growth. It should be accepted, however, that precise values of M are very difficult to obtain and the research projects suggested by the Working Group, if carried out over the range of stocks where values are required, are likely to be a long-term project. ACFM considers it unlikely that new data, which would materially affect its present assessment, could be available in the short term. Consequently it reiterates its advice on introducing mesh size changes with as little delay as possible.

Although estimates of short-term losses have been calculated for some areas, it has been reported that when the minimum mesh size was increased from 70 mm to 80 mm in the Icelandic Nephrops fisheries, there was no evidence of short-term losses, and a highly viable fishery has operated for several years with the increased mesh size. Similarly, the associated regulations related to the unilateral increase by the United Kingdom in mesh sizes for its fisheries have resulted in some fishermen using mesh sizes of 80 mm while fishing for Nephrops, again with no apparent adverse effects on their catches.

232. In the light of all these considerations, ACFM repeats the advice given in its report of June 1978, which was essentially the same advice given by the Liaison Committee in 1977, that minimum mesh sizes for Nephrops fisheries should be increased to 70 mm in Sub-areas III, IV, VI and VII, and to 60 mm in Sub-area VIII. With these increased mesh sizes, minimum landing sizes of 25 mm carapace length should be introduced in Sub-areas III, IV, VI and VII, and 20 mm carapace length in Sub-area VIII.

As pointed out in previous reports, increases of minimum mesh sizes for Nephrops fisheries to these levels would also be of some help in reducing the very high catches of small whiting in Division VIIa, and of hake in Sub-areas VII and VIII, which are taken as a by-catch of Nephrops fisheries, or under the pretext of Nephrops fishing. Such regulation of Nephrops fisheries would help to reduce the very serious problems in the hake fisheries, discussed in paragraphs 210 to 214.

The new assessments of short-term and long-term effects calculated by the Working Group are given in Tables 82 and 83, although these do not differ in any significant way from those given in the ACFM report of June 1978.

## H.2 Other Species

233. In several reports of the Liaison Committee and of ACFM in recent years proposals have been made regarding the need for increases in minimum mesh sizes in Regions 1, 2 and 3. The current situation in the fisheries, and particularly the indications of heavy depletion of the stocks of cod and haddock in Sub-areas I and II; the very heavy discarding which takes place in Sub-area IV; and the present situation in the hake stocks, discussed above, merely underlines the pressing need for these changes in minimum mesh sizes to be implemented as quickly as possible.

Accordingly ACFM, as stated in the Introduction, reiterates below its previous advice on this topic. It should be stressed that estimates of short-term losses given in previous assessments are exaggerated because no account has been taken of discarding. Correspondingly long-term gains are underestimated. Moreover short-term losses are largely theoretical, as they assume that fleets will continue to fish, in the short term, the same grounds with the new mesh size as they did with the old one. This seems highly unlikely.

234. Recent advice of ACFM on this topic, which has not been implemented is:

- 1) An increase of the minimum mesh size in Sub-area IV and Division IIIa for Recommendation 1 fisheries to 90 mm for trawls and Danish seines irrespective of twine type.
- 2) An increase of the minimum mesh size for Recommendation 1 fisheries in Sub-areas VI and VII (excluding Division VIIa) to 80 mm for all trawls and Danish seines irrespective of twine type.

- 3) That in Sub-area VIII and Division IXa the minimum mesh size should be increased to 80 mm for Recommendation 1 fisheries irrespective of twine type (see paragraphs 211 and 214).
- 4) That in Sub-areas I and II the minimum mesh size for all towed gears, in Recommendation 1 fisheries, should be increased to 155 mm.
- 5) That for whiting the minimum landing size should be increased to 27 cm.

ACFM would again recommend that all of these changes be implemented.

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**Table 1.** Nominal catch (in 000's tonnes) by Sub-areas and main species in NEAFC Region 1, 1970-1978.

	1970	1971	1972	1973	1974	1975	1976	1977	1978
Total Nominal Catch in Region 1*)	4 357	4 255	4 153	4 313	4 516	4 592	5 739	6 301	5 421
Sub-areas I and II (North-East Arctic)									
<u>Pelagic Fish</u>									
Herring	62	22	13	7	8	5	1	18	12
Capelin	1 314	1 392	1 593	1 336	1 147	1 416	2 546	2 940	2 036
Others	4	3	4	26	12	40	16	8	9
Total Pelagic Fish	1 380	1 417	1 610	1 369	1 167	1 461	2 563	2 966	2 057
<u>Demersal Fish</u>									
Cod	956	729	643	831	1 143	886	908	945	733
Haddock	86	80	188	294	231	182	139	112	97
Polar cod	243	348	167	82	124	63	12	8	5
Saithe	265	241	214	212	264	233	242	183	154
Redfish	29	44	37	60	97	278	318	186	124
Flatfish	102	111	65	48	57	53	55	48	42
Others	81	95	68	79	92	77	66	105	246
Total Demersal Fish	1 762	1 648	1 382	1 606	2 008	1 772	1 740	1 587	1 401
Total Catch of all Species	3 142	3 065	2 992	2 975	3 175	3 233	4 303	4 553	3 458
Sub-area V (Iceland and Faroes)									
<u>Pelagic Fish</u>									
Herring	19	14	+	9	9	13	20	29	38
Capelin	192	183	277	442	462	461	430	761	833
Others	-	+	+	4	+	-	1	+	+
Total Pelagic Fish	211	197	277	456	471	474	451	790	871
<u>Demersal Fish</u>									
Cod	506	482	423	407	401	410	390	377	363
Haddock	66	66	56	64	57	66	69	65	63
Saithe	146	168	157	168	144	129	115	97	78
Redfish	80	84	81	79	77	79	75	69	45
Flatfish	48	32	23	19	17	14	16	26	21
Others	55	64	60	75	79	63	131	181	257
Total Demersal Fish	901	896	800	812	775	761	796	815	827
Total Catch of all Species	1 112	1 093	1 077	1 267	1 246	1 235	1 247	1 605	1 698
Sub-area XIV (East Greenland)									
Total Catch of all Species	44	68	56	33	49	53	148	97	219

\*) 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, 1970-1978.

	1970	1971	1972	1973	1974	1975	1976	1977	1978
<b>Total Nominal Catch in Region 2*)</b>	4 078	4 000	4 043	4 330	4 901	5 062	5 086	3 937	4 058
<b>Sub-area IV (North Sea) and Division IIIa (Skagerrak and Kattegat)</b>									
<u>Pelagic Fish</u>									
Herring	834	735	715	740	427	416	255	157	108
Mackerel	322	243	188	327	298	263	306	259	153
Sprat	58	100	97	270	376	758	670	385	477
Horse mackerel	12	32	8	42	31	10	9	4	5
Others	7	4	3	3	6	6	4	4	3
<b>Total Pelagic Fish</b>	1 233	1 114	1 011	1 382	1 138	1 453	1 244	809	746
<u>Demersal Fish</u>									
Cod	239	339	368	258	238	219	252	227	306
Haddock	673	260	216	199	198	180	214	160	96
Whiting	195	126	123	165	217	160	210	139	152
Norway pout <sup>1)</sup>	290	385	510	461	833	662	575	455	347
Saithe	222	253	240	219	270	268	307	190	140
Sandeels	195	404	366	307	532	445	517	803	810
Plaice	145	133	144	144	128	124	132	144	124
Sole	20	24	21	20	18	19	15	15	11
Other Flatfish	18	22	24	27	28	28	26	29	30
Others	27	32	36	45	39	42	37	63	138
<b>Total Demersal Fish</b>	2 024	1 976	2 048	1 842	2 501	2 146	2 285	2 225	2 154
<b>Total Catch of all Species</b>	3 257	3 090	3 059	3 224	3 639	3 599	3 529	3 034	2 900
<b>Sub-areas VI and VII (West and South of United Kingdom and Ireland)</b>									
<u>Pelagic Fish</u>									
Herring	230	295	290	324	277	226	179	91	66
Mackerel	65	87	134	184	249	431	419	307	488
Sprat	14	9	13	19	19	16	21	21	32
Horse mackerel	74	51	102	121	119	121	181	30	26
Others	8	8	13	9	7	14	16	21	21
<b>Total Pelagic Fish</b>	391	450	552	657	671	808	816	470	633
<u>Demersal Fish</u>									
Cod	29	32	33	29	33	33	39	31	36
Haddock	41	54	58	44	78	72	67	26	24
Whiting	28	32	30	38	45	53	59	46	43
Hake	14	21	18	21	45	44	41	17	17
Flatfish	31	32	35	34	37	40	43	33	33
Others	77	99	106	134	177	193	233	162	226
<b>Total Demersal Fish</b>	220	270	280	300	415	435	482	315	379
<b>Total Catch of all Species</b>	611	720	832	957	1 086	1 243	1 298	785	1 012

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

1) From 1974-76 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, 1970-1978.

	1970	1971	1972	1973	1974	1975	1976	1977	1978
Total Nominal Catch in Region 3*)	785	838	891	869	625	641	681	723	638
<u>Pelagic Fish</u>									
Pilchard <sup>1)</sup>	136	184	173	170	127	164	146	130	162
Mackerel	82	46	42	77	78	52	61	34	29
Horse mackerel	163	85	156	190	130	134	181	191	114
Others	107	80	141	94	92	124	117	158	136
Total Pelagic Fish	488	395	512	531	427	474	505	513	441
<u>Demersal Fish</u>									
Hake	100	38	71	86	48	54	47	46	29
Others	108	84	142	88	57	77	94	135	138
Total Demersal Fish	208	122	213	174	105	131	141	181	167
Total Catch of all Species	696	517	735	705	532	605	646	694	608

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

1) Catches of Chub (=Spanish) mackerel included in figures for 1970-76.

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

Fishery	1976		1977		1978		1979		1980	1981
	Recom. TAC	Actual Catch	Recom. TAC	Actual Catch	Recom. TAC	Actual Catch	Recom. TAC	Actual Catch <sup>1)</sup>	Recom. TAC	Recom. TAC
<u>NORTH-EAST ARCTIC</u>										
Cod	700-800	867	850	905	850	699	600	428	390	11)
Haddock	100	137	110	110	150	95	206	101	55-78	11)
Saithe	190	242	200	183	160	154	153	166	122-129	123
Greenland halibut	-	36	-	29	40	25	25	17	14	12
Golden redfish	-	49	-	40	20	32	22	25	19	19
Beaked redfish	-	269	-	146	130	93	135	85	81	70
<u>SUB-AREAS V &amp; XIV</u>										
Greenland halibut	-	6	-	17	-	14	15	23	15	15
Golden redfish	-	94	-	53	-	48	58	77	58	60
Beaked redfish	-	95	-	31	-	18	12	23	7	25
<u>ICELAND</u>										
Saithe	75	82	60	62	58 <sup>2)</sup>	50	58	62	54	72
<u>FAROEES</u>										
Cod } Bank	28	2.3)	32	1.9)	30	5.5)	28	1.9)	3.3)	2)
} Plateau		39.8)		35.7)		26.5)		23	22	14)
Haddock	17	26	17	26	23 <sup>2)</sup>	19	20	12	20	15
Saithe	50	33	40	35	32 <sup>2)</sup>	28	31	27	34	29
<u>DIVISION IIIA</u>										
Herring	-	92	-	112	-	102	-	66	40	11)
Sprat <sup>3)</sup>	-	62	80	79	80	79	70	84	70	10)
Cod	-	38	-	42	-	45	26 <sup>2)</sup>	32	30	34
Haddock	-	9	-	10	-	6.6	6.6	4.7	6.6	4.5
Whiting	-	19	-	19	-	49	22	18	22	22
Plaice	-	24	-	37	-	31	-	23	25	22

For footnotes, see page 87.

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Table 4. (continued)

Fishery	1976		1977		1978		1979		1980	1981
	Recom. TAC	Actual Catch	Recom. TAC	Actual Catch	Recom. TAC	Actual Catch	Recom. TAC	Actual Catch <sup>1)</sup>	Recom. TAC	Recom. TAC
<u>NORTH SEA</u>										
Herring <sup>4)</sup>	0 <sup>2)</sup>	175	0	46	0	11	0	19	0	0 <sup>10)</sup>
Sprat	650	622	450 <sup>2)</sup>	304	400	378	400	380	400	400 <sup>10)</sup>
Mackerel <sup>5)</sup>	249 <sup>6)</sup>	316	220 <sup>2)</sup>	261	145 <sup>7)</sup>	153	145 <sup>7)</sup>	158	0(50?)	0 <sup>10)</sup>
Cod	130-210	214	220 <sup>2)</sup>	185	210 <sup>2)</sup>	261	183	252	200 <sup>2)</sup>	190
Haddock	106-155	205	165 <sup>2)</sup>	151	105	90	83	85	90 <sup>2)</sup>	120
Whiting	160	191	165 <sup>2)</sup>	120	111 <sup>2)</sup>	103	85	133	150 <sup>2)</sup>	150
Saithe <sup>8)</sup>	200	320	210	195	200	142	200	115	129	127
Plaice	85	113	71	118	115 <sup>2)</sup>	114	120	143	112	105 <sup>11)</sup>
Sole	8	17.3	6.7	18	8	20.3	13	22.5	14 <sup>2)</sup>	...
<u>SUB-AREA VI</u>										
Cod	14	19	19 <sup>2)</sup>	13	12.2 <sup>2)</sup>	14	10.4	17	12.1 <sup>2)</sup>	10.0
Haddock	23	62	18 <sup>2)</sup>	22	12	22	11	17	15.5 <sup>2)</sup>	18.0
Whiting	13	25	22 <sup>2)</sup>	17	17	15	12	16	13 <sup>2)</sup>	14.0
Saithe	30	42	20	29	32 <sup>2)</sup>	32	32	22	31	27
<u>DIVISION VIA</u>										
Herring	66	111	48 <sup>2)</sup>	48	0 <sup>2)</sup>	34	0	6	0	0 <sup>10)</sup>
Clyde herring	-	4.1	-	4.8	-	3.9	2.0	2.0	2.0	2.0
<u>SUB-AREA VII</u>										
(excl. Division VIIa)										
Cod	-	9.4	-	10.2	-	15.1	8 <sup>9)</sup>	12	9	9
Haddock	-	5.1	-	3.4	-	2.3	8 <sup>9)</sup>	2.7	9	9
Whiting	-	22	-	18	-	18	17 <sup>9)</sup>	19	18	18

For footnotes, see page 87.

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Table 4. (continued)

Fishery	1976		1977		1978		1979		1980	1981
	Recom. TAC	Actual Catch	Recom. TAC	Actual Catch	Recom. TAC	Actual Catch	Recom. TAC	Actual Catch <sup>1)</sup>	Recom. TAC	Recom. TAC
<u>IRISH SEA</u>										
Herring	-	21	12 <sup>2)</sup>	15	9 <sup>2)</sup>	12	11	12	10	6
Cod	-	10.2	-	8.1	8.6	6.3	7.3	8.4	5.0	5.0
Whiting	-	12.2	-	10.7	-	11.1	10	10.1	10	8.0
Plaice	4.0	3.5	4.0	2.9	4.0	3.3	2.5	3.4	2.5	2.0
Sole	1.6	1.5	1.4	1.1	1.4	1.1	1.4	1.6	1.3	1.5
<u>DIVISION VII B,C</u>										
Herring	-	21	10	12	7	12	7	15	7	7
<u>DIVISION VII J</u>										
Herring	-	>5	-	>5	-	3.5	-	5.0	6	6
<u>ENGLISH CHANNEL</u>										
Plaice VII d VII e	3.26	2.6	2.0 0.45	2.25 0.7	2.5 0.6	2.32 0.94	2.2 0.72	2.61 0.86	( 2.0	( 2.2 0.8
Sole VII d VII e	1.36	1.82	1.0 0.45	1.28 0.61	1.15 0.35	1.39 0.86	2.2 0.5	1.58 1.09	1.38 0.78	1.2 1.0
<u>DIVISIONS VII F AND VII G</u>										
Plaice	-	0.9	-	0.8	-	0.9	-	0.9	0.7	0.6
Sole	-	1.4	-	1.0	-	0.8	-	1.0	1.0	1.0

For footnotes, see page 87.

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Table 4. (continued)

Fishery	1976		1977		1978		1979		1980	1981
	Recom. TAC	Actual Catch	Recom. TAC	Actual Catch	Recom. TAC	Actual Catch	Recom. TAC	Actual Catch <sup>1)</sup>	Recom. TAC	Recom. TAC
<u>SUB-AREA VII AND DIVISIONS IVA, VIA AND VIIIA,B</u>										
Hake	-	67	-	51	-	50	43	51	30	30
<u>DIVISIONS VIIIC AND IXA</u>										
Hake	-	26	-	16	-	14	20	18	10	8.5
<u>SUB-AREAS VI, VII AND VIII</u>										
Mackerel	295	507	250 <sup>2)</sup>	326	450 <sup>2)</sup>	504	435	606	330	(293-353) <sup>10)</sup>

- 1) Preliminary.
- 2) Revised.
- 3) Including Norwegian fjords south of 62°N.
- 4) Including Divisions VIIId 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 VIIIf.
- 10) Subject to revision at a later stage.
- 11) Advice to be provided after the 68th Statutory Meeting of ICES in October 1980.

Note: For Celtic Sea herring, regulated on a seasonal basis, it was recommended that there should be no fishing in the 1980/81 season. Advice for the 1981/82 season will be provided at a later stage.

Table 5. Nominal catch of Redfish (in tonnes) by countries (Sub-area I, Divisions IIa and IIb combined)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*
Belgium						30	28	2	2	-	-
Faroe Isl.		60		9	32	6	67	137	8	1 477	160
France						1 116		-	660	3 608	-
German Dem. Rep.	1 069	7 149	14 786	9 972	11 756	28 275	28 020	22 636	17 614	16 165	16 162
Germany, Fed. Rep.	5 573	2 416	3 076	1 697	3 479	6 597	5 182	7 894	7 231	11 483	12 244
Netherlands	20							127	-	-	-
Norway	3 904	3 832	4 644	6 776	7 714	7 055	4 966	7 305	7 381	7 802	10 218
Poland	5 973	4 631	2 532	1 112	215	1 269	4 711	4 137	175	2 957	272
Portugal							331	3 463	1 480	378	638
Spain							1 194	3 398	-	-	6
U.K.	5 224	4 554	4 002	4 379	4 791	3 509	2 746	4 961	6 330	3 390	3 000
USSR	9 144	13 091	29 839	22 647	31 829	48 787	230 950	263 546	144 993	78 092	67 488
Total	30 907	35 733	58 879	46 592	59 816	96 644	278 195	317 606	185 874	125 352**	110 623**

\* Provisional data

\*\* The total figure used by the Working Group for assessments (including catches by non-members)

Table 6. Nominal catch of Redfish (in tonnes ) by countries in Sub - area I

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*
Belgium						30		2	1	-	-
Faroe Islands					6	6				-	-
France						26				27	-
German Dem. Rep.	23	4 912	78	36		358	201	90	-	-	-
Germany Fed.Rep.		133	148	7	76	1 086	483	635	786	-	-
Netherlands											
Norway	365	141	316	1 000	1 917	194	482	739	1 181	1 333	1 681
Poland	5 973	6	1	22			93	47	-	-	-
Portugal							331	478	55	8	-
Spain							820	301	-	-	-
U.K.	1 385	1 384	1 406	1 363	1 894	1 320	1 048	1 392	1 686	959	668
USSR	3 647	2 281	3 743	4 403	4 885	9 318	30 750	12 411	13 154	2 575	604
Total	11 393	8 857	5 692	6 831	8 778	12 338	34 208	16 095	17 012	4 902	2 953

\* Provisional data

Table 7. Nominal catch of Redfish (in tonnes) by countries in Division IIa

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*
Faroe Islands		60		9	22		67	137	8	1 171	160
France						980			478	3 575	-
German Dem. Rep.	812	2 212	12 339	8 963	11 474	27 153	22 778	16 921	12 688	12 993	12 439
Germany Fed. Rep.	5 573	2 165	1 188	1 466	2 207	4 167	4 263	6 722	4 764	11 482	12 244
Netherlands	20							127	-	-	-
Norway	3 510	3 679	4 277	5 720	5 564	6 837	4 444	6 515	6 050	6 369	8 362
Poland		269	1 605	784	156	869	920	217	47	2 477	261
Portugal								2 849	1 249	352	549**
Spain							153	2 082	-	-	4
U.K.	3 578	2 741	2 463	2 680	2 125	1 991	1 621	2 919	4 064	2 067	1 632
USSR	14	142	209	291	131	14	39 138	20 307	94 639	31 783	26 789
Total	13 507	11 268	22 081	19 913	21 679	42 011	73 384	58 796	123 987	72 209	62 440

\* Provisional data

\*\* As reported to Norwegian authorities



Table 8. Nominal catch of Redfish (in tonnes) by countries in Division IIb

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*
Belgium							28		-	-	-
Faroe Islands					4				-	-	-
France						110			33	306	-
German Dem. Rep	234	25	2 369	973	282	764	5 041	5 625	4 926	3 232	3 723
Germany Fed. Rep.		118	1 740	224	1 196	1 344	436	537	1 681	1	-
Norway	29	12	51	56	233	24	40	51	150	100	175
Poland		4 356	926	306	59	400	3 698	3 873	128	480	11**
Portugal								136	176	18	89**
Spain							221	1 015	-	-	2**
U.K.	261	429	133	336	772	198	77	650	580	364	700
USSR	5 483	10 668	25 887	17 953	26 813	39 455	161 062	230 828	37 200	43 734	40 095
Total	6007	15 608	31 106	19 848	29 359	42 295	170 603	242 715	44 874	48 241	44 795
Non-members										296	435**

\* Provisional data

\*\* As reported to Norwegian authorities

Table 9. Nominal catch of Sebastes marinus and Sebastes mentella  
in Sub-area I and Divisions IIa and IIb combined (in tonnes)

Year	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*
<u>S. marinus</u>	24 071	12 817	13 816	17 730	21 436	27 272	39 125	48 584	39 509	32 441	25 441
<u>S. mentella</u>	6 836	22 916	45 063	28 862	38 380	69 372	239 070	269 022	146 365	92 911	85 182
Total	30 907	35 753	58 879	46 592	59 816	96 644	278 195	317 606	185 874	125 352	110 623

\* Provisional data

Table 10. 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	<u>S. marinus</u>	<u>S. mentella</u>
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	35 202	9 806	20 880 <sup>1)</sup>	65 888	47 791	18 097
1979 <sup>*</sup>	65 073	14 077	21 112 <sup>1)</sup>	100 262	76 865	23 397

<sup>\*</sup>) provisional data

<sup>1)</sup> catches updated for Sub-area XII included.

Table 11. Nominal catch of Redfish in Division Va ('000 tonnes) by countries. Separation into the species components according to the method used by the Redfish Working Group.

Div. Va Year	Belg.	Faroe Islands	G.D.R.	Germany, F.R.	Iceland	Norway	Poland	U.K.	U.S.S.R.	Total
1970 Tot.	2.2	-	0.8	48.9	23.8	-	0.3	2.9	+	78.9
1970 S. mar.	2.2	-	0.8	13.1	23.3	-	0.3	2.9	-	42.6
1970 S. ment.	-	-	-	35.8	0.5	-	-	-	-	36.3
1971 Tot.	2.8	+	0.2	46.6	29.1	+	+	3.6	+	82.3
1971 S. mar.	2.8	-	0.2	12.2	28.6	-	-	3.6	-	47.4
1971 S. ment.	-	-	-	34.4	0.5	-	-	-	-	34.9
1972 Tot.	2.5	+	0.1	44.0	27.0	+	+	3.7	+	77.3
1972 S. mar.	2.5	-	0.1	4.1	26.4	-	-	3.7	-	36.8
1972 S. ment.	-	-	-	39.9	0.6	-	-	-	-	40.5
1973 Tot.	1.6	0.2	-	38.4	26.5	+	-	3.0	+	69.7
1973 S. mar.	1.6	0.2	-	3.1	25.7	-	-	3.0	-	33.6
1973 S. ment.	-	-	-	35.3	0.8	-	-	-	-	36.1
1974 Tot.	2.1	0.3	+	36.4	27.8	+	+	2.5	-	69.1
1974 S. mar.	2.1	0.3	-	4.3	27.0	-	-	2.5	-	36.2
1974 S. ment.	-	-	-	32.1	0.8	-	-	-	-	32.9
1975 Tot.	1.9	0.1	-	33.6	32.7	+	-	2.4	-	70.7
1975 S. mar.	1.9	0.1	-	4.3	31.3	-	-	2.4	-	40.0
1975 S. ment.	-	-	-	29.3	1.4	-	-	-	-	30.7
1976 Tot.	1.5	0.2	-	32.9	34.0	+	-	1.1	-	69.7
1976 S. mar.	1.5	0.2	-	4.3	33.3	-	-	1.1	-	40.4
1976 S. ment.	-	-	-	28.6	0.7	-	-	-	-	29.3
1977 Tot.	1.4	0.3	-	31.6	28.1	0.1	-	+	-	61.5
1977 S. mar.	1.4	0.3	-	9.2	27.5	0.1	-	-	-	38.5
1977 S. ment.	-	-	-	22.4	0.6	-	-	-	-	23.0
1978 Tot.	1.5	0.2	-	-	33.3	0.1	-	-	-	35.1
1978 S. mar.	1.5	0.2	-	-	29.4	0.1	-	-	-	31.2
1978 S. ment.	-	-	-	-	3.9	-	-	-	-	3.9
1979 Tot.	1.3	0.7	-	-	63.0	0.1	-	-	-	65.1
1979 S. mar.	1.3	0.7	-	-	55.2	0.1	-	-	-	57.3
1979 S. ment.	-	-	-	-	7.8	-	-	-	-	7.8

Table 12. Nominal catch of Redfish in Division Vb ('000 tonnes) by countries. Separation into the species components according to the method used by the Redfish Working Group.

Div. Vb Year	Faroe Islands	France	G.D.R.	Germany, F.R.	Netherlands	Norway	U.K.	Total
1970 Tot.	-	-	-	1.9	-	-	+	1.9
S. mar.	-	-	-	-	-	-	-	-
S. ment.	-	-	-	1.9	-	-	-	1.9
1971 Tot.	-	-	-	2.3	-	-	+	2.3
S. mar.	-	-	-	-	-	-	-	-
S. ment.	-	-	-	2.3	-	-	-	2.3
1972 Tot.	-	-	-	4.0	-	-	0.1	4.1
S. mar.	-	-	-	-	-	-	0.1	0.1
S. ment.	-	-	-	4.0	-	-	-	4.0
1973 Tot.	0.1	-	-	9.5	-	-	0.1	9.7
S. mar.	0.1	-	-	-	-	-	0.1	0.2
S. ment.	-	-	-	9.5	-	-	-	9.5
1974 Tot.	+	0.3	+	7.3	-	-	0.1	7.7
S. mar.	-	0.3	-	-	-	-	0.1	0.4
S. ment.	-	-	-	7.3	-	-	-	7.3
1975 Tot.	+	0.8	+	7.6	0.1	+	+	8.5
S. mar.	-	0.8	-	-	0.1	-	-	0.9
S. ment.	-	-	-	7.6	-	-	-	7.6
1976 Tot.	+	-	-	5.3	-	+	0.1	5.4
S. mar.	-	-	-	-	-	-	0.1	0.1
S. ment.	-	-	-	5.3	-	-	-	5.3
1977 Tot.	0.1	1.4	-	5.9	-	+	0.1	7.5
S. mar.	0.1	0.6	-	-	-	-	0.1	0.8
S. ment.	-	0.8	-	5.9	-	-	-	6.7
1978 Tot.	1.5	0.4	-	7.8	-	+	0.1	9.8
S. mar.	1.5	0.4	-	-	-	-	0.1	2.0
S. ment.	-	-	-	7.8	-	-	-	7.8
1979 Tot.	5.7	-	-	8.4	-	+	-	14.1
S. mar.	4.8	-	-	-	-	-	-	4.8
S. ment.	0.9	-	-	8.4	-	-	-	9.3

Table 13. Nominal catch of Redfish in Sub-area XIV ('000 tonnes) by countries. Separation into the species components according to the method used by the Redfish Working Group.

Sub-Area XIV Year	Canada	Denmark (G)	Faroe Islands	G.D.R.	Germany, F.R.	Iceland	Norway	Poland	U.K.	U.S.S.R.	Total
1970 Tot.	-	-	-	0.4	16.3	1.0	-	0.4	+	-	18.1
1970 S. mar.	-	-	-	0.4	16.3	1.0	-	0.4	+	-	18.1
1970 S. ment.	-	-	-	-	-	-	-	-	-	-	-
1971 Tot.	-	-	-	0.6	17.1	2.4	-	0.3	+	0.1	20.5
1971 S. mar.	-	-	-	0.6	17.1	2.4	-	0.3	+	0.1	20.5
1971 S. ment.	-	-	-	-	-	-	-	-	-	-	-
1972 Tot.	-	-	-	0.7	7.3	5.5	-	0.5	+	+	14.0
1972 S. mar.	-	-	-	0.7	7.3	5.5	-	0.5	+	+	14.0
1972 S. ment.	-	-	-	-	-	-	-	-	-	-	-
1973 Tot.	-	-	+	0.8	4.5	2.1	-	0.3	0.1	0.1	7.9
1973 S. mar.	-	-	+	0.8	4.5	2.1	-	0.3	0.1	0.1	7.9
1973 S. ment.	-	-	-	-	-	-	-	-	-	-	-
1974 Tot.	-	-	+	1.3	2.6	9.8	-	+	0.1	0.1	13.9
1974 S. mar.	-	-	+	1.3	2.6	9.8	-	+	0.1	0.1	13.9
1974 S. ment.	-	-	-	-	-	-	-	-	-	-	-
1975 Tot.	-	-	+	4.5	5.0	5.6	0.1	0.3	0.1	9.8	25.4
1975 S. mar.	-	-	+	4.5	5.0	5.6	0.1	0.3	0.1	5.4	21.0
1975 S. ment.	-	-	-	-	-	-	-	-	-	4.4	4.4
1976 Tot.	0.4	0.1	+	-	4.4	7.4	+	-	0.3	101.0	113.6
1976 S. mar.	0.4	0.1	+	-	4.4	7.4	+	-	0.3	41.3	53.9
1976 S. ment.	-	-	-	-	-	-	-	-	-	59.7	59.7
1977 Tot.	-	+	+	-	13.3	0.1	0.1	-	0.6	0.3	14.4
1977 S. mar.	-	+	+	-	13.3	0.1	0.1	-	0.6	0.3	14.4
1977 S. ment.	-	-	-	-	-	-	-	-	-	-	-
1978 Tot.	-	+	-	-	20.7	0.2	+	-	+	-	20.9
1978 S. mar.	-	+	-	-	15.3	0.2	+	-	+	-	15.5
1978 S. ment.	-	-	-	-	5.4	-	-	-	-	-	5.4
1979 Tot.	-	-	+	-	21.1	-	-	-	-	-	21.1
1979 S. mar.	-	-	+	-	15.8	-	-	-	-	-	15.8
1979 S. ment.	-	-	-	-	5.3	-	-	-	-	-	5.3

Table 14. Greenland halibut. Nominal catch (tonnes) in Sub-areas I and II, 1969-79.  
(Data for 1969-78 from Bulletin Statistique)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*)</sup>
Faroe Islands	-	44 <sup>1)</sup>	-	-	-	-	-	2	21	-	
German Dem.Rep.	3 788 <sup>1)</sup>	18 729 <sup>1)</sup>	2 949 <sup>1)</sup>	1 633 <sup>1)</sup>	3 954	5 914	8 472	8 955	8 176	4 611	3 488
Germany, Fed.Rep.	71	-	3	3	59	88	94	31	148	321	423
Norway:											
trawl catch <sup>1)</sup> :	-	1 638	2 309	9 656	10 217	4 656	1 686	4 030	2 526	2 302	887 <sup>1)</sup>
long-line catch and gill net <sup>1)</sup> :	14 856	14 233	7 157	6 327	3 772	4 135	3 172	1 975	1 628	1 780	1 873 <sup>1)</sup>
Poland	5 314	19 262	12 277	7 981	2 140	5 146	3 645	3 566	224	544	106
UK (Eng.&Wales)	-	-	-	1 262	1 235	866	731	935	1 059	407	112 <sup>1)</sup>
USSR	19 760	35 578	54 339	16 193	8 561	16 958	20 372	16 580	15 045	14 651 <sup>1)</sup>	10 326 <sup>1)</sup>
Others	-	-	-	-	-	-	-	-	-	1	5 <sup>1)</sup>
Total	43 789	89 484	79 034	43 055	29 938	37 763	38 172	36 074	28 827	24 617	17 220

\*)Preliminary 1) From national statistics

Table 15. Faroe Plateau Cod. Nominal catches by countries, 1968 - 79 (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	39 799
1977	28 177	1 450	332	853	-	809	4 071	2	35 694
1978	24 076	183	71	245	-	518	1 460	2	26 555
1979**)	21 773	129	23	192	-	263	647	-	23 027

\*) Vb<sub>2</sub> included

\*\* ) Preliminary data



Table 16. Faroe Bank Cod. Nominal catches by countries, 1968-1979 (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	*	-	183	-	2	1 071	-	5 450
1979**	1 273	-	-	-	-	-	582	-	1 855

\* ) Catches included in Vb<sub>1</sub>.

\*\* ) Preliminary data.

Table 17. Faroe Plateau Haddock. Nominal catches by countries, 1968-79 (tonnes).

Year	Faroe Islands	France	Germany Fed.Rep. of	Norway	Poland	UK England	UK Scotland	Others	Total
1968	6 751 <sup>*</sup> )	1 143	36	-	-	2 158	5 783	-	15 871
1969	11 122 <sup>*</sup> )	3 314 <sup>*</sup> )	73	-	-	1 549	6 392	-	22 450
1970	11 791	2 006 <sup>*</sup> )	14	-	-	769	5 428	-	20 008
1971	10 488	790 <sup>*</sup> )	19	-	-	1 896	4 949	-	18 142
1972	8 314	2 660 <sup>*</sup> )	24	-	-	844	2 842	-	14 690
1973	4 931	3 508	46		1 190 <sup>*</sup> )	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	15 539	71 <sup>*</sup> )	8	91	-	48	367	-	16 124
1979 <sup>**</sup> )	11 258	-	1	26	-	36	206	-	11 527

<sup>\*</sup>) Catches including Vb<sub>2</sub>

<sup>\*\*</sup>) Preliminary estimates

Table 18. Faroe Bank Haddock. Nominal catches by countries, 1968-79 (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	2 643	*	-	39	-	-	394	-	3 076
1979 <sup>xxx</sup>	714	-	-	-	-	-	102	-	816

\* ) Catches are included in Vb<sub>1</sub>

xxx) Preliminary estimates

**Table 19.** 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 20, 21, 22, 23 and 24.

(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	6 724	212 452
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	96 353	52 003	25 563	18 534	394 313
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	210 508	245 801	111 301	42 186	29 225	639 021
1973	215 659	225 771	110 888	57 574	35 812	645 704
1974	262 301	272 944	97 568	47 188	36 298	716 299
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	34 829	28 467	502 988
1978	154 465	142 077	49 672	28 136	31 536	405 886
1979 <sup>*)</sup>	166 234	114 798	63 257	27 243	21 637	393 169

<sup>\*)</sup> Preliminary

Table 20. Nominal catch (tonnes) of SAITHE in Sub-area I and Divisions IIa, IIb, 1970-1979

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*)</sup>
Belgium	-	-	-	-	5	47	1	-	-	-
Faroe Islands	1 097	215	109	7	46	28	20	270	809	1 117
France	-	14 536	14 519	11 320	7 119	3 156	5 609	5 658	4 345	1 195
German Dem.Rep.	29 200	16 840	7 474	12 015	29 466	28 517	10 266	7 164	6 484	2 435
Germany, Fed.Rep.	23 466	12 204	24 595	30 338	33 155	41 260	49 056	19 985	18 190	14 593
Netherlands	-	-	-	-	-	-	64	-	-	-
Norway	151 759	128 499	143 775	148 789	152 699	122 598	131 675	139 705	121 069	145 621
Poland	-	6 017	1 111	23	2 521	3 860	3 164	1	35	-
Portugal	-	-	-	-	-	6 430	7 233	783	203	41
Spain	-	13 097	9 247	2 115	7 075	11 397	21 661	1 327	121	7
Sweden	-	-	-	-	-	8	-	-	-	-
UK (Engl.&Wales)	15 469	10 361	8 223	6 503	3 001	2 623	4 651	6 853	2 790	1 169
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	381	56
Total	264 762	241 272	210 456	213 769	264 121	233 453	242 486	182 817	154 464	166 234

<sup>\*)</sup> Preliminary.

Table 21. Nominal catch (tonnes) of SAITHE in Sub-area IV and Division IIIa, 1970-1979  
(Data for 1970-1978 from Bulletin Statistique).

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*)</sup>
Belgium	36	44	59	55	33	81	127	107	44	6
Denmark	4 600	11 500	17 000	10 100	8 388	10 149	15 111	17 334	10 372	9 906
Faroe Islands	-	18	182	552	581	287	425	318	213	115
France	38 873	38 330	26 696	32 961	28 619	24 396	32 552	41 022	38 122	39 711
German Dem.Rep.	4 250	6 398	10 674	7 668	5 816	5 882	2 088	2 430	2 404	1 504
Germany Fed.Rep.	6 022	4 217	8 665	12 003	20 589	18 622	38 698	26 860	25 982	21 991
Iceland	18	97	4	23	5	1	-	-	-	-
Ireland	-	-	-	-	-	-	119	126	88	-
Netherlands	20 460	18 136	12 532	9 232	14 504	8 917	6 101	7 270	5 135	1 466
Norway	11 201	15 184	23 256	15 219	9 246	12 483	17 856	14 949	17 627	15 390
Poland	-	4	186	7 512	22 203	35 304	35 819	12 378	5 661	6 104
Spain	-	-	190	108	308	249	-	-	-	-
Sweden	1 921	4 523	3 899	1 876	1 187	913	1 271	1 275	990	189
UK(Engl.+Wales)	2 664	3 162	3 744	3 378	4 353	3 472	6 300	6 822	8 382	6 256
UK (Scotland)	5 293	6 106	10 797	10 834	10 956	8 898	13 034	11 366	14 330	8 306
USSR	68 062	110 200	99 883	83 333	104 500	110 743	83 669	46 385	10 161	2 210
Sub-total	163 400	217 919	217 767	194 854	231 288	240 397	253 170	188 642	139 511	113 154
By-Catch from Industrial Fisheries:										
Denmark <sup>a)</sup>	58 700	34 700	22 600	24 400	38 800	27 800	53 684	1 805	72	493
Norway <sup>a)</sup>			5 434	6 517	3 469	9 878	13 082	4 392	2 494	1 142
TOTAL	222 100	252 619	245 801	225 771	273 557	278 075	319 936	195 377	142 077	114 798

<sup>\*)</sup> Preliminary

<sup>a)</sup> Data for by-catch from industrial fisheries from national laboratories.

Table 22. Nominal catch (tonnes) of SAITHE in Division Va, 1970-79.

(Data for 1970-78 from Bulletin Statistique)

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*
Belgium	4 153	3 490	2 250	2 131	2 371	1 638	1 615	1 448	1 092	739
Faroe Isls.	2 386	2 046	857	1 467	1 712	1 366	3 267	3 013	4 250	5 452
France	2 046	3 987	-	-	94	32	51	-	-	-
German Dem.Rep.	3 527	2 637	3 471	-	-	-	-	-	-	-
Germany, Fed.Rep.	27 806	40 628	30 918	38 565	18 627	13 820	13 785	10 575	-	-
Iceland	63 882	60 080	59 945	56 567	65 169	61 430	56 811	46 973	44 327	57 065
Norway	-	-	-	-	-	6	5	4	3	1
Poland	-	113	150	-	-	-	-	-	-	-
Spain	-	59	-	-	-	-	-	-	-	-
UK(Engl. Wales)	10 634	21 767	13 152	11 874	8 845	8 643	6 024	13	-	-
UK(Scotland)	2 402	1 743	545	509	731	1 021	443	-	-	-
USSR	-	5	-	-	-	-	-	-	-	-
Total	116 836	136 555	111 288	111 113	97 549	87 956	82 001	62 026	49 672	62 257

\* Preliminary

Table 23. Nominal catch (tonnes) of SAITHE in Division Vb, 1970-1979  
(Data for 1970-1978 from Bulletin Statistique)

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*
Belgium	-	-	-	-	-	-	6	-	-	-
Faroe Islands	2 694	5 653	5 646	2 973	3 726	2 517	2 560	5 153	15 892	21 937
France	11 036	12 394	24 006	22 676	20 457	23 980	15 367	17 038	8 128	2 991
German Dem.Rep.	-	-	-	-	130	26	-	-	-	-
Germany, Fed. Rep.	2 211	2 254	3 440	9 329	6 661	5 229	2 605	3 086	1 088	592
Netherlands	-	63	-	-	-	491	232	58	-	-
Norway	1 495	1 839	470	355	1 660	486	2 232	1 279	1 124	1 172
Poland	-	-	-	4 050	1 925	815	1 007	-	-	-
Spain	-	-	423	390	500	654	117	-	-	-
UK(England & Wales)	3 066	3 305	2 453	7 527	3 827	2 428	3 063	2 613	557	190
UK(Scotland)	8 608	7 198	6 225	10 131	8 302	4 950	5 860	5 608	1 349	361
USSR	-	-	-	-	-	-	16	-	-	-
Total	29 110	32 706	42 663	57 431	47 188	41 576	33 065	34 835	28 138	27 243

\*) Preliminary



Table 24. Nominal catch (tonnes) of SAITHE in Sub-area VI, 1970 - 1979

(Data for 1970 - 1978 from Bulletin Statistique).

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*)</sup>
Belgium	34	29	125	191	209	21	95	-	-	1
Denmark	-	-	-	-	-	-	3	-	-	-
Faroe Islands	-	-	-	4	6	6	7	11	-	5
France	5 140	12 017	17 718	18 970	22 802	19 946	29 216	19 686	21 519	15 637
German Dem.Rep.	-	-	-	-	-	8	3	-	-	-
Germany, Fed. Rep.	545	1 068	350	52	16	481	511	254	604	94
Ireland	-	-	-	-	-	-	375	240	266	246
Iceland	1	1	-	+	-	+	-	-	-	-
Netherlands	7	32	638	67	124	702	547	527	623	256
Norway	-	-	-	2	22	10	17	91	122	19
Poland	-	2	-	394	125	164	91	-	-	-
Spain	-	-	1 302	1 980	1 862	1 882	1 012	346	-	-
UK(Engl.&Wales)	3 615	1 965	2 268	2 138	1 333	1 571	1 560	2 758	3 193	1 766
UK (N.Ireland)	19	24	6	14	3	12	13	9	27	11
UK(Scotland)	5 175	4 620	6 706	11 330	9 527	6 131	5 807	4 628	5 181	3 602
USSR	-	105	112	670	269	15	2 550	-	-	-
Total	14 536	19 863	29 225	35 812	36 298	30 949	41 807	28 550	31 535	21 636

<sup>\*)</sup> Preliminary.

Table 25. Landings (t) of blue whiting from the main fisheries 1970-1979.

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*)</sup>
Norwegian Sea Fishery, (Sub- division Areas I,II,Va,XIVa)	14807	35219	625	878	146	6746	3436	56923	235227	686704
Spawning Fishery, (divisions Vb, VIa,VIIb,VIIb,c)	354	18394	15396	15027	15207	30335	81200	135364	227382	283389
Icelandic industrial Fishery, (division Va)			12	2833	4230	1294	8220	5838	9484	2500
Industrial mixed Fishery, (divisions IVa-c, IIIa)	-	600	27959	56826	62197	39765	28251	37945	97145	57919
Southern Fishery, (divisions VIId,e, VIIg-k,VIII,IX)	22788	21386	33503	27452	25733	31715	35035	30451	29203	24064
Total	37949	75599	77495	103016	107513	109855	156142	266521	598441	1054576

<sup>\*)</sup> Preliminary

**Table 26.** Landings (t) of blue whiting from the Norwegian Sea (Areas I and II, Divisions Va and XIVa) fisheries 1970-79.

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*)
Faroes	-	-	-	-	-	-	-	593	2810	189
German Dem. Rep.	-	-	3	-	-	-	90	2031	7301	22502
Germany, Fed.Rep.of 1)	-	-	-	3	2	35	33	6701	8422	1121
Iceland 2)	-	-	622	60	119	3	569	4768	17756	12428
Norway	-	-	-	-	20	31	837	-	-	3528
Poland	-	-	-	-	-	-	95	1536	5083	4346
UK, (England & Wales)	-	-	-	-	-	-	60	165	11	-
UK (Scotland)	-	-	-	-	-	-	-	-	-	32
USSR	14807	35219	-	815	5	6677	1752	41129	193844	642558
<b>Total</b>	<b>14807</b>	<b>35219</b>	<b>625</b>	<b>878</b>	<b>146</b>	<b>6746</b>	<b>3436</b>	<b>56923</b>	<b>235227</b>	<b>686704</b>

\*) Preliminary.

1) Not including catches off the southeast coast of East Greenland (Division XIVb) (327 t. in 1977 and 897 t. in 1978).

2) Directed fishery only.

**Table 27.** Landings (t) of the blue whiting from the Spawning Fishery  
(Divisions Vb, VIa, b, and VIIb, c.) 1970-79.

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>#)</sup>
Denmark	-	-	-	-	-	-	-	18745	23498	20000
Faroes	-	-	-	1155	1527	-	12826	29096	39491	36938
German Dem. Rep.	-	-	-	-	-	-	4971	1094	1714	172
Germany, Fed. Rep. of	-	-	-	-	2655	-	85	3260	6363	3270
Iceland	-	-	-	319	-	-	-	5172	7537	24864
Ireland	-	-	-	-	-	-	160	-	-	-
Netherlands	-	-	-	-	-	-	-	-	1172	-
Norway	-	-	651	2445	3247	7301	24691	36791	114969	184611
Poland	-	-	-	-	116	4704	10950	3996	2469	4643
Spain	-	-	6955	6571	6484	8153	5910	183	14	-
Sweden	-	-	-	-	-	-	-	6391	6260	-
UK (England & Wales)	-	-	-	-	-	455	341	1475	5287	4137
UK (Scotland)	-	-	-	-	-	279	1488	3001	1599	1466
USSR	354	18394	7790	4537	1178	9443	19778	26160	17009	23288
Total	354	18394	15396	15027	15207	30335	81200	135364	227382	283389

<sup>#)</sup> Preliminary.

**Table 28.** Landings (t) of blue whiting from the Icelandic mixed industrial trawl fisheries Division Va 1970-79.

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Iceland	-	-	12	2833	4230	1294	8220	5838	9484	2500 <sup>#)</sup>

<sup>#)</sup> Preliminary.

**Table 29.** Landings (t) of blue whiting from the Mixed Industrial Fisheries and caught as by catch in ordinary fisheries in the North Sea Divisions IV a-c and IIIa).

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*)</sup>
Denmark	-	-	-	-	-	-	-	16071	54804	19089
Faroes	-	-	-	3714	2610	428	1254	-	1177	3900
German Dem.Rep. <sup>1)</sup>	-	-	-	-	-	-	-	-	988	49
Germany, Fed. Rep. of <sup>1)</sup>	-	-	-	-	-	-	-	76	1514	13
Norway	-	-	27609	50835	59151	38020	26827	20293	37260	33582
Poland <sup>1)</sup>	-	-	-	-	55	-	45	838	601	-
Spain <sup>2)</sup>	-	-	350	350	318	195	47	-	-	-
Sweden	-	-	-	-	-	-	-	639	648	1249
UK (England & wales) <sup>1)</sup>	-	-	-	-	-	-	-	3	+	-
UK (Scotland)	-	-	-	-	-	414	58	25	153	37
USSR <sup>1)</sup>	-	600	-	1927	63	708	20	-	-	-
Total	-	600	27959	56826	62197	39408	28251	37945	97145	57919

\*) Preliminary.

1) Reported landings in human consumption fisheries.

2) Reported landings assumed to be from human consumption fisheries.

**Table 30.** Landings (t) of blue whiting from the Southern Areas. (Areas VIII and IX and Divisions VII g-k and VII d, e.)

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*)
German, Dem. Rep.	-	78	-	-	-	-	-	-	-	-
Germany, Fed. Rep. of	-	-	-	-	-	-	-	-	25	-
Ireland	-	-	-	-	-	-	-	-	-	1
Netherlands	-	-	-	-	-	-	-	-	7	-
Poland	-	-	-	-	170	-	385	169	53	-
Portugal	-	-	-	-	-	-	-	1744	114	-
Spain <sup>1)</sup>	16360	11800	28090	26741	24627	30790	29470	24800	29000*)	24000*)
UK (England & Wales)	-	-	-	-	-	-	-	+	-	-
UK (Scotland)	-	-	-	-	-	-	-	-	-	63
USSR	6428	9508	5413	711	936	925	5180	3738	4	-
<b>Total</b>	<b>22788</b>	<b>21386</b>	<b>33503</b>	<b>27452</b>	<b>25733</b>	<b>31715</b>	<b>35035</b>	<b>30451</b>	<b>29203</b>	<b>24064</b>

\*) Preliminary.

1) Significant quantities taken in Sub-divisions VII g-k not included in the table are discarded every year.

Table 31. HERRING in Division IIIa. Landings in tonnes 1970-79  
(Data mainly provided by Working Group members)

Country / Year		1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*)
SKAGERRAK	Denmark	30 107	26 985	34 900	42 098	35 732	29 997	7 326	19 889	6 425	5 153
	Faroe Islands	-	5 636	4 115	5 265	7 132	8 053	1 553	10 064	1 041	817
	Germany Fed.Rep.	-	-	-	-	36	108	6	32	28	181
	Iceland	6 453	3 066	7 317	15 938	231	1 209	123	-	-	-
	Norway (Open Sea)	7 581	6 120	1 045	836	698	196	-	-	1 860	2 460
	Norway (Fjords)	1 830	3 166	4 222	1 680	1 720	1 459	2 304	1 837	2 271	2 259
	Sweden	26 930	19 763	19 644	20 429	11 683	12 348	6 505	8 109	11 551	8 104
	Total	72 901	64 736	71 241	66 246	57 214	53 370	17 817	39 424	23 176	18 974
KATTEGAT	Denmark	39 434	50 177	52 755	78 125	54 540	48 974	41 749	38 205	29 241	21 337
	Sweden	40 453	49 760	39 972	40 418	39 779	23 769	30 263	37 160	35 193	25 272
	Total	79 887	99 937	92 727	118 543	94 319	72 743	72 012	75 365	64 434	46 609
Div. IIIa Total		152 788	164 673	163 968	184 789	151 533	126 113	89 829	114 789	87 610	65 583

Table 32. HERRING. Catch in tonnes 1969-1979. North Sea (Sub-area IV and Divisions VIIId and e) by country.  
(Data provided by Working Group members)

Country/Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*)
Belgium	1 200	681	1 337	2 160	603	2 451	1 430	57	-	-
Denmark	133 331	185 393	213 738	174 254 <sup>a)</sup>	61 728	115 616	34 841	12 769	4 359	10 546
Faroe Islands	58 365	45 524	48 444	54 935 <sup>b)</sup>	26 161 <sup>b)</sup>	25 854	14 378	8 070	40	-
Finland	-	-	-	-	-	-	1 034	-	-	-
France	11 482	11 408	12 901	22 235	12 548	20 391	14 468	1 613	2 119	2 350
German Dem. Rep.	290	475	127	1 728	3 268	2 689	2 624	2	-	-
Germany, Fed.Rep.	7 150	3 570	3 065	10 634 <sup>c)</sup>	12 470	6 953	1 654	221	24	10
Iceland	22 951	37 171	31 998	23 742 <sup>d)</sup>	29 017	16 286	9 412	-	-	-
Netherlands	46 218	32 479	24 829	34 070	35 106	38 416	20 146	4 134	18	-
Norway	193 102	125 842	117 501	99 739	40 975	34 183	27 386	4 065	1 189	3 617
Poland	5 057	2 031	2 235	5 738	9 850	7 069	7 072	2	-	-
Sweden	34 670	36 880	7 366	4 222 <sup>e)</sup>	3 561	6 858	4 777	3 616	-	-
UK (England)	9 702	4 113	394	2 268	5 699	6 475	9 662	3 224	2 843	2 253
UK (Scotland) <sup>f)</sup>	21 885	25 073	17 227	16 012	15 034	8 904	15 015	8 159	437	-
USSR	18 078	9 500	16 386	30 735	18 096	20 653	10 935	78	4	162
Total North Sea	563 481	520 140	497 548	484 012	275 116	312 798	174 834	46 010	11 033	18 938
Total including unallocated catches										21 938

a) Total includes 2 107 t for human consumption unspecified to area

b) Supplied by Fiskirannsóknarstofnan

c) From Federal Republic of Germany national statistics compiled by Federal Research Board of Fisheries, Hamburg

d) Excludes 15 938 t 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

\*) Preliminary



Table 33. Total catches of HERRING (tonnes) in Division VIa, 1970-1979  
(Data provided by Working Group members)

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*)</sup>
Belgium	-	-	-	-	-	-	12	-	-	-
Denmark	-	554	150	932	-	374	249	626	128	-
Faroe Islands <sup>a)</sup>	15 100	8 100	8 094	10 003	5 371	3 895	4 017	3 564	-	-
France	1 293	2 055	680	2 441	547	1 293	1 528	1 548	1 435	-
German Dem. Rep.	207	330	935	2 507	2 037	1 994	929	-	-	-
Germany, Fed. Rep. of	16 548	7 700	4 108	17 443	14 354	9 099	4 980	221	126	-
Iceland <sup>b)</sup>	5 595	5 416	2 066	2 532	9 566	2 633	3 273	-	-	-
Ireland	11 716	12 161	17 308	14 668	12 557	10 417	8 558	7 189	12 071	4 569
Netherlands	1 102	9 252	23 370	32 715	19 635	19 360	20 812	8 515	5 929	1 214
Norway	20 199	76 720	17 400	36 302	26 218	512	5 307	1 098	4 462	-
Poland	3 709	-	-	5 685	6 368	2 934	3 085	6	-	-
Sweden	-	-	-	-	-	-	2 206	261	-	-
U.K. (England)	1	-	-	-	45	125	20	301	134	54
U.K. (N. Ireland)	1	-	-	-	3	6	1	1	6	2 <sup>c)</sup>
U.K. (Scotland)	103 530	99 537	107 638	120 800	107 475	85 395	53 351	25 238 <sup>c)</sup>	10 097 <sup>c)</sup>	3 <sup>c)</sup>
USSR	3	-	?	2 052	5 388	3 232	3 092	-	-	-
Unspecified catches	-	-	-	-	-	-	-	-	-	186
Total	179 004	221 825	181 749	248 080	209 564	141 269	111 420	48 568	34 388	6 028
Scottish juvenile herring and sprat fisheries in Moray Firth	1 385	5 666	10 242	7 219	13 003	2 454	313	205	1 502	28

<sup>\*)</sup> Preliminary figures

<sup>a)</sup> Figures supplied by Fiskirannsóknarstovan

<sup>b)</sup> Catches prior to 1976 mainly taken in Division VIIb and landed in Division VIa

<sup>c)</sup> Including by-catch in local sprat fishery (16 tonnes in 1977; 157 tonnes in 1978; 3 tonnes in 1979).

Table 34. 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 <sup>a)</sup>
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	8	-	220	2 725	1 002	-	-	-	3 955
1979*)	455	-	20	2 123	850	-	-	-	3 448

\*) Provisional

1) Including 123 tonnes for Bulgaria

Table 35. 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 <sup>a)</sup>
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	8	-	220	2 656	1 002	-	-	-	3 886
1979/80*	455	-	20	2 920	850	-	-	-	4 245

\*) Provisional

a) Including 123 tonnes for Bulgaria

Table 36. HERRING in Division VIIb,c. Nominal catches  
(tonnes) 1967-79.

(Data for 1967-78 from Bulletin Statistique)

Year	France	German Dem.Rep.	Germany Fed.Rep.	Ireland	Nether- lands	Poland	U.K.	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
1979 <sup>*)</sup>	-	-	-	14 341	724	-	-	-	15 065

<sup>\*)</sup> Provisional data.

Table 37.

HERRING. Total catches (tonnes) in North Irish Sea (Division VIIa), 1969-1979 (includes industrial catch)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*)</sup>
France	-	558	1 815	1 224	254	3 194	813	651	85	174	455 <sup>2)</sup>
Ireland	2 328	3 933	3 131	2 529	3 614	5 894	4 790	3 205	3 331	2 371	1 805
Netherlands	-	-	-	260	143	1 116	630	989	500	98	-
U.K.	9 821	17 912	21 861	23 337	18 587	27 489	18 244	16 401	11 498	8 432 <sup>1)</sup>	10 078 <sup>3)</sup>
USSR	-	-	-	-	-	945	26	-	-	-	-
Total	12 149	22 403	26 807	27 350	22 598	38 638	24 503	21 246	15 414	11 075	12 338

<sup>\*)</sup> Preliminary. <sup>1)</sup> Includes 68.5 tonnes of spring-spawned herring. <sup>2)</sup> No data basis for allocation to stock.

<sup>3)</sup> Additional unrecorded catch of 106 tonnes estimated.

Table 38.

HERRING. Total catch by stock in North Irish Sea, 1969 - 1979

Country	1969		1970		1971		1972		1973		1974		1975		1976		1977		1978		1979 <sup>*)</sup>	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
France	-	-	558	-	1 815	-	1 224	-	254	-	3 194	-	813	-	651	-	85	-	174	-	455	-
Ireland	-	2 328	-	3 933	-	3 131	-	2 529	-	3 614	-	5 894	-	4 790	-	3 205	-	3 331	-	2 371	-	1 805
Netherlands	-	-	-	-	-	-	260	-	-	143	-	1 116	-	630	-	989	-	500	-	98	-	-
U.K.	9 139	682	15 629	2 283	18 758	3 103	19 308	4 029	13 071	5 516	23 639	3 850	15 408	2 836	12 831	3 570	9 837	1 661	7 663	700	9 382	696
USSR	-	-	-	-	-	-	-	-	-	-	945	-	26	-	-	-	-	-	-	-	-	-
Total Manx	9 139		16 187		20 573		20 792		13 325		30 677		19 283		16 287		12 431		8 458		10 130	
Total Mourne	3 010		6 216		6 234		6 558		9 273		7 961		5 220		4 959		2 983		2 548		1 753	

Note: 1 - Manx stock, 2 - Mourne Stock <sup>\*)</sup> Preliminary

**Table 39.** SPRAT catches in the North Sea ('000 tonnes), 1968-1979.  
(Data provided by Working Group members.)

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>a)</sup>
<u>IVa West</u>												
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	0
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	6.8
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	6.8
<u>IVa East (North Sea stock)</u>												
Denmark	-	-	-	-	-	-	-	-	0.2	0.1	-	-
Norway	-	-	-	-	-	-	-	-	1.9	0.7	0.1	+
UK (Scotland)	-	-	-	-	-	-	-	-	+	0	-	-
Total	-	-	-	-	-	-	-	-	2.1	0.8	0.1	...
<u>IVb West</u>												
Belgium	-	-	-	-	-	-	-	-	+	0	-	-
Denmark	...	...	8.6	9.9	14.4	47.0	55.4	106.6	104.4	57.5	44.1	75.3 <sup>b)</sup>
Faroe Islands	-	-	-	-	-	-	4.0	30.0	42.9	1.8	-	2.8
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	47.8
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	12.9
UK (Scotland)	13.4	22.0	9.5	7.2	3.6	2.9	8.6	4.9	18.1	10.9	14.8	5.0
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	143.8

a) Preliminary figures as reported. b) IVb East and West. + = less than 0.1.  
... = No data available. - = Magnitude known to be nil.

/Cont'd.

Table 39 (continued)

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>a)</sup>
<u>IVb East</u>												
Denmark	18.1	18.5	16.2	19.9	28.8	93.9	104.0	215.2	201.1	126.8	161.0	191.5
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	-	3.8
Norway	-	-	-	-	-	-	-	-	5.1	0	29.8	27.4
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	222.7
<u>IVc</u>												
Belgium	0.4	0.4	0.6	0.1	0.1	0.2	+	+	-	0	-	-
Denmark	-	-	-	-	-	-	0.9	3.9	0.3	1.4	-	1.5
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	3.1
UK (England)	6.2	4.2	3.9	0.2	+	0.8	3.4	2.9	0.7	0.2	0.0	1.4
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	6.0
<u>Total North Sea</u>												
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	268.3
Faroe Islands	-	-	-	-	-	-	4.2	42.9	45.4	2.2	-	2.8
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	-	3.8
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	78.6
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	14.3
UK (Scotland)	26.4	34.4	13.3	22.2	33.4	52.3	49.8	14.3	30.8	37.8	31.7	11.8
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	379.6

a) Preliminary figures as reported. + = less than 0.1. ... = No data available. - = Magnitude known to be nil.

Table 40. Landings of sprat in Division IIIa and in Norwegian fjords in Division IVa  
(10<sup>-3</sup> tonnes)<sup>1)</sup>

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
1979	17.3	8.1	1.8	27.2	45.8	6.4	52.2	79.4	5.0	84.4

1) Data provided by Working Group members.

Table 41. Cod landings from the Skagerrak 1970-79<sup>1)</sup> (in tonnes).

Year	Denmark	Sweden	Norway	Others	Total
1970	3 459	1 964	882	35	6 340
1971	5 914	2 040	1 355	13	9 322
1972	6 959	1 925	1 201	22	10 107
1973	6 673	1 690	1 253	27	9 643
1974	6 694	1 380	1 197	92	9 363
1975	14 171	917	1 190	52	16 330
1976	18 847	873	1 241	466	21 427
1977	18 618	560	979	675	20 832
1978	23 614	592	1 442	260	25 908
1979 <sup>*)</sup>	14 007 <sup>2)</sup>	1 279	1 745	123	17 154

1) Data provided by Working Group members

\*) Preliminary

2) The fishery closed: 26/2 - 5/4  
1/5 - 13/5  
1/6 - 31/7  
10/8 - 30/9

Table 42. Cod landings from the Kattegat 1970-79<sup>1)</sup> (in tonnes).

Year	Denmark	Sweden	Germany, Fed. Rep. of <sup>2)</sup>	Total
1970	9 841	4 015	21	13 877
1971	11 748	3 962	22	15 732
1972	13 451	3 957	34	17 442
1973	14 913	3 850	74	18 837
1974	17 043	4 717	120	21 880
1975	11 749	3 642	94	15 485
1976	12 986	3 242	47	16 275
1977	16 668	3 400	51	20 119
1978	10 293	2 893	204	13 390
1979 <sup>*)</sup>	11 045 <sup>3)</sup>	3 763	51	14 859

1) Data provided by Working Group members

2) Landing statistics incompletely split on the Kattegat and the Skagerrak. The figures are estimated by the Working Group.

3) The fishery closed: 26/2 - 5/4  
2/6 - 31/7

\*) Preliminary



Table 43. Nominal landings of Haddock from the Skagerrak and the Kattegat, in tonnes.

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Belgium	-	-	-	-	-	-	-	181	118	25	28
Denmark	982	810	2101	2816	2832	4417	5015	7488	6907	4978	4124
German Dem.Rep.	..a)	..a)	..a)	..a)	1	-	-	1	-	-	-
Germany, Fed. Rep.	22	46	9	20	+	+	12	1	16	11	1 <sup>d)</sup>
Netherlands	-	-	-	-	-	-	5	59	81	20	5 <sup>e)</sup>
Norway	52	73	139	153	242	175	122	191	156	168	236
Sweden	..b)	..b)	..b)	..b)	..b)	..b)	921	1075	2485	1435 <sup>c)</sup>	325
U.K. (England & Wales)	-	13	-	-	16	26	40	59	-	-	-
U.K. (Scotland)	-	-	-	-	-	+	-	-	-	-	-
Total	1056	942	2249	2989	3091	4618	6115	9055	9763	6637	4719

a) IIIa included in IV

b) IIIa included in IVa

c) IIIa includes IVa, b.

d) Derived from final catch figures Jan-June and estimates for Jul-Dec.

e) Jan-Oct.

Table 44. Whiting landings from Division IIIa (from Bulletin Statistique), in tonnes.

Year	Denmark	Norway	Sweden	Others	Total
1970	13 115	15	IIIa incl. in IV a	-	13 130
1971	13 971	17	↓	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	55	973	41	19 185
1978	48 216	58	318	32	48 624
1979 <sup>x)</sup>	16 943 <sup>1)</sup>	52	990	14	17 999

x) Preliminary

1) The fishery closed:  
17/3-31/3

Table 45.      Plaice catches from the Skagerrak<sup>1)</sup>  
(in tonnes)

Year	Denmark	Sweden	Total
1970	3 219	57	3 276
1971	3 741	64	3 805
1972	5 095	70	5 165
1973	3 871	80	3 951
1974	3 429	70	3 499
1975	4 888	77	4 965
1976	9 251	81	9 332
1977	12 855	142	12 997
1978	13 383	94	13 477
1979	11 045	105	11 150

1) Data provided by Working Group members.

Table 46.      Plaice catches from the Kattegat<sup>1)</sup>  
(in tonnes)

Year	Denmark	Sweden	Total
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
1979	9 756	281	10 037

1) Data provided by Working Group members.

Table 47. Plaice catches. Kattegat and Skagerrak combined  
(Division IIIa). Denmark and Sweden from national  
sources, other countries from Bulletin Statistique.

Year	Denmark	Sweden	Other Countries	Total
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	5 331 <sup>1)</sup>	24 454
1977	24 323	442	12 268 <sup>1)</sup>	37 033
1978	26 156	462	4 160 <sup>1)</sup>	34 938
1979*)	20 801	386	2 185 <sup>1)</sup>	23 372

\*) Preliminary figures.

- 1) Including Dutch catches. A large part of these is assumed to have been taken from the North Sea (1976: 4 575 tonnes, 1977: 11 384 tonnes, 1978: 3 680 tonnes, 1979 Jan-Oct: 1 532 tonnes).

Table 48. Nominal catch (in tonnes) of COD in Sub-area IV, 1970-1979 (Data for 1970-78 as officially reported to ICES)

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*)
Belgium	8 076	19 334	21 133	11 741	10 253	7 566	7 483	10 346	17 473	12 370
Denmark	40 017	68 179	72 520	47 950	54 207	46 344	53 277	42 582	41 858	47 773
Faroe Islands	78	123	284	803	416	732	448	260	56	78
France	16 058	24 769	24 038	13 247	7 275	8 667	8 079	7 511	11 944	11 742
German Dem. Rep. <sup>a)</sup>	3	18	122	343	132	223	69	21	75	27
Germany, Fed.Rep.of	20 093 <sup>b)</sup>	46 647	49 431	21 410	17 089	16 457	24 445	22 663	37 040	20 454
Iceland	+	1	-	-	+	-	-	-	-	-
Ireland	-	-	-	-	-	-	98	136	174	-
Netherlands	25 212	46 614	47 634	25 758	24 029	23 263	21 835	29 903	48 817	34 027
Norway <sup>c)</sup>	5 374	7 732	4 377	4 831	2 481	1 528	1 877	1 449	2 747	3 277
Poland	219	178	189	1 551	4 750	2 991	2 961	381	115	142
Spain	-	-	91	90	80	63	14	-	-	-
Sweden	2 946	3 060	2 887	2 534	2 071	900	597	36	...e)	299
UK (England & Wales)	38 464	55 525	62 503	47 327	39 857	33 615	46 475	35 424	59 127	54 896
UK (Scotland)	30 079	37 229	55 190	48 844	39 887	37 308	39 597	34 406	41 984	42 833
USSR	32 147	5 153	774	2 497	2 667	6 796	6 187	-	17	12
Total IV	218 766	314 562	341 173	228 926	205 194	186 453	213 442	185 118	261 427	227 930
Total IVa	73 627	61 368	74 768	64 017	66 309	58 343	68 352	55 623	43 357	
Total IVb	110 271	184 957	215 160	134 953	114 087	107 227	126 218	100 191	164 388	
Total IVc	34 868	68 237	51 245	29 956	24 798	20 883	18 872	29 304	53 682	
W.G. Total Catch <sup>d)</sup>					206 456	189 151	214 926	186 133	272 787	267 736

\*) Prov. figs. a) 1970-72 incl. IIIa b) Incl. misc. products c) Figs. from Norway do not incl. Cod caught in Rec.2 fisheries

d) Incl. discards  
e) Incl. in IIIa

Table 49. Nominal catch (in tonnes) of HADDOCK in Sub-area IV, 1970-1979  
(Data for 1970-1978 as officially reported to ICES).

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*)</sup>
Belgium	3 691	971	1 601	2 385	1 137	2 209	2 166	2 293	1 295	466
Denmark	158 276	31 043	34 858	13 118	44 342	32 930	46 899	20 069	8 093	7 849
Faroe Islands	-	-	5	1 198	435	267	183	385	12	27
France	10 392	8 738	7 814	4 695	4 020	4 646	5 500	6 914	5 122	6 548
German Dem. Rep. <sup>a)</sup>	2	3	90	22	8	44	20	8	37	5
Germany, Fed. Rep. of	5 075	3 045	4 020	4 587	3 478	2 396	3 433	3 744	2 589	2 349
Iceland	+	1	-	-	-	-	-	-	-	-
Ireland	-	-	-	-	-	-	31	53	101	-
Netherlands	8 278	6 914	5 188	3 185	3 035	1 901	1 728	1 598	857	735
Norway <sup>b)</sup>	963	1 063	1 146	5 611	5 954	331	367	374	690	908
Poland	-	-	38	2 553	3 001	1 485	1 155	485	62	106
Spain	-	-	-	101	210	-	-	-	-	-
Sweden <sup>c)</sup>	8 704	5 857	5 305	4 550	3 098	2 083	2 455	113	-	896
U.K. (Engl.+Wales)	19 500	16 648	20 827	16 586	10 798	11 499	17 238	17 167	12 200	10 773
U.K. (Scotland)	112 952	121 539	96 197	88 132	71 679	64 686	80 576	89 465	58 406	54 155
U.S.S.R.	344 000	62 398	36 467	49 356	42 234	49 686	42 852	8 010	54	49
Total IV	671 833	258 220	213 556	196 079	193 429	174 163	204 603	150 678	89 518	84 866
Total IVa	455 649	197 306	135 095	131 819	128 607	110 848	138 591	116 577	57 967	
Total IVb	212 646	58 270	75 325	62 288	63 695	62 761	65 594	34 030	31 457	
Total IVc	3 538	2 644	3 136	1 972	1 127	554	418	71	94	
W.G. Total Catch <sup>d)</sup>	709 852	302 048	277 863	230 656	364 750	352 810	290 240	187 505	139 330	123 956

<sup>\*)</sup>Provisional figures; <sup>a)</sup>1970-1972 includes IIIa; <sup>b)</sup>Figures from Norway do not include haddock caught in Rec. 2. fisheries;

<sup>c)</sup>1970-1974 includes IIIa; <sup>d)</sup>Includes discards.

**Table 50.** Nominal catch (in tonnes) of WHITING in Sub-area IV, 1970-1979  
(Data for 1970-1978 as officially reported to ICES)

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*
Belgium	2 799	2 108	2 745	3 387	3 156	3 279	2 640	3 275	3 304	3 561
Denmark	102 698	55 618	50 109	73 928	109 654	61 941	116 973	46 479	15 741	41 890
Faroe Islands	-	-	-	1 453	1 126	764	1 262	472	42	7
France	25 842	16 668	19 822	20 353	19 825	20 079	19 557	17 592	22 525	22 558
German Dem.Rep.	-	-	-	5	-	3	18	-	22	3
Germany, Fed. Rep.	392	233	264	403	454	446	302	461	348	1 044
Ireland	-	-	-	-	-	-	4	9	38	-
Netherlands	10 115	6 322	7 613	8 811	12 057	14 078	12 274	9 406	11 030	10 981
Norway <sup>a)</sup>	43	25	28	1 527	4 990	55	71	33	70	55
Poland	-	-	-	7	1 002	888	509	445	8	3
Spain	-	-	107	119	110	65	18	-	-	-
Sweden <sup>b)</sup>	820	616	596	2 328	2 440	255	153	341	...	31
U.K.(Engl. + Wales)	3 398	4 158	3 789	4 592	5 519	5 246	5 112	6 185	7 542	7 581
U.K. (Scotland)	21 080	26 755	23 846	20 756	25 274	27 696	26 167	33 017	42 779	44 840
U.S.S.R.	14 319	541	613	3 522	2 978	5 098	5 612	2 413	-	-
Total IV	181 506	113 044	109 532	141 191	188 585	140 166	190 672	120 128	103 449	132 554
Total IVa	32 185	23 451	32 932	31 104	81 693	75 444	100 001	61 499	42 843	
Total IVb	126 024	70 728	66 789	96 678	87 842	41 930	69 908	42 911	40 943	
Total IVc	23 297	18 865	9 811	13 409	19 050	22 792	20 763	15 718	19 663	
Working Group Total Catch <sup>c)</sup>	305 259	163 156	216 334	272 345	280 868	335 982	264 632	201 648	191 312	275 156

\*) Provisional figures

a) Figures from Norway do not include Whiting caught in Rec. 2 fisheries

b) 1970-1974 includes IIIa, 1978 included in IIIa

c) Includes discards

Table 51. Nominal catch (in tonnes) of COD in Division VIa, 1970-79  
(Data for 1970-78 as officially reported to ICES)

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*)</sup>
Belgium	61	41	39	75	174	49	71	-	-	4
Denmark	-	-	-	-	-	7	-	-	-	-
Faroe Islands	-	-	-	7	13	3	39	43	-	-
France	1 161	1 054	2 360	3 445	3 678	3 546	5 611	3 583	4 499	4 436
German Dem.Rep.	-	-	-	-	-	2	-	-	-	-
Germany, Fed.Rep.of	136 <sup>b)</sup>	46	3	15	6	12	1	3	31	63 <sup>a,c)</sup>
Iceland	-	+	-	-	-	-	-	-	-	-
Ireland	1 135	888	686	583	883	1 141	1 341	984	1 214	2 237
Netherlands	5	10	21	4	5	5	11	5	3	24
Norway	-	-	-	13	14	17	22	29	40	35
Poland	199	154	491	184	175	68	18	-	-	-
Spain	-	-	102	208	137	180	15	20 <sup>a)</sup>	108 <sup>a)</sup>	-
UK (England + Wales)	2 602	2 414	3 371	2 074	2 467	2 217	2 742	2 434	2 082	2 348
UK (Scotland)	7 382	5 732	7 018	5 645	6 084	5 806	7 475	5 513	5 539	6 929
UK (N. Ireland)	1	2	2	3	3	3	13	5	5	2
USSR	-	325	606	7	13	107	46	-	-	-
Total VIa	12 682	10 666	14 699	12 263	13 652	13 163	17 405	12 619	13 521	16 078
Working Group total catch <sup>c)</sup>									14 247	16 110

\*) Preliminary

a) Includes VIb

b) Including miscellaneous products

c) Includes discards.



Table 52. Nominal catch (in tonnes) of COD in Division VIb, 1970 - 1979  
(Data for 1970 - 1978 as officially reported to ICES).

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*)</sup>
Belgium	-	-	-	-	-	1	-	-	-	-
Faroe Islands					5	3	22	40	10	92
France	745	-	1 659	320	1 128	4	4	3	1	1
Germany, Fed. Rep. of					-	-	-	-	-	...
Ireland									3	-
Norway	-	-	-	-	3	-	8	3	69	108
Poland	-	-	-	8	-	-	-	-	-	
Spain	-	-	-	-	-	-	-	... a)	... a)	
U.K. (Engl.+Wales)	28	37	32	1	-	28	77	89	285	129
U.K. (Scotland)	102	57	175	128	39	98	61	33	384	198
U.S.S.R.	-	-	701	26	-	110	1 398	-	-	-
Total VIb	875	94	2 567	483	1 175	243	1 571	168	752	528

<sup>\*)</sup> Preliminary.

<sup>a)</sup> Included in VIa.

Table 53. Nominal catch (in tonnes) of HADDOCK in Division VIa, 1970-1979  
(Data for 1970-1978 as officially reported to ICES)

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*
Belgium	13	9	44	45	98	23	45	-	-	2
Denmark	-	-	-	-	-	-	13	-	-	-
Faroe Islands	-	-	-	2	1	-	-	-	-	-
France	785	2 354	5 014	5 141	3 979	2 328	3 026	3 401	4 255	4 788
German Dem.Rep.	-	10	87	-	-	9	-	-	-	-
Germany, Fed. Rep.	9	15	7	15	18	3	30	+	20	5
Iceland	-	+	-	-	-	-	-	-	-	-
Ireland	2 720	4 316	3 982	2 631	1 715	599	1 115	616	441	877
Netherlands	126	78	205	169	63	19	30	28	13	2
Norway	-	-	-	-	-	-	3	7	13	11
Poland	-	10	-	402	97	20	-	-	-	-
Spain	-	-	101	497	540	-	-	-	-	-
Sweden	-	-	-	-	-	-	-	-	-	-
U.K. (Engl.+Wales)	1 785	1 491	2 393	2 187	1 512	1 214	1 971	3 827	2 805	1 654
U.K. (Scotland)	28 724	33 087	27 730	17 631	9 583	8 973	11 992	11 422	9 629	7 461
U.K. (N. Ireland)	12	2	1	-	-	-	-	-	-	-
U.S.S.R.	4	4 927	1 480	110	364	495	533	-	-	-
Total VIa	34 178	46 299	41 044	28 830	17 970	13 683	18 758	19 301	17 176	14 800
Working Group Total Catch								19 301	17 178	14 199

\* Preliminary

Table 54. Nominal catch (in tonnes) of HADDOCK in Division VIb, 1970-1979  
(Data for 1970-1978 as officially reported to ICES)

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*
Belgium	-	-	-	-	-	-	33	-	-	-
Faroe Islands	-	-	-	-	2	1	8	3	11	20
France	12	182	1 527	600	353	21	4	4	3	18
Ireland	-	-	-	-	-	-	-	-	61	-
Norway	-	-	-	-	-	-	-	+	4	11
Poland	-	-	-	54	-	-	-	-	-	-
U.K. (Engl.+Wales)	220	117	27	1	-	5	2 111	2 694	2 365	1 654
U.K. (Scotland)	608	313	616	72	22	71	640	297	2 060	548
U.S.S.R.	-	9	7 304	3 291	48 911	49 830	40 447	-	-	-
Total VIb	840	621	9 474	4 018	49 288	49 928	43 243	2 998	4 504	2 251

\* Preliminary

Table 55. Nominal catch (in tonnes) of WHITTING in Divisions VIa, 1970-1979  
(Data for 1970-1978 as officially reported to ICES)

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*)</sup>
Belgium	12	9	7	5	10	1	14	-	-	-
Denmark	-	-	-	121	-	-	-	-	119	-
Faroe Islands	-	-	-	5	1	30	2	-	-	-
France	1 851	2 507	1 662	2 777	2 983	2 763	3 655	3 395	3 610	2 640
German Dem. Rep.	-	-	-	-	-	-	31	-	-	-
Germany, Fed.Rep.of	-	+	148	127	80	62	1	1	2	4
Iceland	-	-	-	-	-	-	-	-	-	-
Ireland	2 420	1 178	1 122	2 117	2 431	2 429	3 255	2 752	2 080	2 785
Netherlands	24	28	40	57	23	85	255	78	23	16
Norway	-	-	-	-	-	-	1	-	-	-
Poland	-	2	-	10	9	-	-	-	-	-
Spain	-	-	1 397	1 540	1 479	1 871	821	763 <sup>a)</sup>	-	-
U.K. (Engl.+Wales)	76	66	102	91	112	132	244	520	669	320
U.K. (Scotland)	6 839	11 435	10 707	9 796	9 929	12 668	16 658	9 873	8 174	10 614
U.S.S.R.	-	-	128	-	-	-	-	-	-	-
Total VIa	11 222	15 225	15 313	16 646	17 057	20 041	24 937	17 382	14 677	16 379
Working Group total catch								17 384	14 677	16 379

<sup>\*)</sup> Preliminary

<sup>a)</sup> Includes VIb

Table 56. Nominal catch (in tonnes) of WHITTING in Division VIb, 1970-1979  
(Data for 1970-1978 as officially reported to ICES)

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*)</sup>
Faroe Islands	-	-	-	-	1	-	-	+	-	-
France	1 265	800	69	62	-	-	-	-	-	-
Ireland	-	-	-	-	-	-	-	-	1	-
Spain	-	-	-	-	-	-	-	... b)	-	-
U.K. (Engl.+Wales)	+	+	+	+	-	-	3	2	5	1
U.K. (Scotland)	12	7	12	1	+	12	15	5	24	1
Total VIb	1 277	807	81	63	1	12	18	7	30	2

<sup>x)</sup> Preliminary

<sup>b)</sup> Included in VIa

Table 57. Nominal catch (in tonnes) of COD in Divisions VIId and VIIe, 1970 - 1979.  
(Data for 1970 - 1978 as officially reported to ICES).

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*)</sup>
Belgium	132	213	124	93	67	59	65	53	435	696
Denmark	-	-	-	-	-	2 718	1 506	1 120	2 160	1 986
France	2 139	4 544	2 658	1 425	3 099	2 143	1 646	5 185	8 044	4 632
Germany, Fed. Rep. of	-	+	-	-	-	-	-	-	-	-
Netherlands	3	13	30	2	4	+	2	1	+	-
Poland	-	-	7	13	6	-	-	-	-	-
U.K. (Engl.+Wales)	279	662	717	499	260	159	142	581	654	485
U.S.S.R.			8	45	-	3	4	-	-	-
Total VIId,e	2 553	5 432	3 544	2 077	3 436	5 082	3 365	6 940	11 293	7 799

<sup>\*)</sup> Preliminary.

Table 58. Nominal catch (in tonnes) of COD in Divisions VIIb,c and VIIg-k, 1970-1979  
(Data for 1970-1978 as officially reported to ICES).

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*)</sup>
Belgium	223	295	77	323	167	116	159	85	52	45
Faroe Islands	-	-	-	256	-	-	-	-	-	-
France	4 320	5 570	4 168	2 791	2 302	2 877	3 196	1 972	2 192	2 838
Germany, Fed. Rep. of	2	2	-	1	-	-	-	-	3 <sup>a)</sup>	-
Ireland	537	347	352	568	283	474	506	315	323	530
Netherlands	38	81	22	14	9	54	46	291	279	-
Norway	-	-	-	-	-	1	-	+	-	-
Poland	59	33	130	75	39	19	40	6	-	2
Spain	-	-	137	301	232	588	1 140	51	11	-
U.K. (Engl.+Wales)	72	13	56	60	26	73	44	33	28	34
U.K. (Scotland)	-	-	-	-	-	-	-	-	2	1
U.S.S.R.	116	24	139	10	72	134	203	-	-	-
Total VIIb,c, g-k	5 367	6 365	5 081	4 399	3 130	4 336	5 234	2 753	2 890	3 450

<sup>\*)</sup> Preliminary

<sup>a)</sup> Catch in VIIg only.

Table 59. Nominal catch (in tonnes) of HADDOCK in Divisions VIIId and VIIe, 1970-1979  
(Data for 1970-1978 as officially reported to ICES)

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*)</sup>
Belgium	3	1	2	1	+	+	+	1	-	-
Denmark	-	-	-	-	-	-	-	2	22	21
France	295	97	224	208	487	868	405	438	356	315
Germany, Fed. Rep. of	-	1	-	-	-	+	-	-	-	-
Ireland	-	-	-	-	-	-	-	4	-	-
Netherlands	5	-	9	1	-	1	-	-	-	-
Poland	-	-	-	12	-	-	-	-	-	-
U.K. (Engl.+Wales)	118	71	166	135	113	99	45	29	22	51
U.S.S.R.	-	-	10	2	33	3	-	-	-	-
Total VIIId,e	421	170	411	359	633	971	450	474	400	387

<sup>\*)</sup> Preliminary.

Table 60. Nominal catch (in tonnes) of HADDOCK in Divisions VIIb,c and VIIg-k, 1970-1979  
(Data for 1970-78 as officially reported to ICES)

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*)</sup>
Belgium	31	23	45	65	35	33	19	13	5	-
Faroe Islands	-	-	-	3	-	-	-	-	-	-
France	3 823	3 652	6 456	5 524	6 057	4 583	3 726	2 244	1 479	1 851
Germany, Fed. Rep. of	1	1	-	1	-	+	3	-	-	-
Ireland	783	947	1 103	1 348	829	507	287	153	111	150
Netherlands	98	66	56	12	2	4	14	1	-	+
Poland	-	3	-	62	143	-	-	-	-	-
Spain	-	-	733	890	1 100	-	-	294	-	-
U.K. (Engl.+Wales)	46	25	107	24	39	46	24	18	13	20
U.K. (Scotland)	-	-	-	-	-	-	-	-	8	22
U.S.S.R.	27	136	253	24	456	1 290	183	-	-	-
Total VIIb,c and g-k	4 809	4 853	8 753	7 953	8 661	6 463	4 256	2 723	1 616	2 043

<sup>\*)</sup> Preliminary.

Table 61. Nominal catch (in tonnes) of WHITING in Division VIIId and VIIe in 1970-1979  
(Data for 1970-1978 as officially reported to ICES)

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*)</sup>
Belgium	41	25	19	38	39	70	103	36	85	88
Denmark	-	-	-	-	-	-	18	-	1	2 572
France	4 029	2 999	3 121	5 050	7 917	10 060	8 390	8 886	8 010	7 374
Netherlands	2	1	21	42	12	14	5	1	2	1
Ireland	-	-	-	-	-	-	-	11	12	-
U.K. (Engl.+Wales)	753	567	515	498	579	1 255	1 504	1 342	1 038	930
Germany, Fed. Rep. of	-	+	-	-	25	1	-	-	-	-
U.S.S.R.	-	-	-	19	-	-	-	-	-	-
Total VIIId,e	4 825	3 592	3 676	5 647	8 572	11 400	10 020	10 276	9 148	10 665

<sup>\*)</sup> Preliminary

Table 62. Nominal catch (in tonnes) of WHITING in Divisions VIIb,c and VIIg-k  
(Data for 1970-1978 as officially reported to ICES)

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*)</sup>
Belgium	113	54	20	124	75	83	97	60	37	22
France	3 066	4 893	5 695	4 035	4 331	3 637	4 731	3 962	3 848	3 980
Germany, Fed. Rep. of	1	-	-	+	-	2	-	1	45	-
Ireland	712	482	1 141	1 894	1 641	2 562	1 980	1 201	1 172	2 674
Netherlands	73	100	377	2 080	915	66	112	86	63	2
Poland	-	-	-	14	-	-	-	-	-	-
Spain	-	-	1 491	1 121	1 367	2 974	2 772	-	-	-
U.K. (Engl.+Wales)	80	17	34	21	15	61	21	26	38	22
U.K. (Scotland)	-	-	-	-	-	-	-	2	1	1
U.S.S.R.	-	-	3	16	-	64	2	-	-	-
Total VIIb,c and g-k	4 045	5 546	8 761	9 305	8 344	9 449	9 715	5 338	5 204	6 701

<sup>\*)</sup> Preliminary



Table 63. Nominal catch (tonnes) of SOLE in Sub-area IV, 1968-1979.  
( Data by countries for 1968-78 from Bulletin Statistique)

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*)</sup>
Belgium	3 874	2 703	1 880	2 227	1 834	1 485	1 130	1 383	1 456	1 673	1 728	2 043
Denmark	1 590	842	525	1 149	671	957	705	682	574	348	465	279
France	273	364	265	403	206	250	195	297	598	308	346	309
Germany, Fed.Rep. of	1 138	692	318	600	258	336	173	233	192	316	467	242
Netherlands	25 175	22 032	16 024	18 776	17 662	15 883	15 343	15 242	11 044	10 873	6 749	7 646
Poland	-	-	-	-	-	-	-	-	5	-	-	-
Sweden <sup>a)</sup>	...	-	13	12	13	13	12	+	-	-	-	-
U.K. (Engl.+Wales)	1 129	927	660	485	449	387	340	426	455	492	626	600
U.K. (Scotland)	-	-	1	2	+	1	...	-	2	2	1	+
Total	33 179	27 560	19 686	23 654	21 093	19 312	17 898	18 263	14 326	14 012	10 382	11 119
Unreported landings								2 500	3 000	4 000	9 900	11 354
Grand Total								20 763	17 326	18 012	20 282	22 473

<sup>\*)</sup> Preliminary data

<sup>a)</sup> Figures include catches made in Division IIIa. The 1968 catch was included in 148 tonnes of Various Pleuronectiforms.

**Table 64.** North Sea PLAICE  
Nominal catch (tonnes) in Sub-area IV, 1968-1979  
(Data by countries for 1968-78 from Bulletin Statistique)

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*)
Belgium	5 576	4 476	4 360	5 073	5 531	6 133	6 202	6 154	4 574	6 547	6 036	7 687
Denmark	30 369	35 227	32 807	22 278	24 494	23 266	19 814	22 731	25 612	20 900	21 285	25 686
Faroe Islands	-	-	-	-	-	1	-	1	-	1	-	-
France	1 310	1 330	1 406	1 380	1 062	1 355	519	536	497	598	750	730
Germany, Fed.Rep.of	5 250	5 071	5 519	3 296	4 318	5 451	3 233	4 040	3 654	5 423	4 674	4 260
Netherlands	33 236	39 420	46 080	44 502	52 048	57 948	54 438	51 293	46 457	42 307	28 219	38 376
Norway	38	26	22	18	19	15	13	13	20	16	13	10
Poland	-	-	-	-	-	1	-	153	40	-	-	-
Sweden <sup>a)</sup>	776	772	608	588	626	432	431	35	28	-	-	7
UK (England & Wales)	29 569	30 349	34 839	32 576	31 642	30 400	23 854	20 290	23 789	27 623	27 862	25 822
UK (Scotland)	5 810	4 981	4 703	4 210	3 410	4 815	4 002	3 266	3 310	3 622	3 877	4 128
USSR	-	-	-	-	-	397	39	-	-	-	-	-
Total	111 934	121 652	130 344	113 921	123 150	130 214	112 545	108 512	107 981	107 037	92 716	106 706
Unreported landings <sup>b)</sup>									5 000	11 384	21 150	36 624
Grand Total									112 981	118 421	113 866	143 330

- \*) Preliminary  
a) 1968-74 includes Division IIIa.  
b) Estimated by the Working Group

Table 65. English Channel SOLE  
Nominal catch (tonnes) in Divisions VIIId and VIIe, 1968-1979.

Year	Belgium		Denmark	France		Netherlands <sup>2)</sup>	United Kingdom		Total	
	VIIId	VIIe	VIIe	VIIId	VIIe	VIIId,e	VIIId	VIIe	VIIId	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 <sup>1)</sup>	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	241	4	20 <sup>3)</sup>	782	384	-	366	453	1 389	861
1979 <sup>*)</sup>	312	1	-	893	429	-	378	658	1 583	1 088

\*) Preliminary figures

1) Figures amended from 1976 Working Group Report

2) Mainly Division VIIId

3) Includes Division VIIId

Note: Catches for Divisions VIIId and VIIe combined were taken from Bulletin Statistique as were the separate catches in 1975-78.

The Divisions VIIId and VIIe separate catches for previous years were obtained from national statistics.

Table 66. English Channel PLAICE  
Nominal catch (tonnes) in Divisions VIId and VIIe, 1962-1979

Year	Belgium		Denmark		France		Netherlands	U.K. (England & Wales)		Total	
	VIId	VIIe	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 <sup>1)</sup>		-	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	147	5	1 <sup>2)</sup>	-	1 439	323	-	376	312	1 963	640
1977	149	3	81 <sup>2)</sup>	-	1 714	336	-	302	363	2 246	702
1978	161	3		156 <sup>3)</sup>	1 810	314	-	349	467	2 320	940
1979 <sup>*)</sup>	218	1		27 <sup>3)</sup>	2 095	316	-	292	516	2 605	860

\*) Preliminary figures as reported

1) Figure from Revue des Travaux de l'Institut des Pêches maritimes raised to round fresh weight

2) Includes VIIe

3) Includes VIId

Note: All combined VIId,e figures and the 1975-78 data are from Bulletin Statistique. All others from national statistics.

Table 67. Nominal catch (tonnes) of COD in Division VIIa, 1969-1979.

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*)
Belgium	272	332	390	348	276	409	282	257	135	144	173
France	563	1 282	2 575 <sup>a)</sup>	2 024	2 507	2 601	2 623	1 938	1 370	1 022	1 090
Ireland	2 176	1 574	2 800	2 275	4 224	3 276	3 477	4 815	3 862	3 128	3 746
Netherlands	-	4	148	58	35	113	53	87	32	15	12
UK (Engl.&Wales)	3 445	1 710	2 451	2 856	3 158	2 463	2 132	1 815	1 186	875	980
UK (N. Ireland)	1 380	1 267	1 112	1 522	1 537	1 279	1 153	1 175	1 409	1 064	1 898
UK (Isle of Man)	...	...	...	...	...	...	...	...	...	...	354
UK (Scotland)	131	88	64	90	50	49	70	91	60	79	118
Total	7 967	6 257	9 540	9 173	11 787	10 190	9 790	10 178	8 054	6 328	8 371
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	8 371

\*) Preliminary

a) Includes Division VIIIf

Table 68. Nominal catch (tonnes) of WHITING in Divisions VIIa, 1970-79  
(Data by countries for 1970-78 as officially reported to ICES)

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*)
Belgium	159	154	38	102	94	99	68	63	51	42
France	1 312	3 172	2 805	3 101	2 700	2 784	2 985	1 952	2 098	1 897
Ireland	1 282	2 306	2 188	3 414	4 184	3 946	5 055	4 821	4 562	3 847
Netherlands	+	23	5	12	52	52	56	24	12	11
UK (England & Wales)	706	810	639	1 224	685	617	635	1 008	1 105	842
UK (N. Ireland	1 314	1 899	1 976	2 437	2 045	2 280	3 290	2 692	3 089	2 946
UK (Scotland)	31	19	29	47	52	54	104	161	152	154
UK (Isle of Man)	...	...	...	....	...	...	...	...	...	372
USSR	-	-	-	-	7	-	-	-	-	-
Total	4 804	8 383	7 680	10 337	9 819	9 832	12 193	10 721	11 069	10 111
Total figures used by the Working Group for assessment purposes:	4 667	6917	7 445	9 972	9 364	9 275	11 651	10 204	10 404	9 892
Industrial catches total (Ireland only):	2 198	2 531	1 231	744	283	353	425	760	927	-

\*) Preliminary

Table 69. Nominal catch (tonnes) of PLAICE in Division VIIa, 1970-1979  
(Data for 1970-1978 as officially reported to ICES)

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*
Belgium	305	175	179	221	247	248	136	110	109	142
France	250	-	440	500	132	134	126	141	110	135
Ireland	678	1 080	909	1 079	891	884	1 032	953	1 025	980
Netherlands	8	61	48	42	47	75	73	24	15	18
UK (England & Wales)	1 869	2 744	3 366	3 002	2 240	2 544	1 945	1 422	1 792	1 839
UK (Isle of Man)	...	...	...	...	...	...	...	...	...	52
UK (N. Ireland)	184	132	134	142	104	125	120	165	173	161
UK (Scotland)	58	92	89	73	54	53	52	89	89	106
USSR	-	-	-	-	1	-	-	-	-	-
Total	3 352	4 284	5 165	5 060	3 716	4 063	3 484	2 904	3 313	3 433
Total figures used by Working Group for stock assessment:	3 583	4 232	5 119	5 060	3 715	4 063	3 473	2 904	3 231	3 390

\*) Preliminary

Table 70.A    PLAICE in Divisions VIIIf and g. Nominal catches (tonnes) 1970 - 1979.

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*)
Belgium	369	326	217	309	270	195	307	214	196	171
France	165	213	320	185	218	413	360	365	527	467
Ireland	19	74	46	39	20	50	49	28	45	49
Netherlands	-	-	-	16	-	2	-	-	-	-
UK (England + Wales)	552	568	413	398	214	227	153	150	152	176
USSR	-	-	-	4	-	1	-	-	-	-
Total	1 105	1 181	996	951	722	888	869	757	920	863

\*) Preliminary

Table 70.B

Division	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*)
VIIg	276	434	372	408	358	419	555	424	528	478
VIIIf	829	747	624	539	364	468	314	333	392	385
VIIIf + g	1 105	1 181	996	947	722	887	869	757	920	863

\*) Preliminary



Table 71. Irish Sea SOLE. Nominal catches (tonnes) 1970 - 1979

(Data for 1970-1978 as officially reported to ICES)

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*
Belgium	1 142	883	561	793	664	805	674	566	453	779
France	115	45	38	12	54	59	72	39	65	32
Ireland	25	45	50	27	28	24	74	84	127	130
Netherlands	235	552	514	281	320	234	381	227	177	280
UK (Engl. & Wales)	267	316	238	258	218	281	195	160	189	290
UK (N. Ireland)	24	40	40	46	23	24	49	49	57	47
UK (Scotland)	1	1	9	11	...	15	18	21	30	38
UK (Isle of Man)	...	...	...	...	...	...	...	...	...	33
Total	1 809	1 882	1 450	1 428	1 307	1 442	1 463	1 146	1 098	1 629

\*) Preliminary

Table 72.A Celtic Sea SOLE (Divisions VIIf and VIIg). Nominal catch (tonnes) 1970-1979 by country

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*
Belgium	1 003	989	546	822	914	663	1 054	779	506	693
France	386	731	587	435	75	133	181	80	160	153
Ireland	4	6	4	2	2	5	10	2	2	7
Netherlands	-	-	7	4	15	2	7	7	-	-
UK (Engl. & Wales)	164	135	134	128	99	116	99	93	112	101
Total	1 557	1 861	1 278	1 391	1 105	919	1 351	961	780	954

\*) Preliminary

Table 72.B Total nominal catch of SOLE (tonnes) in Divisions VIIg and VIIf for 1970-1979.

Division	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*
VIIg	727	1 095	730	613	442	354	831	595	436	530
VIIIf	830	766	548	778	663	565	520	366	344	424
VIIIf + VIIg	1 557	1 861	1 278	1 391	1 105	919	1 351	961	780	954

\*) Preliminary

Table 73. Nominal catch (tonnes) of COD in Divisions VIIIf and VIIg 1971-79.

Country	1971	1972	1973	1974	1975	1976	1977	1979	1979 <sup>*)</sup>
Belgium	807	394	524	197	377	226	107	88	170
France	3 330	2 814	2 229	1 770	2 472	3 351	2 088	2 567	3 150
Ireland	28	27	64	24	15	13	17	30	57
Netherlands	-	-	-	-	-	-	-	-	-
UK(Engl.&Wales)	298	328	196	153	127	92	59	67	75
USSR		61	30		30	1			
Total	4 463	3 624	3 043	2 144	3 021	3 683	2 271	2 752	3 452

<sup>\*)</sup> Preliminary

Table 74. Nominal catch (tonnes) of WHITING in Divisions VIIIf and VIIg 1971-79.

Country	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*)</sup>
Belgium	194	87	190	72	216	162	97	66	91
France	5 058	5 129	4 514	4 395	4 521	5 881	5 737	6 620	5 690
Ireland	20	58	17	9	23	27	10	12	69
Netherlands	-				1	4	4	2	4
UK(Engl.&Wales)	192	164	208	134	164	130	166	181	146
USSR			15						
Total	5 464	5 438	4 944	4 610	4 925	6 204	6 014	6 881	6 000

<sup>\*)</sup> Preliminary

Table 75. Nominal catch (tonnes) of HADDOCK in Divisions VIIg-k, 1970-1979  
(Data for 1970-1978 as officially reported to ICES)

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*</sup>
Belgium	31	23	45	65	35	33	19	13	5	-
France	2 156	2 722	5 590	5 011	4 687	3 463	2 929	1 612	1 001	919
Germany.Fed.Rep.	1	1	-	1	-	+	3	-	-	-
Ireland	535	736	795	1 033	574	314	177	114	69	49
Netherlands	91	66	53	11	1	2	-	-	-	+
Poland	-	3	-	62	143	-	-	-	-	-
Spain	-	-	662	807	998	-	-	265	-	-
UK(Engl.+Wales)	46	25	105	9	8	36	24	14	13	3
USSR	27	136	84	23	125	50	147	-	-	-
Total	2 887	3 712	7 334	7 022	6 571	3 898	3 299	2 018	1 088	971

\* ) Preliminary.

Table 76. Nominal catch (tonnes) of mackerel in the North Sea, Skagerak and Kattegat (IV and IIIa) 1969-1979. (Data for 1969-1978 as officially reported to ICES)

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>*)</sup>
Belgium	139	19	85	129	78	145	134	292	49	10	-
Denmark	10 851	26 753	17 590	2 023	7 459	3 890	9 836	27 988	21 833	18 068	19 171
Faroe Islands <sup>2)</sup>	3 080	2 134	3 603	7 551	11 202	18 625	23 424	63 476	42 836	34 194	28 124
France	11 353	4 677	9 061	6 882	636	2 254	2 749	2 607	2 529	3 452	3 620
Germany, Dem.Rep.	399	51	166	346	214	234	141	259	41	233	17
Germany, Fed.Rep. <sup>3)</sup>	1 161	225	407	374	563	270	276	284	-	284	385
Iceland	612	1 492	649	687	3 079	4 689	198	302	-	-	-
Netherlands	4 928	2 956	4 945	4 436	2 339	3 259	2 390	2 163	2 673	1 065	1 009
Norway <sup>1)</sup>	683 045	278 631	200 635	160 141	298 877	255 132	241 533	207 867	182 200	86 826	96 190
Poland	12	205	130	244	561	4 520	2 313	2 020	298	-	-
Sweden	10 820	4 407	3 163	4 748	2 960	3 579	4 789	6 448	4 012	4 501	3 935
UK (England & Wales)	35	35	23	32	31	61	33	89	105	142	95
UK (Scotland)	231	148	616	395	2 943	390	578	1 199	1 590	3 704	5 272
USSR	12 516	718	2 600	611	17 150	8 161	9 330	1 231	2 765	488	162
Unallocated											500
Total	739 182	322 451	243 673	188 599	348 092	305 209	297 724	316 225	260 931	152 967	158 480

\*) Preliminary

1) 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, 1979 - 5 470 tonnes)

2) Includes catches from Div. IIa (1978 - 283 tonnes, 1979 - 6 tonnes)

3) Includes 174 tonnes in Div. IIa in 1979

Table 77. Nominal catch (tonnes of mackerel in the Western area (VI, VII, and VIII)  
(Data for 1969-77 as officially reported to ICES).

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*
Belgium	11	8	2	1	3	7	17	10	1	1	-
Denmark	-	-	-	-	-	-	-	3	698	8 677	8 535
Faroe Islands	-	-	-	-	635	8 659	1 760	5 539	3 978	12 135	10 609
France	31 356	42 899	33 141	35 354	41 664	37 824	25 818	33 556	35 702	37 801	31 510
German Dem.Rep.	9	130	93	214	1 733	2 885	9 693	4 509	431	-	-
Germany, Fed.Rep.	428	783	258	98	559	993	1 941	391	446	28 873	21 493
Iceland	-	90	86	74	52	-	21	10	-	-	-
Ireland	1 615	1 055	3 107	4 592	8 314	8 526	11 567	14 395	23 022	27 508	24 217
Netherlands	4 441	3 828	3 837	6 166	7 785	7 315	13 263	15 007	35 766	50 815	62 396
Norway	-	-	1 611	-	34 600	32 597	1 907	4 252	362	1 900	25 414
Poland	2 149	6 054	10 832	13 219	10 536	22 405	21 573	21 375	2 240	-	92
Spain	21 571	31 368	37 506	31 416	25 677	30 177	23 408	18 480	21 853	19 142	20 000**)
Sweden	-	-	-	-	-	-	-	38	-	-	-
UK (England & Wales)	2 692	3 374	4 791	6 923	13 081	21 132	31 546	57 311	132 320	213 344	244 293
UK (N.Ireland)	279	243	315	57	93	75	30	95	97	46	25
UK (Scotland)	402	807	805	1 412	5 170	8 466	16 174	28 399	52 662	103 671	103 160
USSR	6 147	13 555	36 390	71 249	65 202	103 435	309 666	262 384	16 396	-	-
Unallocated											54 000
Total, ICES memb.	71 100	104 194	132 774	170 775	215 104	284 496	468 384	465 754	325 974	503 913	605 744
Bulgaria	-	-	-	-	4 341	13 558	20 830	28 195	-	-	-
Rumania	-	-	-	-	-	-	2 166	13 222	-	-	-
Total	71 100	104 194	132 774	170 775	219 445	298 054	491 380	507 178	325 974	503 913	605 744

\*) Preliminary

\*\*) Working Group estimate

Table 78. Nominal catches (in thousand tonnes) for the Northern Hake stock (ICES Divisions IVa and VIa, Sub-area VII, and Divisions VIIIA and b), as reported to ICES by country and areas, 1961-79.

YEARS	TOTAL	FRANCE				SPAIN				U.K.			OTHERS		
		TOTAL	IVa+VIa	VII	VIII <sup>1</sup>	TOTAL	IVa+VIa	VII	VIII <sup>1</sup>	TOTAL	IVa+VIa	VII	TOTAL	IVa+VIa	VII
1961	85.4	31.8	1.5	18.0	12.3	40.6	.	.	40.6	11.8	10.5	1.3	1.2	1.0	0.2
1962	81.5	34.9	0.7	19.4	14.8	32.0	.	.	32.0	13.7	12.3	1.4	0.9	0.6	0.3
1963	81.2	28.8	1.5	14.9	12.4	39.3	.	.	39.3	11.9	10.7	1.2	1.2	1.0	0.2
1964	71.7	27.5	3.2	11.3	13.0	34.0	.	.	34.0	9.2	8.7	0.5	1.0	0.8	0.2
1965	62.9	26.1	3.7	11.7	10.7	28.1	.	21.0	7.1	7.7	7.3	0.4	1.0	0.8	0.2
1966	50.6	16.1	3.0	7.6	5.5	27.5	.	.	27.5	5.9	5.3	0.6	1.1	0.9	0.2
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	65.2	21.8	0.4	8.8	12.6	38.3	1.1	4.8	32.4	2.9	2.4	0.5	2.2	2.2	.
1973	72.5	24.2	2.2	10.7	11.3	42.2	0.5	4.7	37.0	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
1978	36.4	18.4	2.2	7.3	8.8	12.9	1.3	5.0	6.6	2.0	1.6	0.3	3.1	.	.
1979 <sup>*</sup>	38.6	20.5	2.5	7.1	10.9	16.4	1.2	5.8	9.4	1.7	1.5	0.2	.	.	.

<sup>1</sup>Includes Divisions VIIIA,b and c.

<sup>\*</sup>Preliminary.

Table 79. Revised<sup>1)</sup> catches (in thousand tonnes) for the Northern Hake stock (ICES Divisions IVa and VIa, Sub-area VII and Divisions VIII a and b) by country and area determined by the Hake Working Group, 1961-1979.

YEARS	TOTAL	FRANCE				SPAIN				U.K.			OTHERS		
		TOTAL	IVa+VIa	VII	VIIIa,b	TOTAL	IVa+VIa	VII	VIIIa,b	TOTAL	IVa+VIa	VII	TOTAL	IVa+VIa	VII
1961	95.6	42.0	5.3	20.7	16.0	40.6	.	.	40.6	11.8	10.5	1.3	1.2	1.0	0.2
1962	86.3	39.7	4.9	19.3	15.5	32.0	.	.	32.0	13.7	12.3	1.4	0.9	0.6	0.3
1963	86.2	33.8	4.0	16.2	13.6	39.3	.	.	39.3	11.9	10.7	1.2	1.2	1.0	0.2
1964	76.8	32.6	4.6	15.2	12.8	34.0	.	.	34.0	9.2	8.7	0.5	1.0	0.8	0.2
1965	64.7	27.9	3.3	13.0	11.6	28.1	.	21.0	7.1	7.7	7.3	0.4	1.0	0.8	0.2
1966	60.9	26.4	3.2	13.0	10.2	27.5	.	.	27.5	5.9	5.3	0.6	1.1	0.9	0.2
1967	62.1	24.2	3.2	9.9	11.1	31.6	.	.	31.6	4.9	4.1	0.8	1.4	0.9	0.5
1968	62.0	22.8	2.5	9.2	11.1	32.2	.	.	32.2	5.4	4.5	0.9	1.6	1.3	0.3
1969	54.9	21.8	3.5	10.9	7.4	27.1	.	.	27.1	4.3	3.9	0.4	1.7	0.5	1.2
1970	64.9	25.3	4.3	11.5	9.5	34.3	.	.	34.3	3.2	2.7	0.5	2.1	1.9	0.2
1971	51.3	23.4	3.3	10.7	9.4	22.7	0.9	7.8	14.0	2.6	2.2	0.4	2.6	2.1	0.5
1972	65.5	22.1	3.7	9.6	8.8	38.3	1.1	4.8	32.4	2.9	2.4	0.5	2.2	2.2	.
1973	79.5	24.0	3.2	12.3	8.5	49.4	2.4	17.9	29.1	2.8	2.2	0.6	3.3	2.9	0.4
1974	74.2	21.3	2.8	11.9	6.6	47.6	3.6	16.1	27.9	2.7	2.1	0.6	2.6	2.3	0.3
1975	74.5	22.2	3.3	12.1	6.8	46.4	4.9	15.8	25.7	2.6	2.3	0.3	3.3	2.4	0.9
1976	67.3	18.3	3.8	10.3	4.2	44.1	4.2	15.6	24.3	2.3	1.7	0.6	2.6	1.8	0.8
1977	51.2	17.2	2.8	7.6	6.8	31.0	1.6	13.0	16.4	1.9	1.6	0.3	1.1	0.8	0.3
1978	49.9	17.4	2.2	7.3	7.9	27.4	1.4	12.4	13.6	2.0	1.6	0.3	3.1	.	.
1979 <sup>2)</sup>	51.4	20.5	2.5	7.1	10.9	29.2	2.4	11.6	15.2	1.7	1.5	0.2	.	.	.

<sup>1)</sup> Data for 1961-1972 and 1979 not revised; revised figures for Sub-area VIII for 1973-1978 include data for VIII a+b only.

<sup>2)</sup> Preliminary



**Table 80.** Nominal catches (in thousand tonnes) for the Southern Hake stock (ICES Divisions VIIIc and IXa), as reported to ICES by country and area, 1961-1979.

YEARS	TOTAL	FRANCE		PORTUGAL	SPAIN	
		VIII <sup>1</sup>	IXa		VIII <sup>1</sup>	IXa
1961	100.6	12.3	3.1	13.0 <sup>3)</sup>	40.6	31.8 <sup>2)</sup>
1962	92.2	14.8	3.2	6.4	32.0	35.8 <sup>2)</sup>
1963	101.7	12.4	3.2	7.0	39.3	39.8 <sup>2)</sup>
1964	104.7	13.0	2.9	9.0	34.0	45.8 <sup>2)</sup>
1965	74.8	10.7	-	10.4	7.1	46.6 <sup>2)</sup>
1966	89.1	5.5	2.1	8.3	27.5	45.7 <sup>2)</sup>
1967	97.7	11.0	2.4	7.6	31.6	45.1 <sup>2)</sup>
1968	89.1	10.2	2.0	7.2	32.2	37.5 <sup>2)</sup>
1969	82.8	8.8	1.7	6.6	27.1	38.6 <sup>2)</sup>
1970	99.7	12.8	1.5	9.3	34.3	41.8 <sup>2)</sup>
1971	37.8	13.1	0.6	8.0	14.0	2.1 <sup>2)</sup>
1972	71.0	12.6	-	8.7	32.4	17.3
1973	84.4	11.3	-	15.3	37.0	20.8
1974	47.8	7.3	0.1	7.8	18.5	14.1
1975	54.4	7.9	0.1	9.4	18.0	19.0
1976	46.7	4.8	0.1	7.9	20.2	13.7
1977	46.2	6.6	-	5.5	16.6	17.5
1978	28.6	8.8	-	4.4	6.6	8.8
1979*)	36.6	10.9	-	6.8	9.4	9.5

\*) Preliminary.

1) Includes Divisions VIIIA,b and VIIIC.

2) Data refer to port of landing, not area of capture (includes African catches).

3) Include catches from area Xa,b.

Table 81. Revised catches (in thousand tonnes) for the Southern Hake stock (ICES Divisions VIIIc and IXa) by country and area determined by the Hake Working Group, 1961-1979.

YEARS	TOTAL	PORTUGAL (IXa)	SPAIN (VIIIc + IXa)	FRANCE (VIIIc + IXa)
1961	.	7.5	.	.7
1962	.	7.5	.	.7
1963	.	8.1	.	.6
1964	.	10.5	.	.7
1965	.	12.1	.	.8
1966	.	9.6	.	.6
1967	.	7.8	.	.6
1968	.	8.0	.	.4
1969	.	7.1	.	.5
1970	.	9.9	.	.2
1971	.	9.5	.	.1
1972	26.7	9.4	17.3	.0
1973	35.7	14.7	20.8	.2
1974	23.4	9.2	14.1	.1
1975	32.0	11.1	20.8	.1
1976	26.2	9.7	16.4	.1
1977	15.8	6.4	9.2	.2
1978	14.5	5.6	8.6	.1
1979*)	18.1	6.8	11.3	.0

\*) Preliminary

Table 82. Immediate losses from increases in mesh size.

Effect of discarding on the assessments.

Assessments of immediate losses in catches and landings.

	Current mesh mm	New mesh mm	Selection Factor	Sex	% Loss	
					No discarding <sup>1)</sup>	Discarding <sup>2)</sup>
Denmark IIIa	35	70	0.3	♂	0.7	0.1
				♀	1	0.2
			0.5	♂	19	12
				♀	26	15
		80	0.3	♂	2	0.5
				♀	4	0.7
			0.5	♂	32	24
				♀	41	29
Scotland IVa	70	80	0.5	♂	26	24
				♀	31	29
England IVa	70	80	0.3	♂	8	4
				♀	15	6
			0.5	♂	30	28
				♀	32	32
England VIIa	50	70	0.3	♂	11	7
				♀	9	7
			0.5	♂	53	51
				♀	53	52
		80	0.3	♂	22	17
				♀	20	17
			0.5	♂	68	67
				♀	69	68
Ireland VIIa	45	70	0.3	♂	16	10
				♀	22	14
			0.5	♂	61	57
				♀	68	65
		80	0.3	♂	28	20
				♀	37	27
			0.5	♂	74	70
				♀	79	78
France VIIb, g	50	70	0.5	♂	38	29 (36) <sup>3)</sup>
				♀	46	35 (42)
		80	0.5	♂	54	45 (52)
				♀	62	53 (59)
France VIIIa, b	40	60	0.5	♂	49	44
				♀	57	56

1) Equivalent to catches and to the procedure used in previous reports.

2) Discarding based on discard data in Report for 1979 where available. Otherwise knife edged discarding at 25mm assumed.

3) Values in brackets based on knife edged selection at 25mm. Other values for France, VIIb, g based on discard data in Table 3.2 in Working Group Report for 1979.

**Table 83.** Long-term changes resulting from increases in mesh size  
Effect of discarding on the assessments

	Current mesh mm	New mesh mm	Selection Factor	M	Sex	Z Change		
						No discarding (1)	zero survival	50% survival
Denmark IIIa	35	70	0.3	0.2	♂	0.2	1	0.5
				0.1	♀	1	3	2
			0.5	0.2	♂	1	12	6
				0.1	♀	13	39	22
		80	0.3	0.2	♂	0.5	2	1
				0.1	♀	3	7	4
			0.5	0.2	♂	0.3	15	7
				0.1	♀	18	56	31
Scotland IVa	70	80	0.5	0.2	♂	2	10	5
					♀	- 3	8	2
England IVa	70	80	0.3	0.2	♂	3	10	5
					♀	2	22	13
			0.5		♂	4	20	8
					♀	1	33	18
England VIIa	50	70	0.3	0.2	♂	5	11	6
					♀	0.2	3	- 2
			0.5		♂	16	27	18
					♀	- 7	- 2	- 5
		80	0.3	0.2	♂	10	18	12
					♀	- 0.2	4	2
			0.5		♂	14	26	16
					♀	- 15	- 10	- 13
Ireland VIIa	45	70	0.3	0.2	♂	10	21	14
					♀	- 4	10	4
			0.5		♂	29	64	42
					♀	- 25	- 2	- 11
		80	0.3	0.2	♂	16	35	22
					♀	- 7	13	4
			0.5		♂	32	73	46
					♀	- 37	- 15	- 24
France VIIb, g	50	70	0.5	0.2	♂	9	38 (12)	22
					♀	- 12	23 (-8)	8
			0.4		♂	- 16	2(-14)	- 6
					♀	- 38	- 22(-35)	- 25
		80	0.5	0.2	♂	11	52 (15)	30
					♀	- 22	20(-18)	2
			0.4		♂	- 27	- 6(-24)	- 15
					♀	- 54	- 38(-54)	- 42
France VIIIa, b	40	60	0.5	0.2	♂	37	56	41
					♀	8	32	18
				0.4	♂	1	13	5
					♀	- 29	- 16	- 21

1) See footnotes to Table 82.

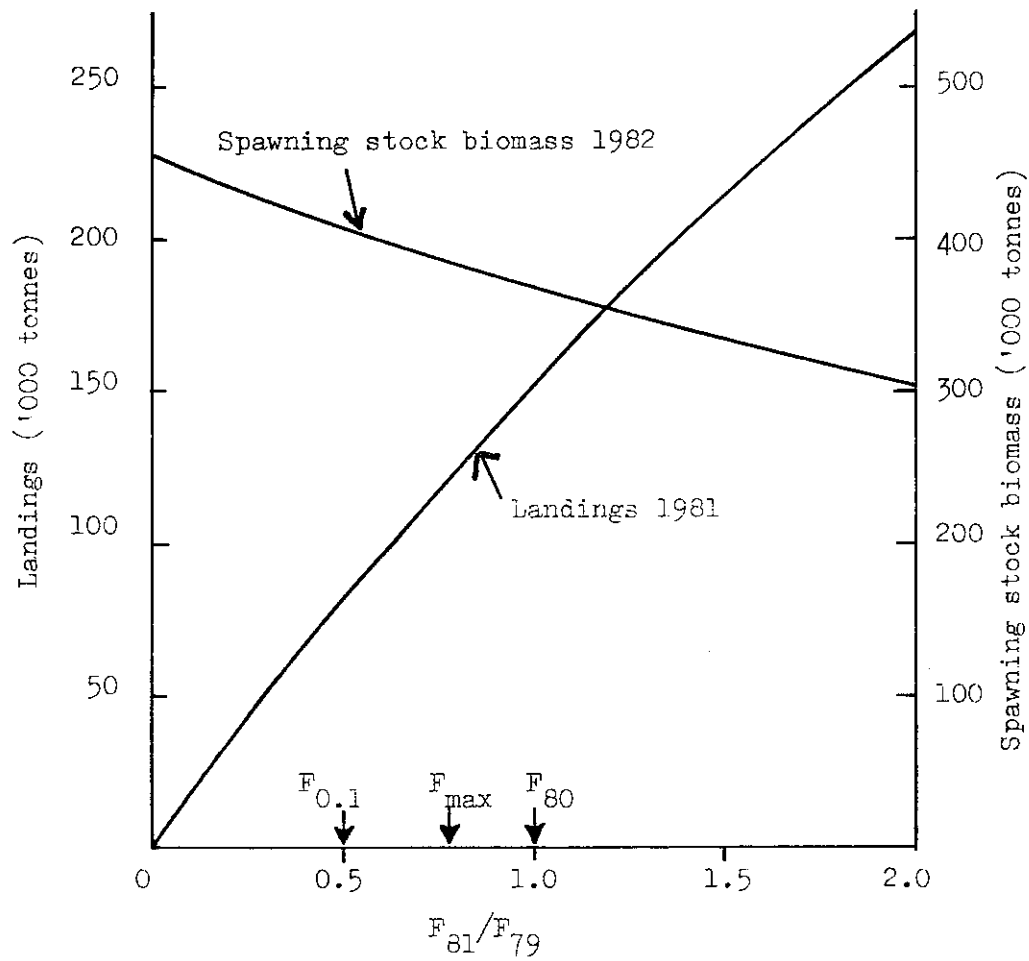


Figure 1. NORTH-EAST ARCTIC SAITHE. Predictions for landings in 1981 and spawning stock biomass in 1982.

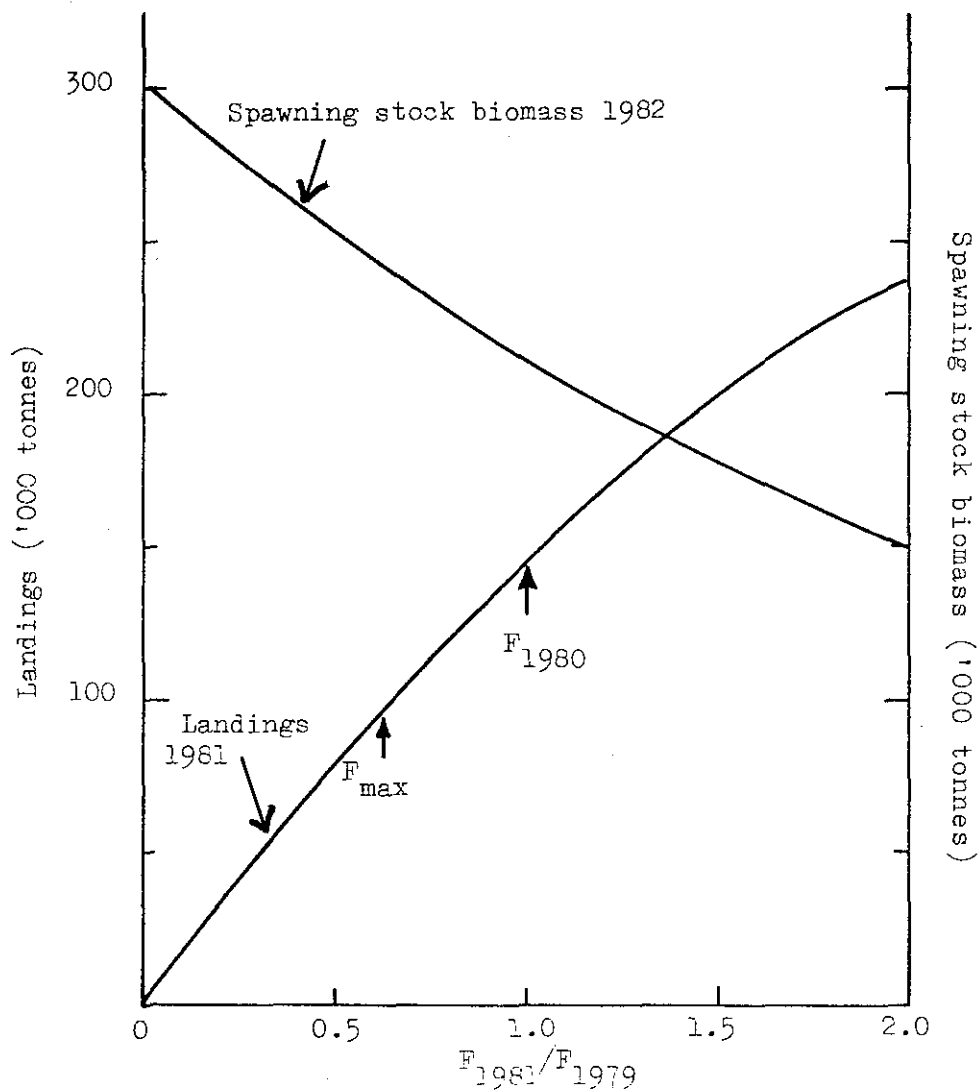


Figure 2. NORTH SEA SAITHE. Predictions for landings in 1981 and spawning stock biomass in 1982.

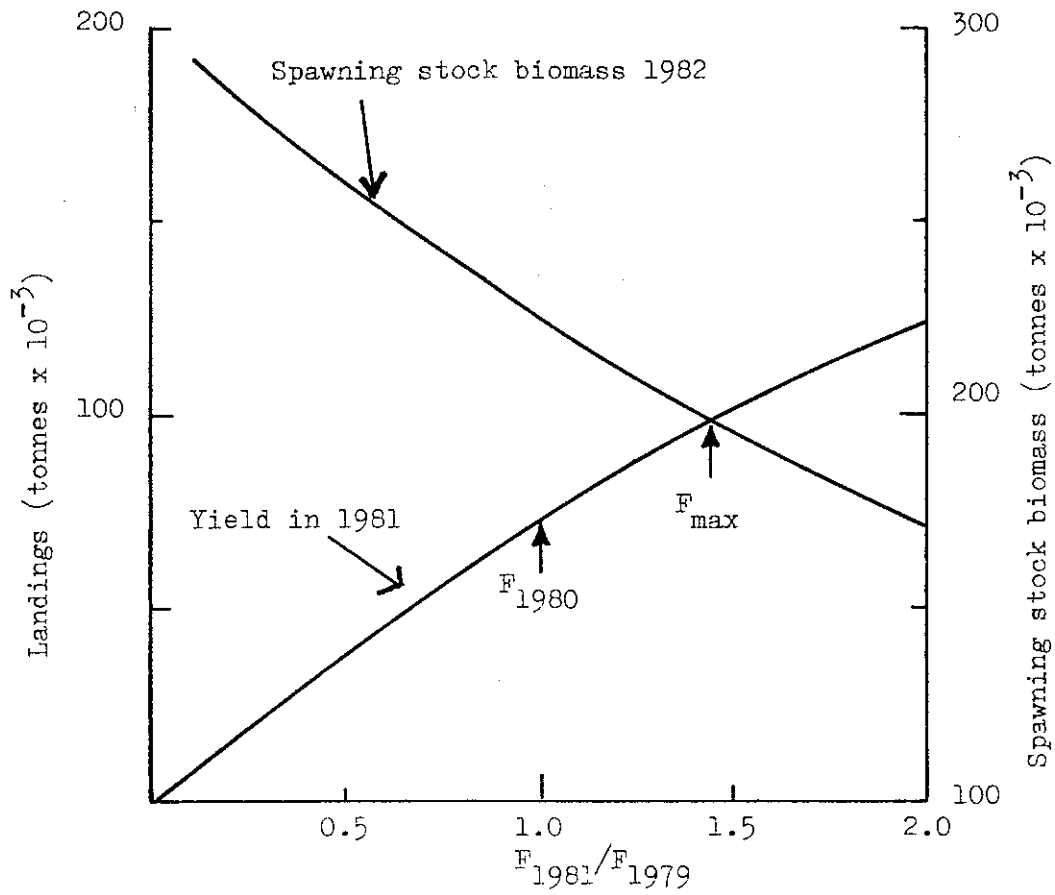


Figure 3. ICELAND SAITHE. Predictions for landings in 1981 and spawning stock biomass in 1982.

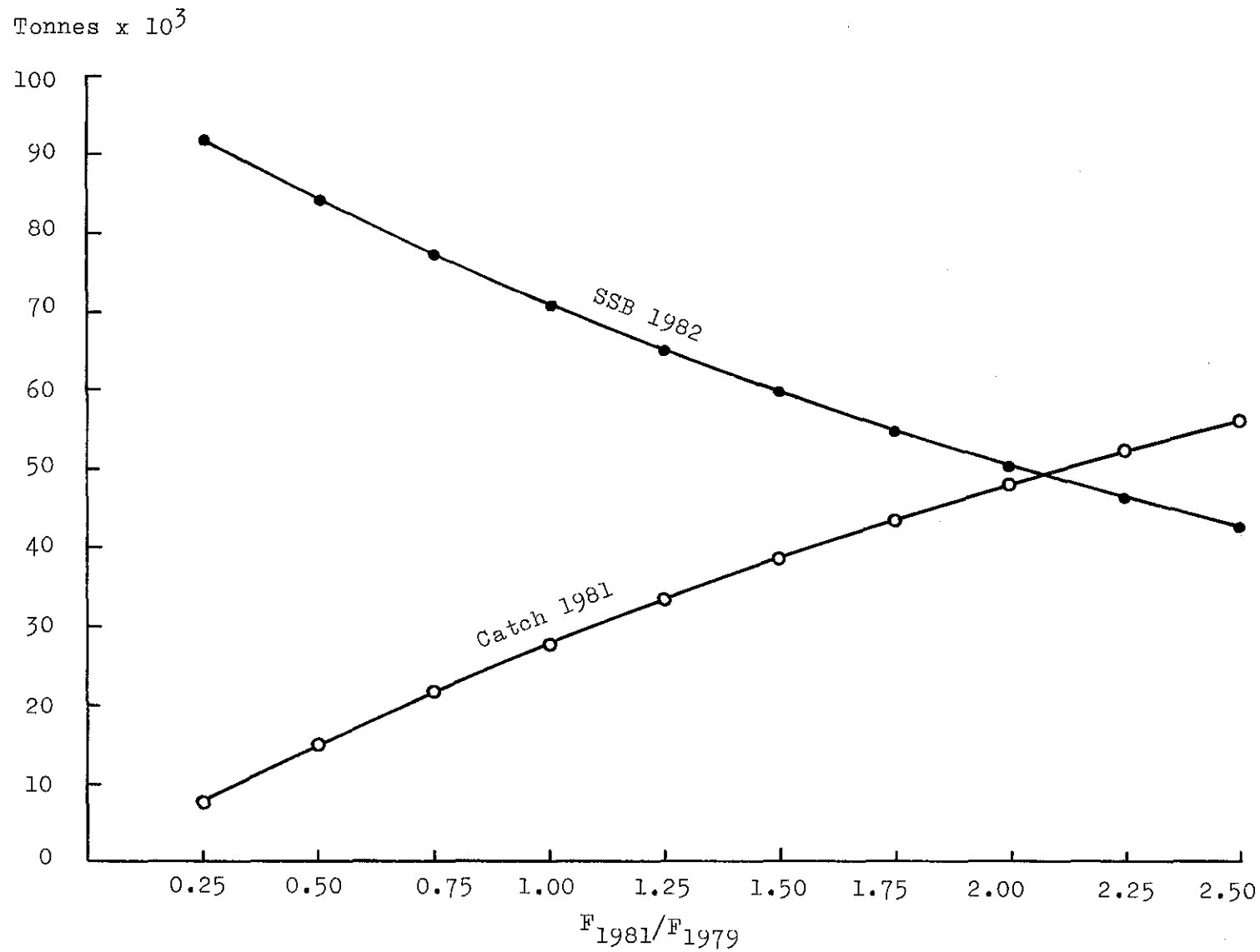


Figure 4. FAROE SAITHE. Predictions for landings in 1981 and spawning stock biomass in 1982.



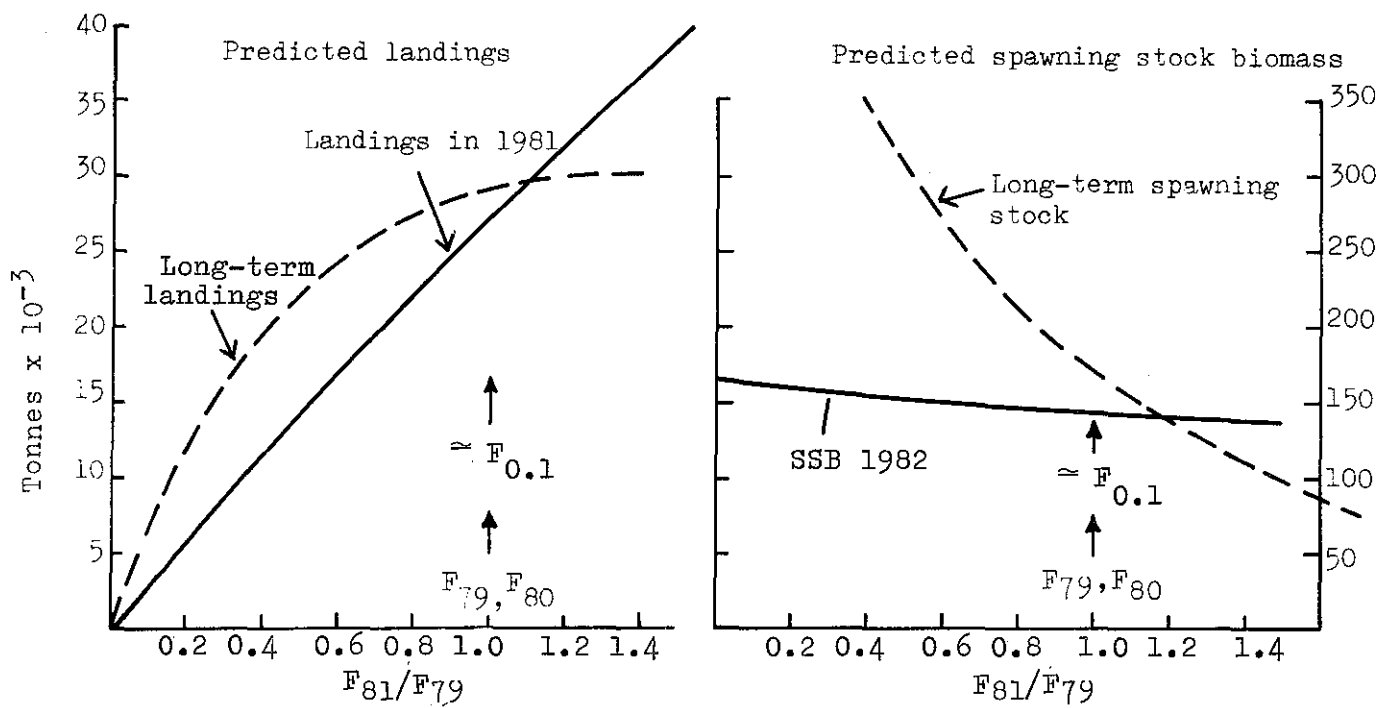


Figure 5. SAI THE in Sub-area VI. Predictions for landings in 1981 and spawning stock biomass in 1982.

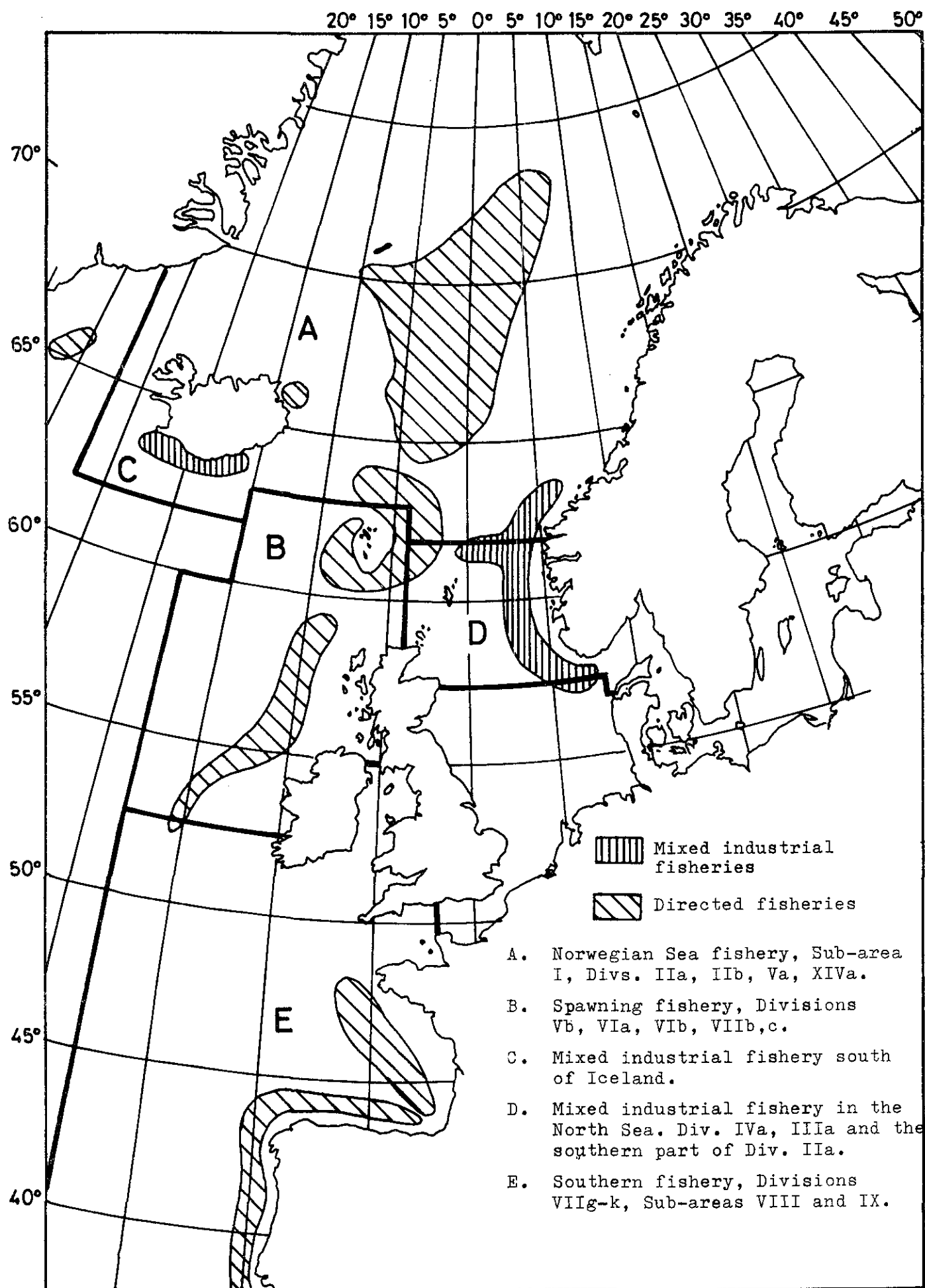


Figure 6. The main blue whiting fishing areas.

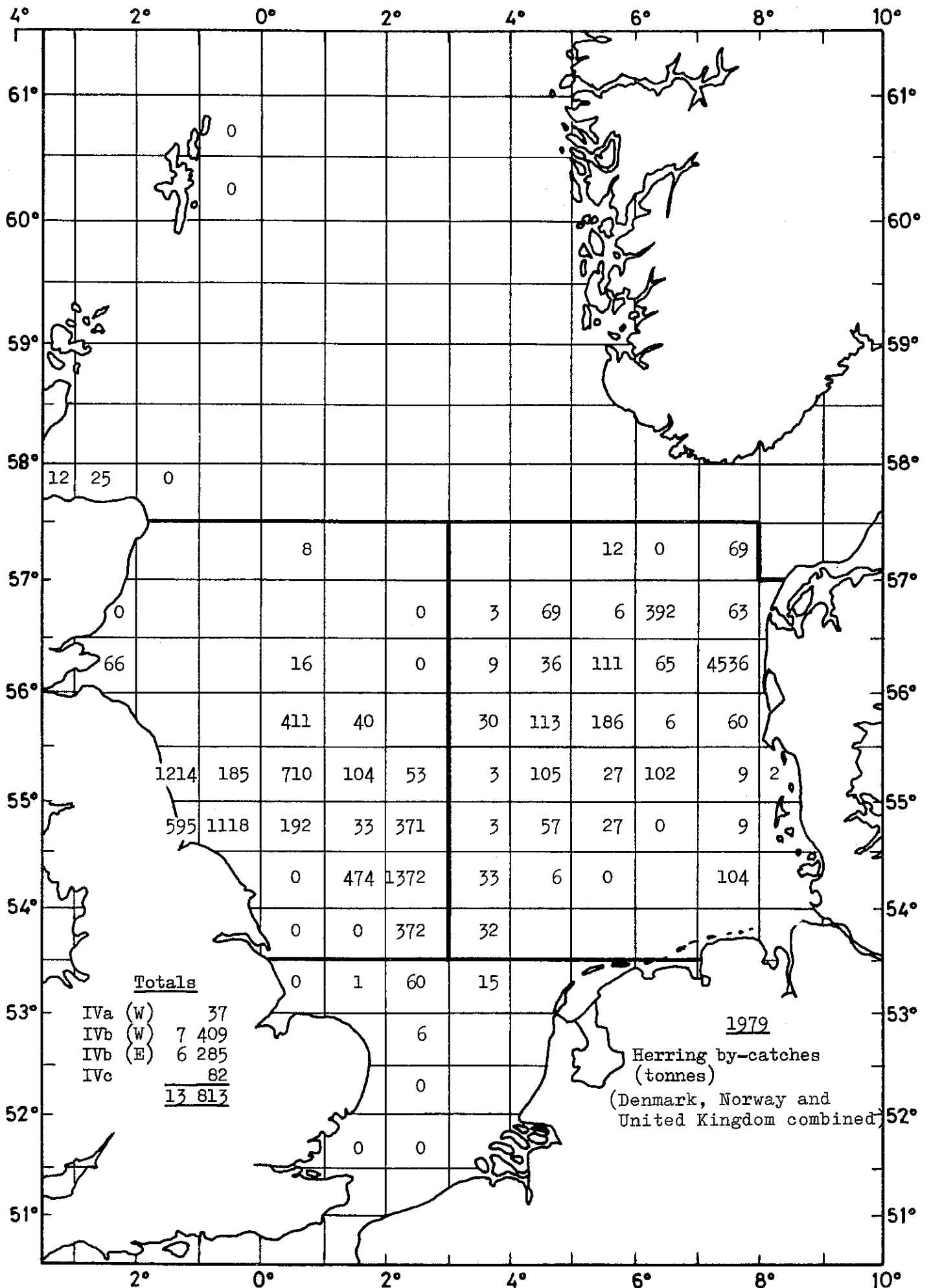


Figure 7. Estimated herring by-catches in 1979.

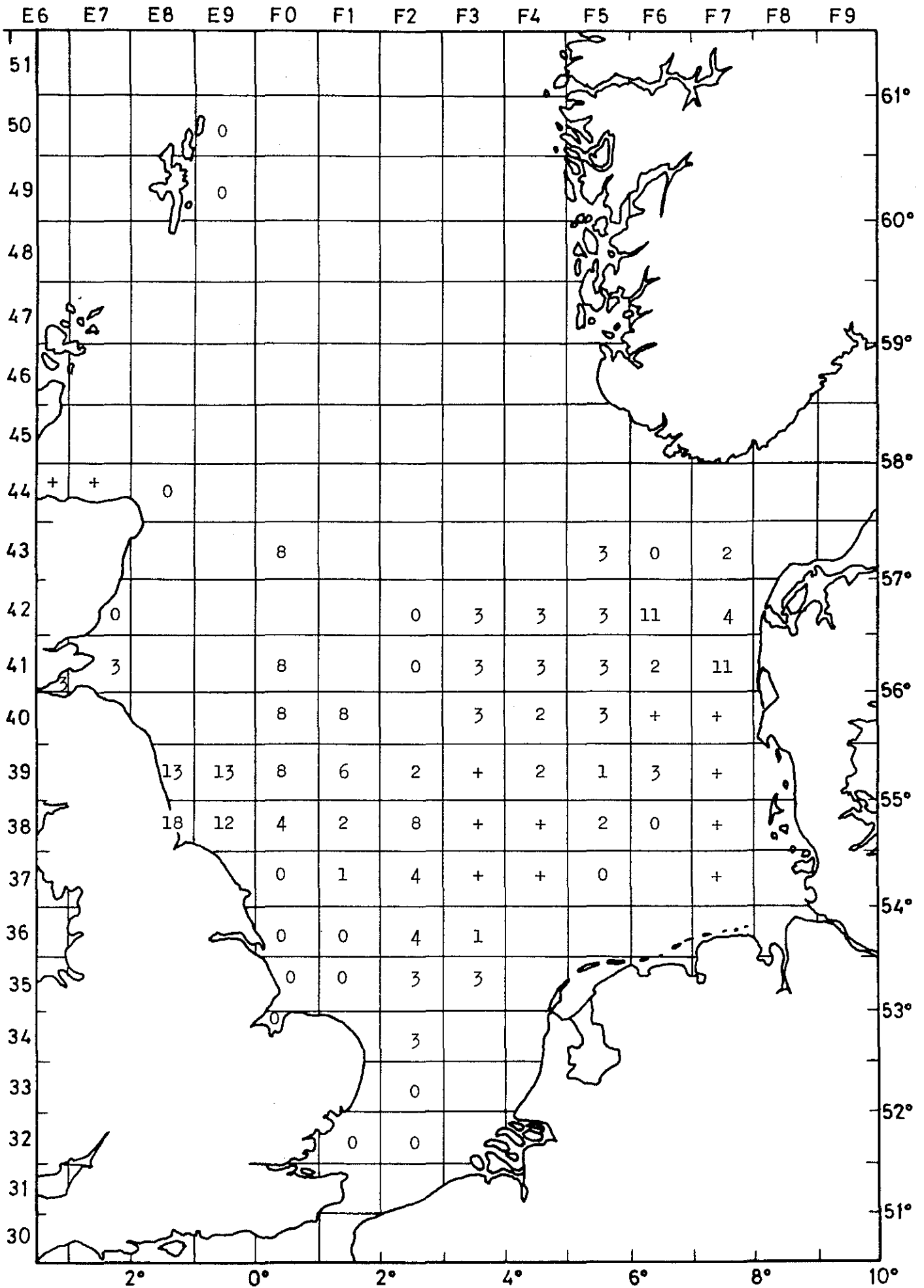


Figure 8. % herring by-catches as proportions of the international sprat fisheries.

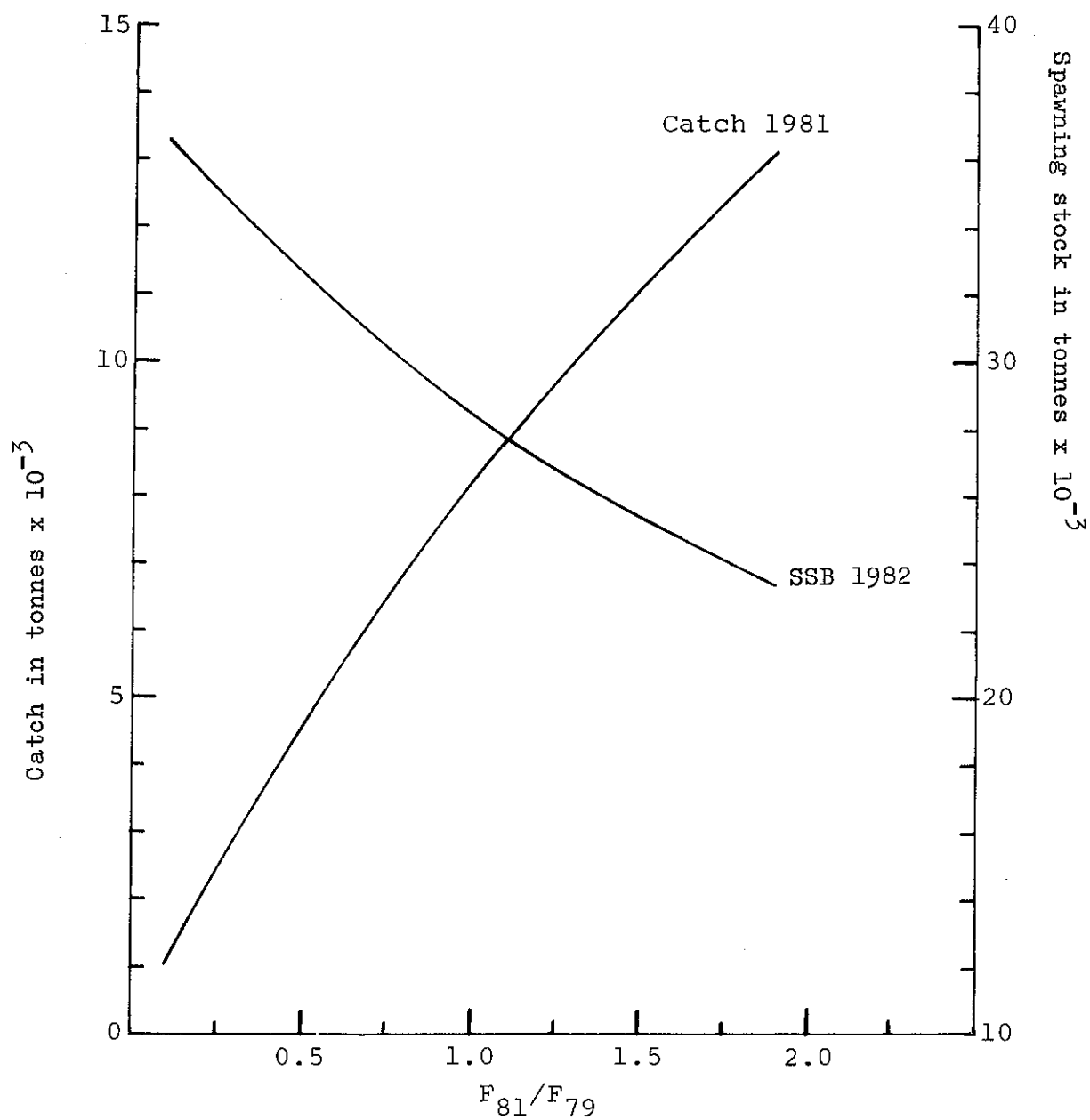


Figure 9. Plaice, Kattegat. Predicted catch in 1981 and spawning stock biomass at the beginning of 1982 for an array of fishing mortalities in 1981 relative to that in 1979.

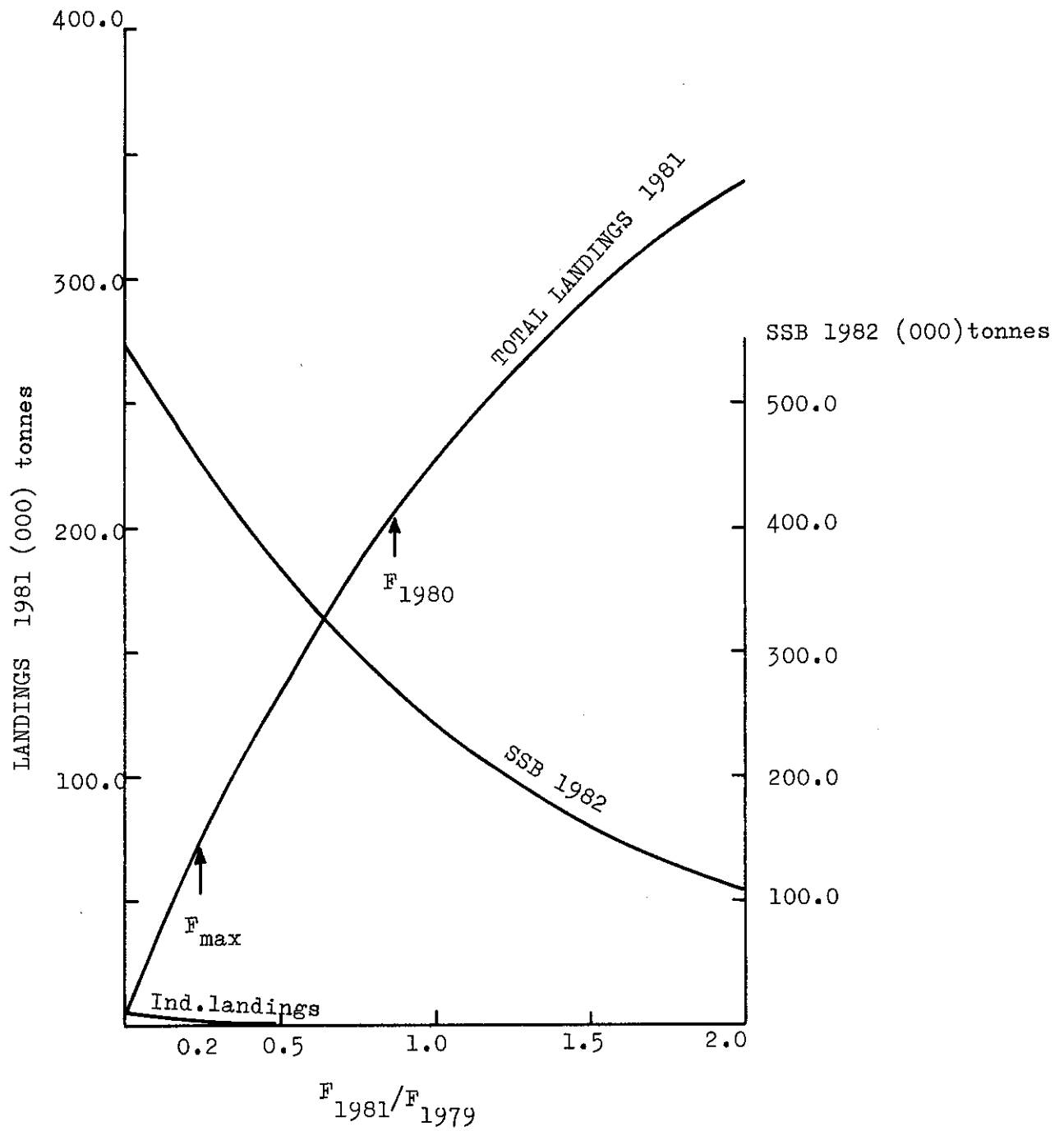


Figure 10. North Sea COD. Predictions for landings in 1981 and spawning stock biomass in 1982.

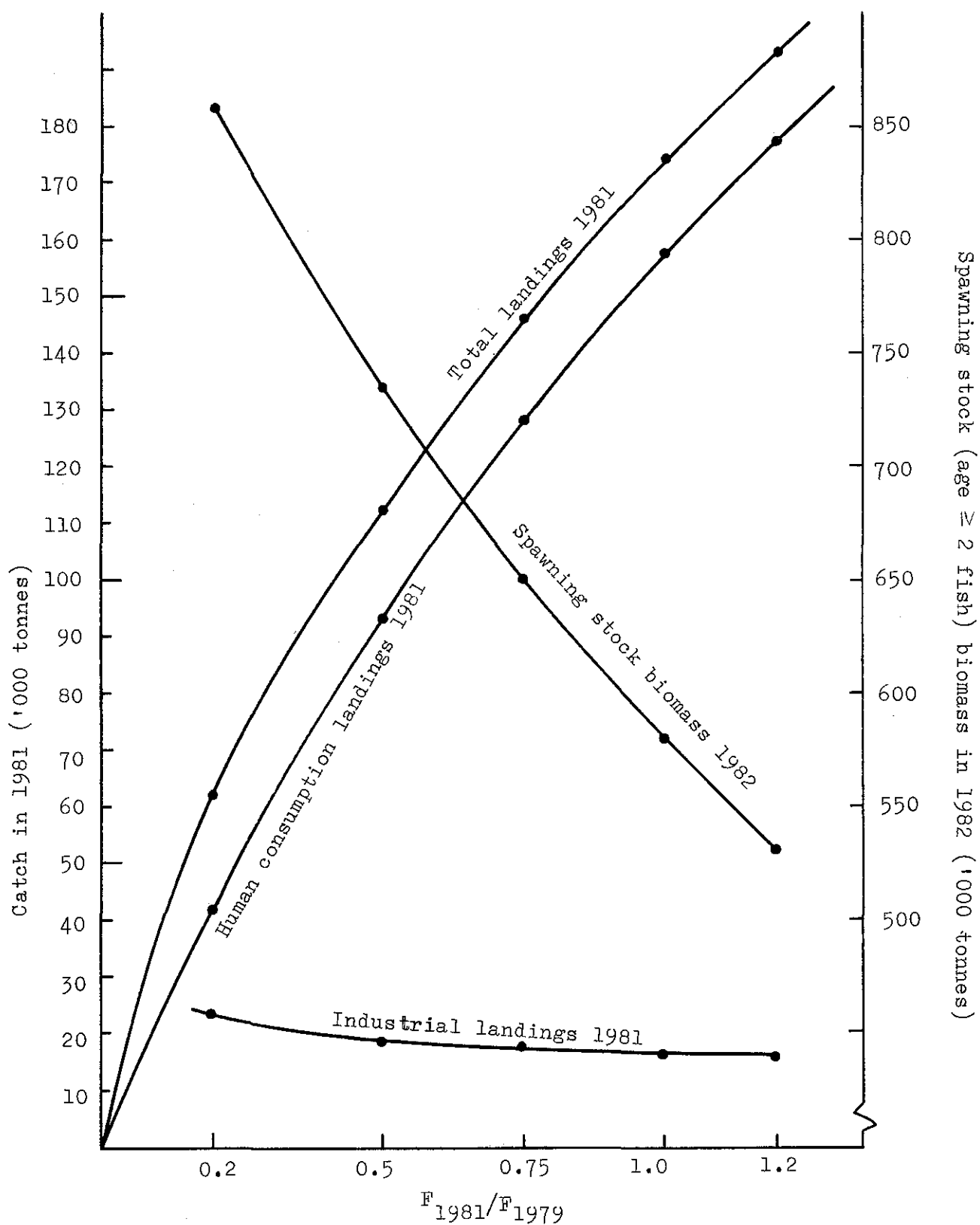


Figure 11. North Sea haddock. Predictions for landings in 1981 and spawning stock biomass in 1982.

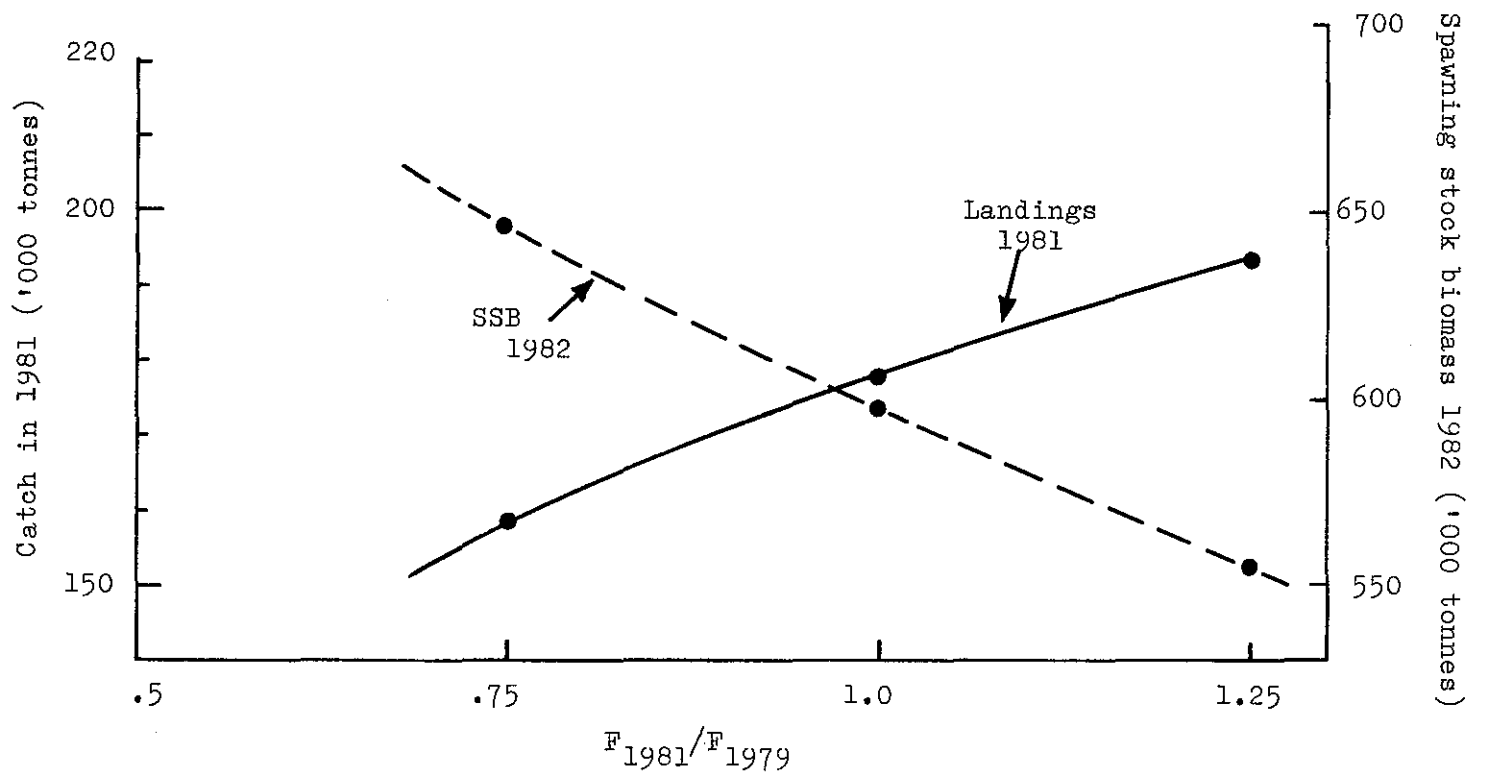


Figure 12. North Sea whiting. Predictions for landings in 1981 and spawning stock biomass in 1982.



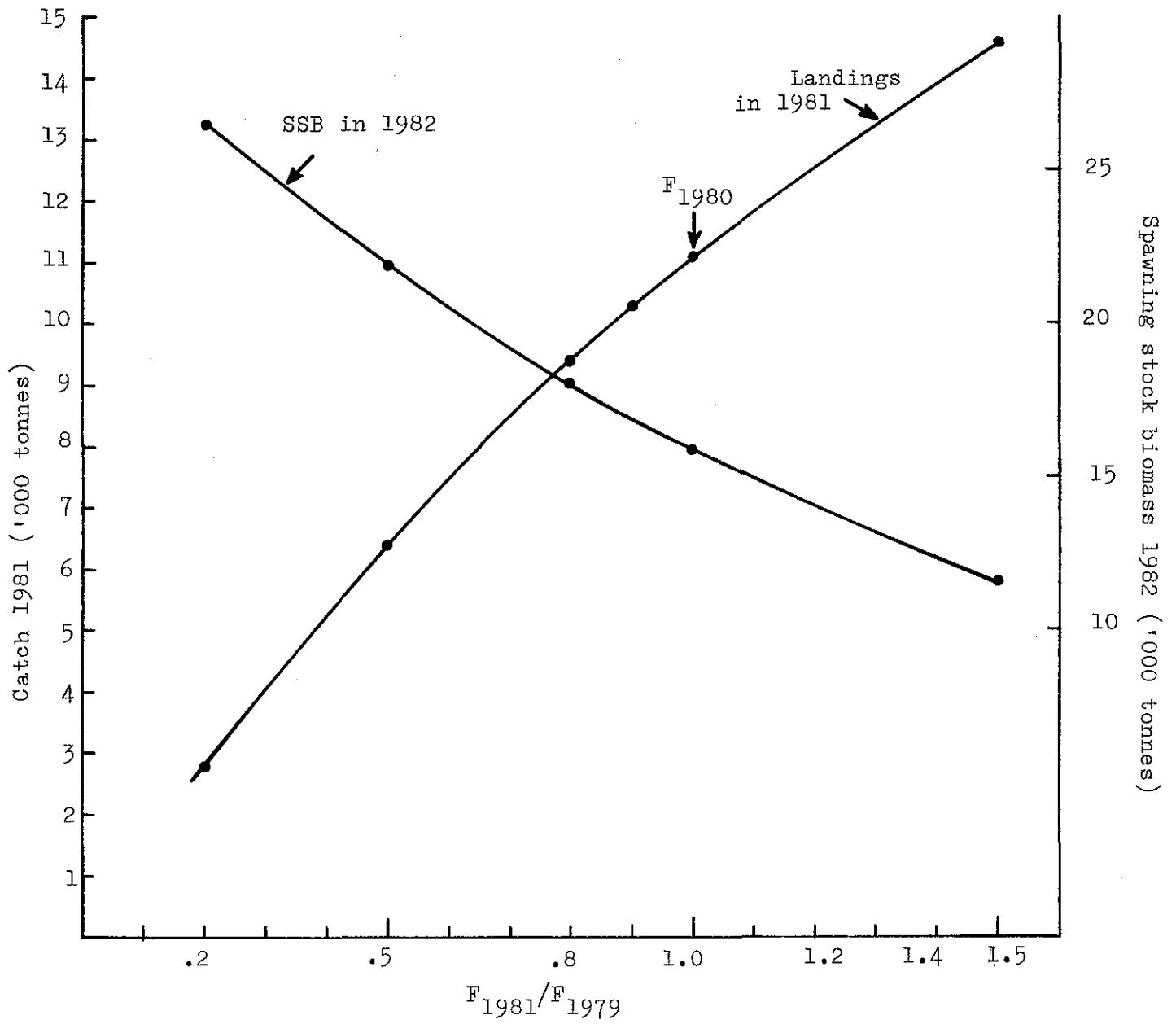
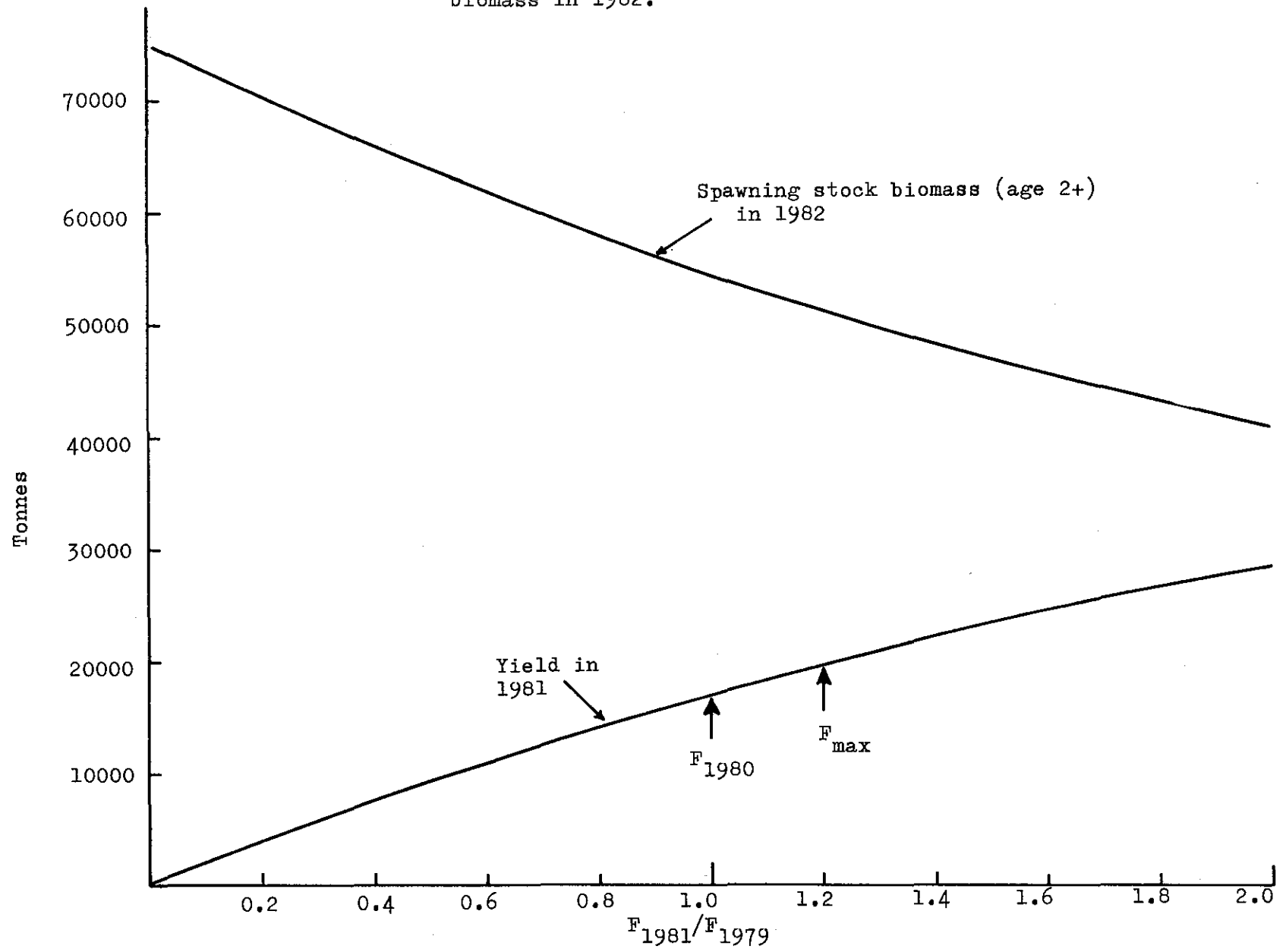


Figure 13. Cod in Division VIa. Predictions for landings in 1981 and spawning stock biomass in 1982.

Figure 14. HADDOCK in Division VIa.  
Predictions for landings in 1981 and spawning stock  
biomass in 1982.



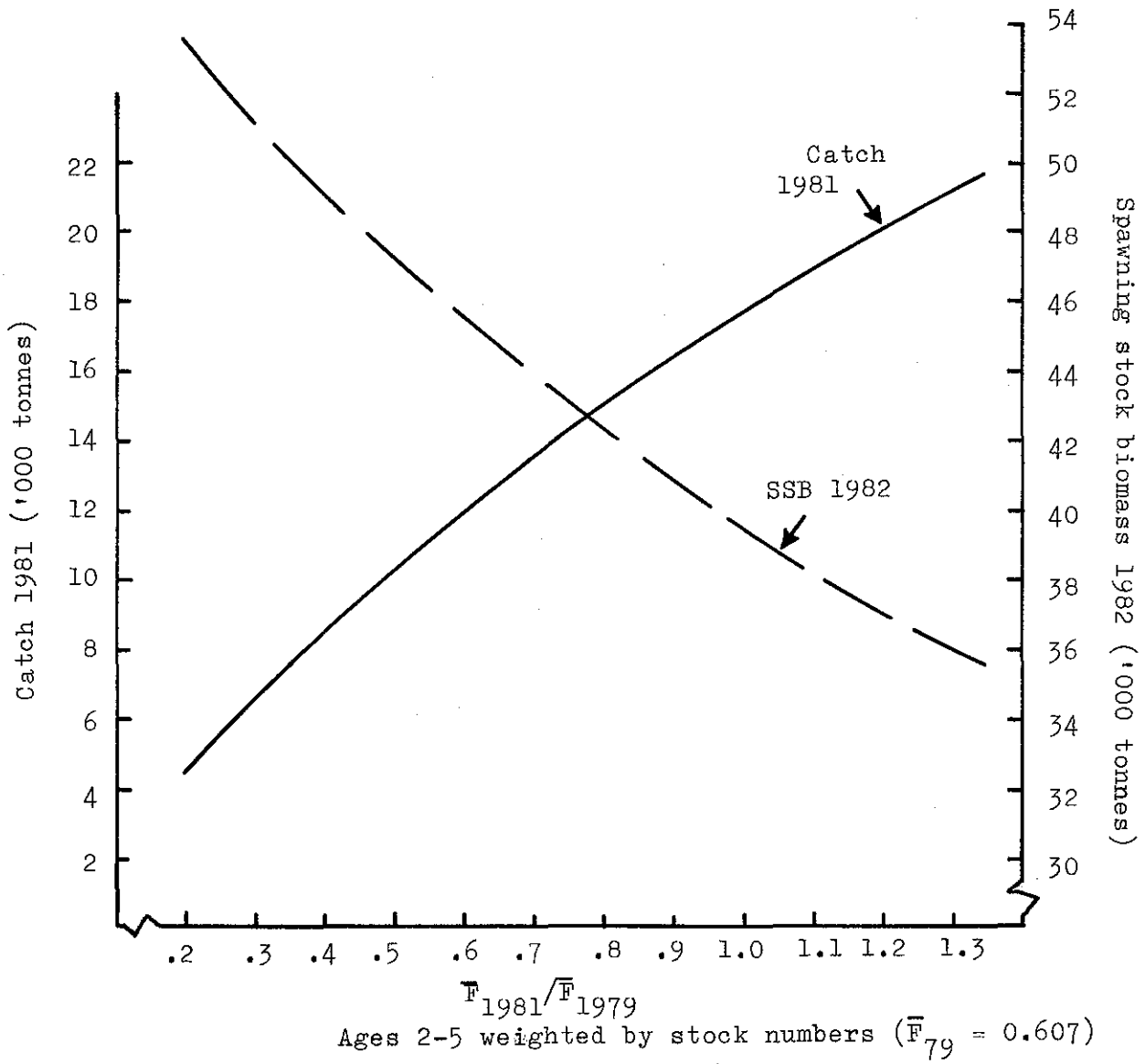


Figure 15. Whiting in Sub-area VI. Predictions for landings in 1981 and spawning stock biomass at the beginning of 1982.

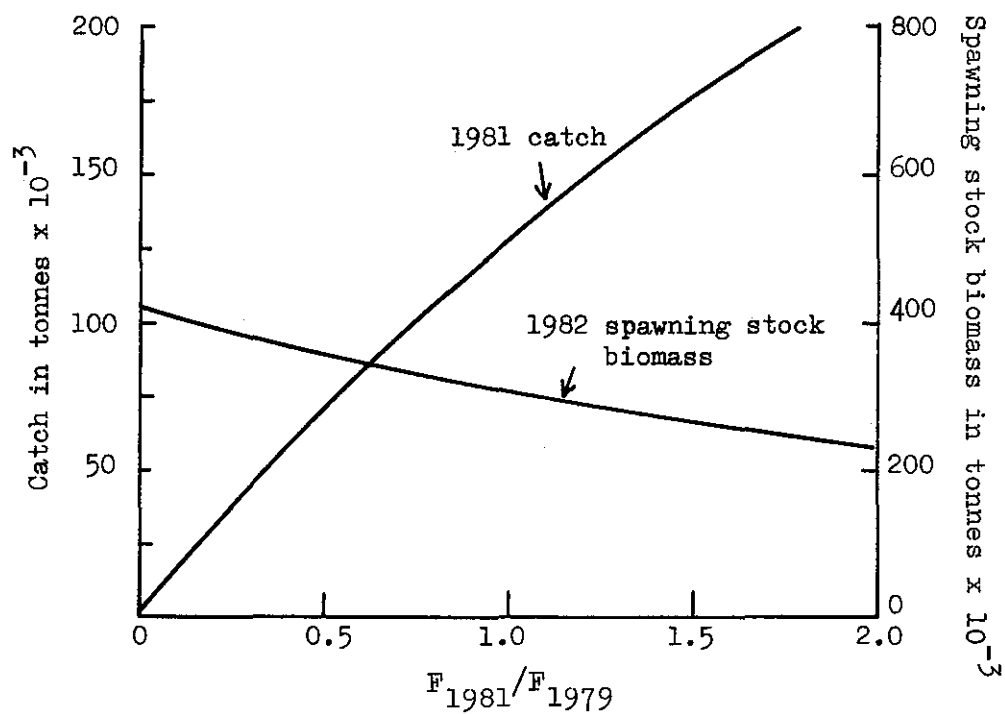
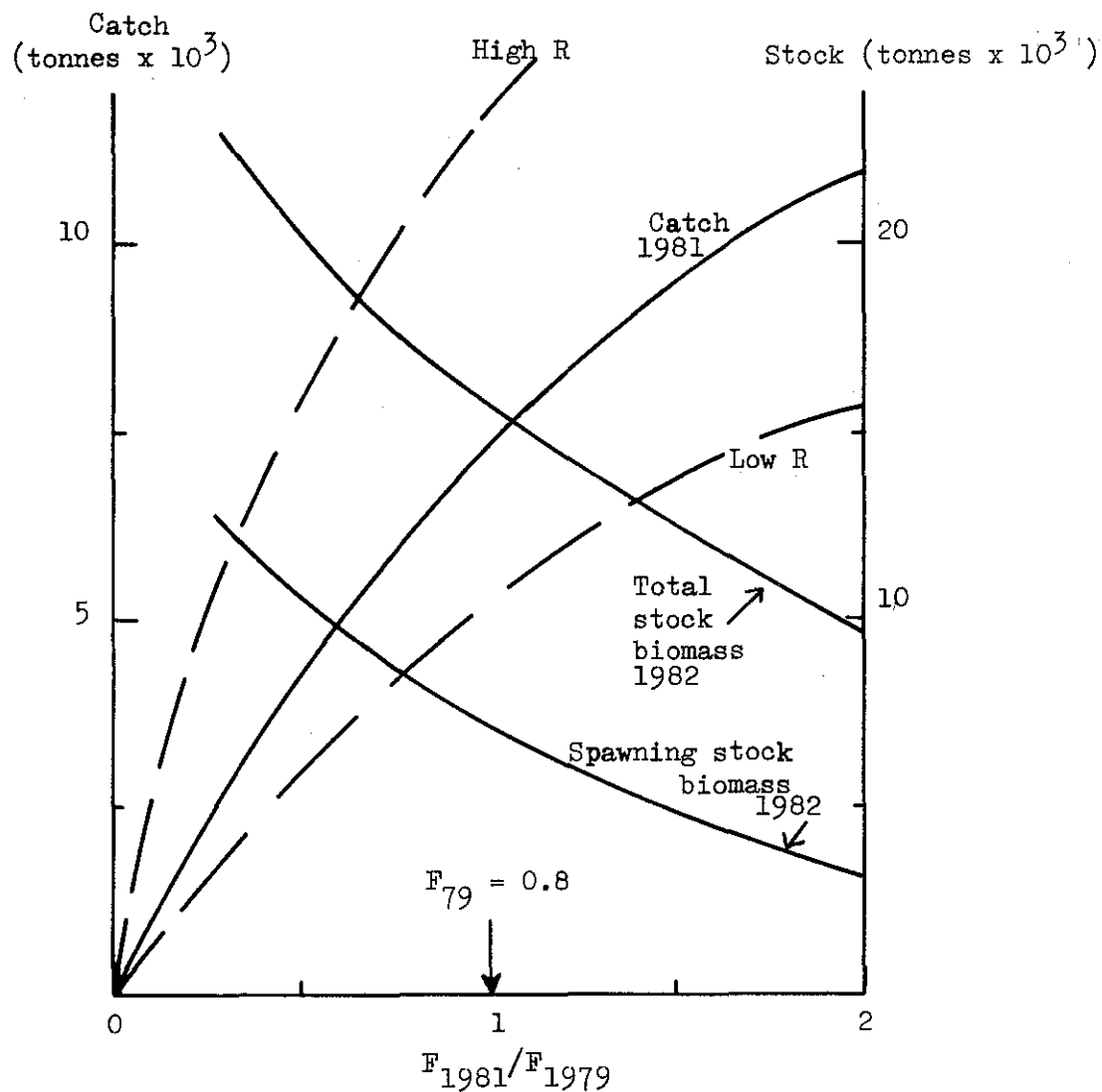


Figure 16. North Sea PLAICE. Predictions for landings in 1981 and spawning stock biomass in 1982.



**Figure 17.** Irish Sea COD (Division VIIa). Predictions for catches in 1981 and spawning stock biomass in 1982. For the catch the 95% confidence interval resulting from two high and two low recruitments is shown.

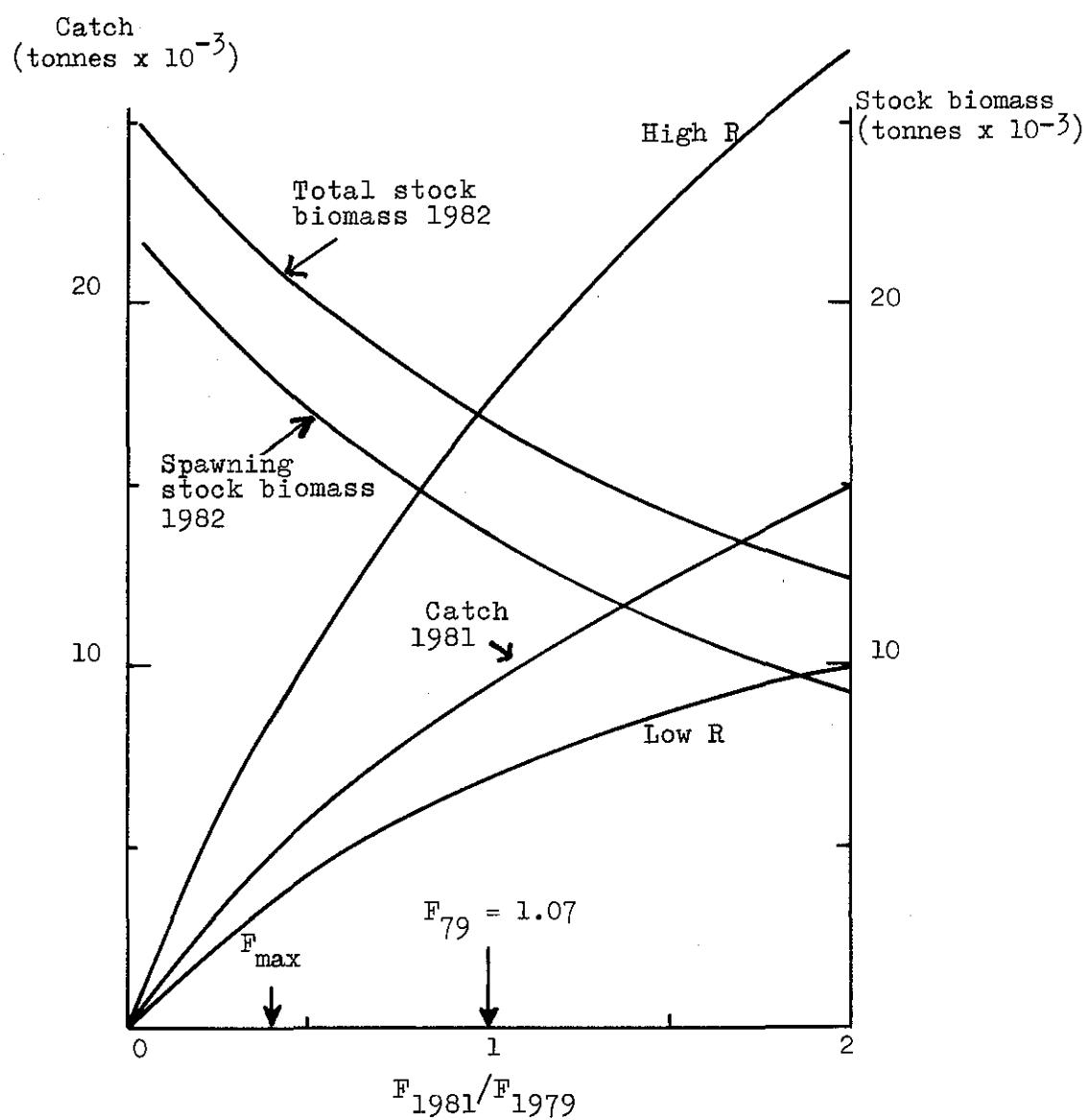
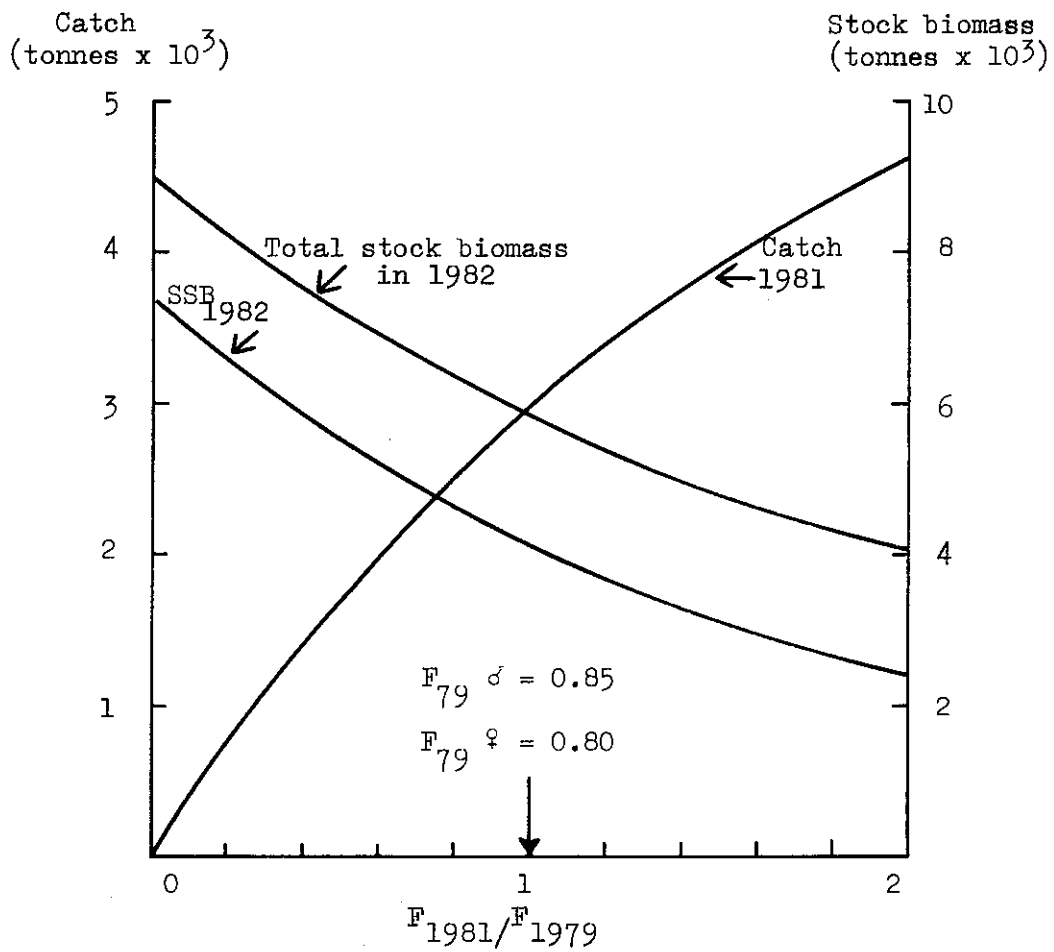


Figure 18. Irish Sea WHITING (Division VIIa). Predictions for catches in 1981 and spawning stock biomass in 1982. For the catch, the 95% confidence interval resulting from two high and two low recruitments is shown.



**Figure 19.** Irish Sea PLAIKE (Division VIIa). Predictions for catches in 1981 and spawning stock biomass in 1982.

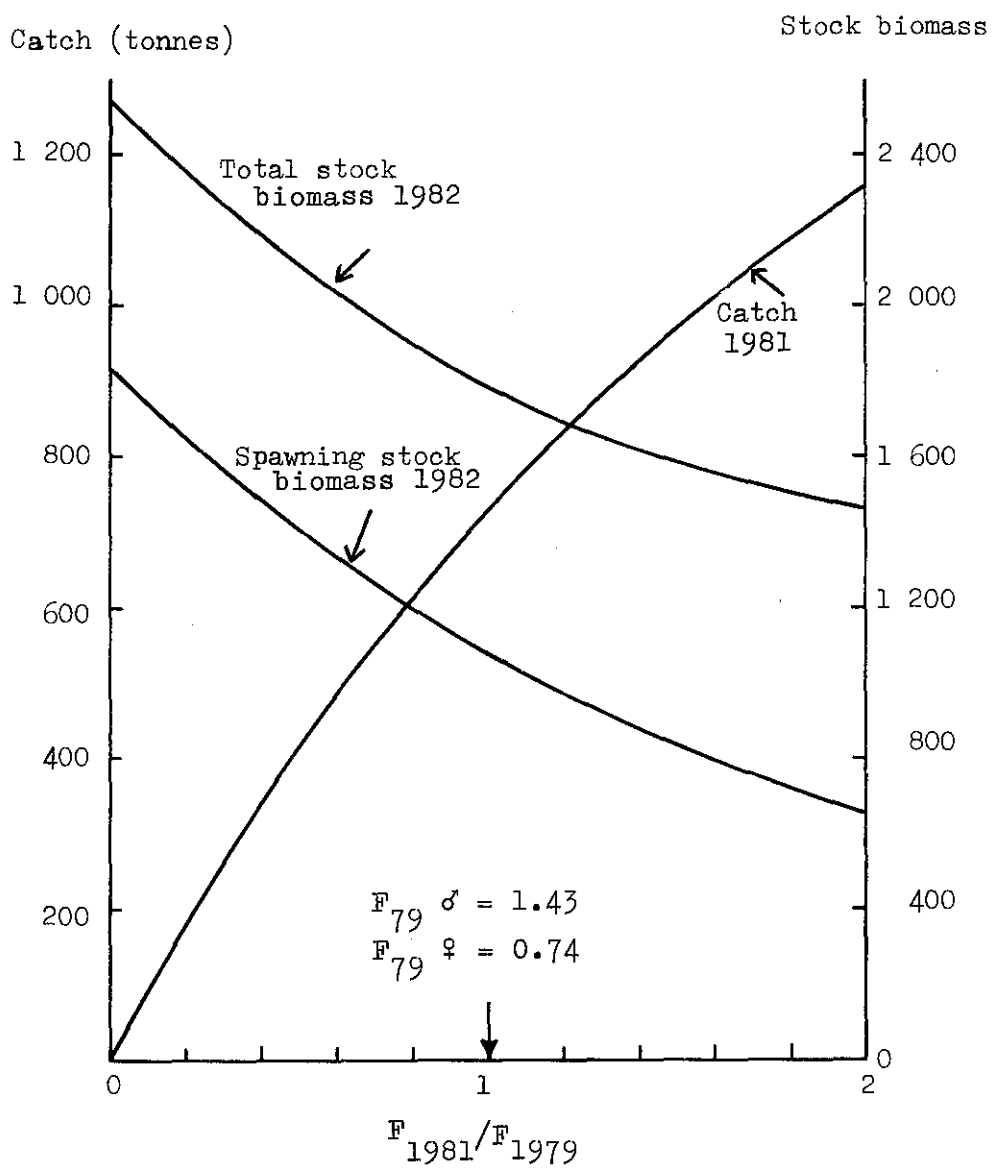


Figure 20. Celtic Sea PLAICE (Divisions VIIIf and VIIg). Predictions for catches in 1981 and spawning stock biomass in 1982.



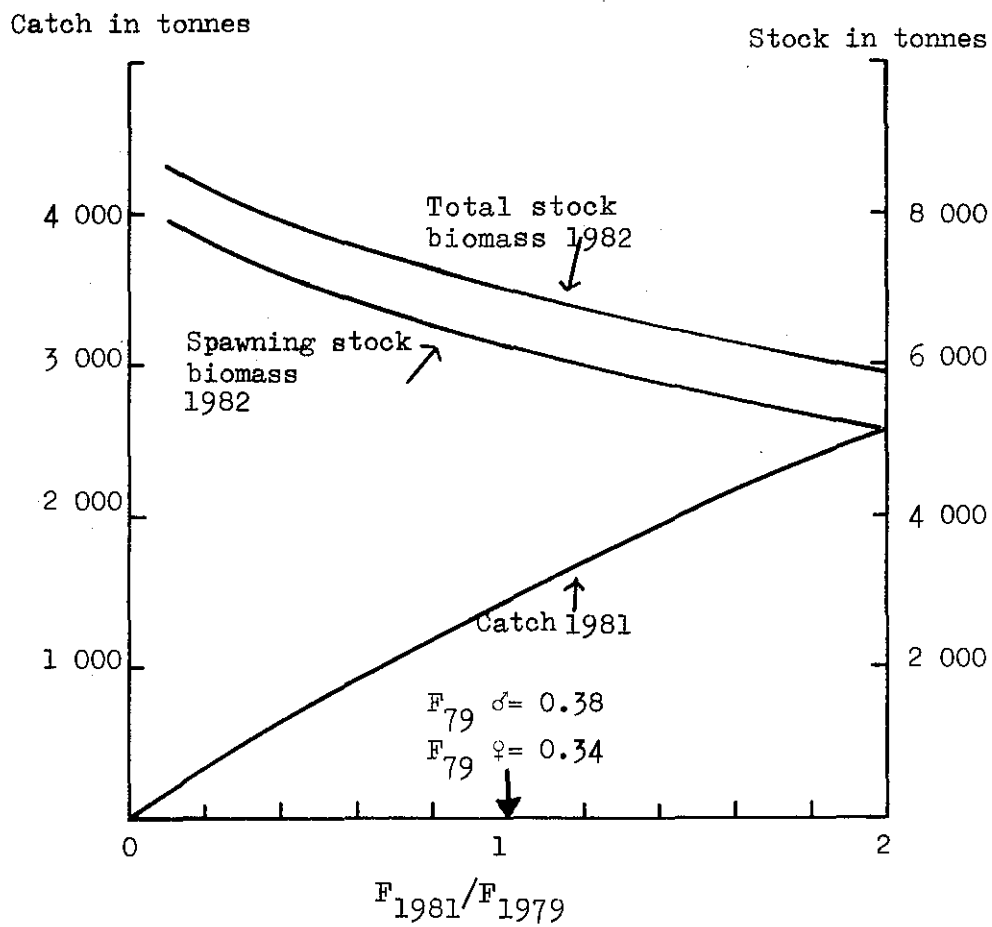
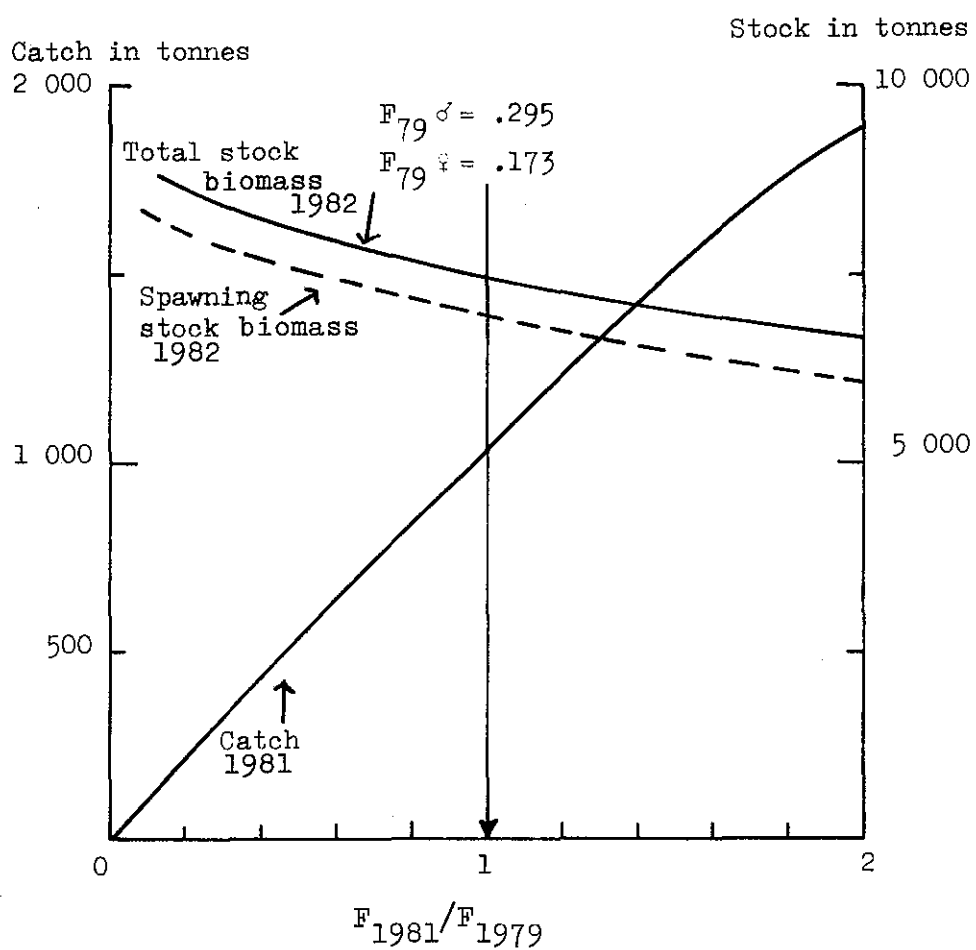
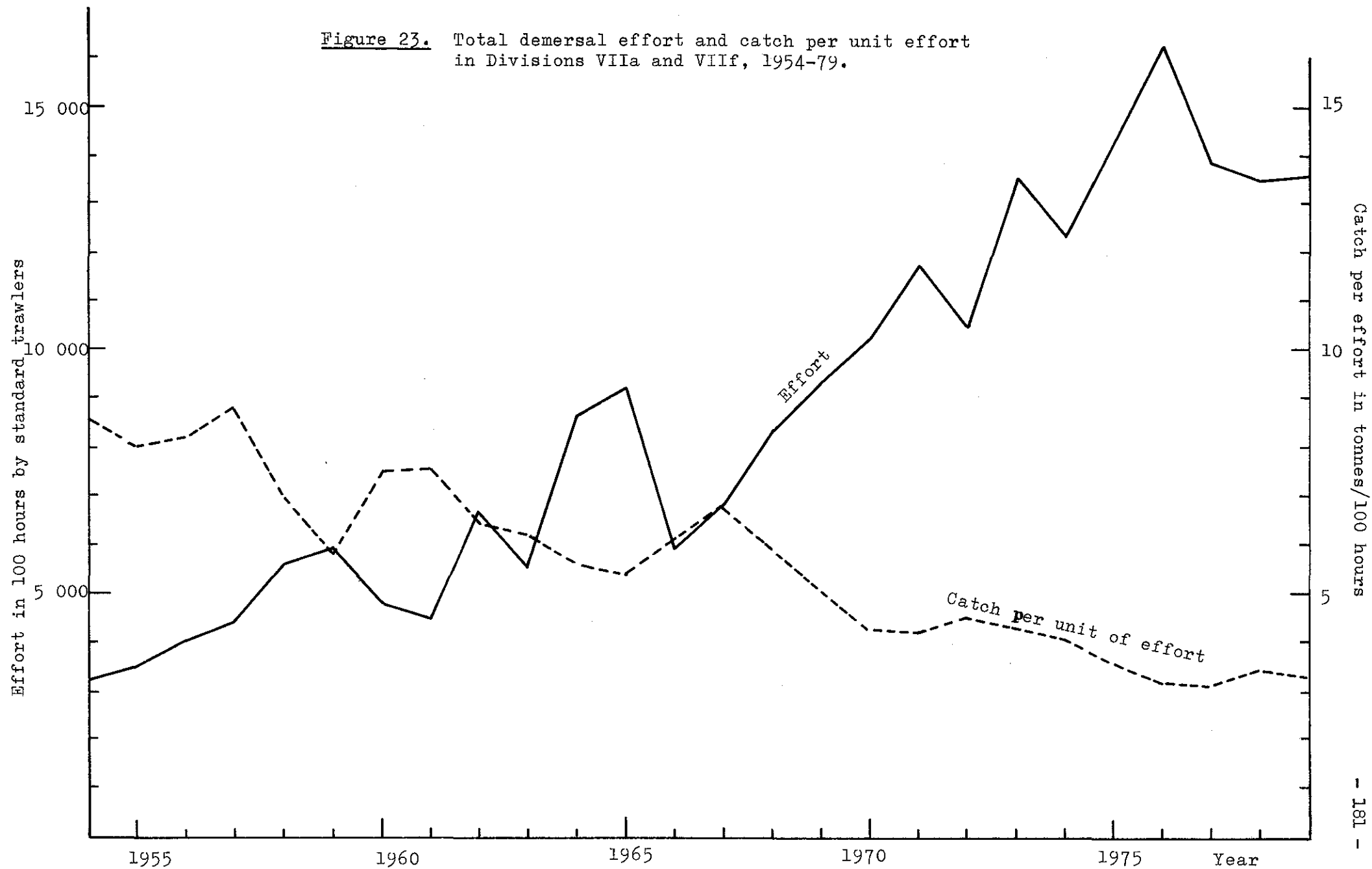


Figure 21. Irish Sea SOLE (Division VIIa). Predictions for catches in 1981 and spawning stock biomass in 1982.



**Figure 22.** Celtic Sea SOLE (Divisions VIIIf and VIIg). Predictions for catches in 1981 and spawning stock biomass in 1982.

Figure 23. Total demersal effort and catch per unit effort in Divisions VIIa and VIIf, 1954-79.



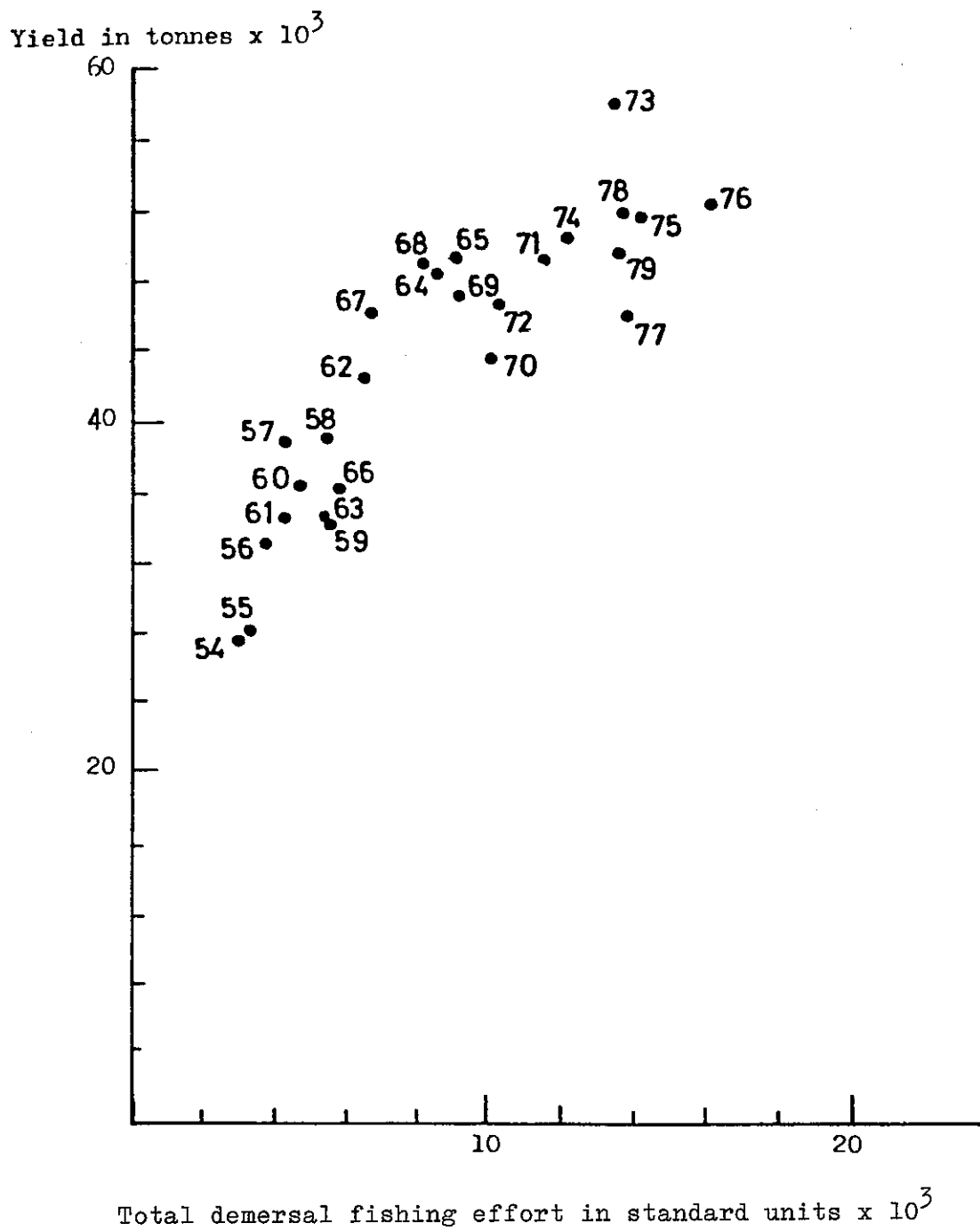
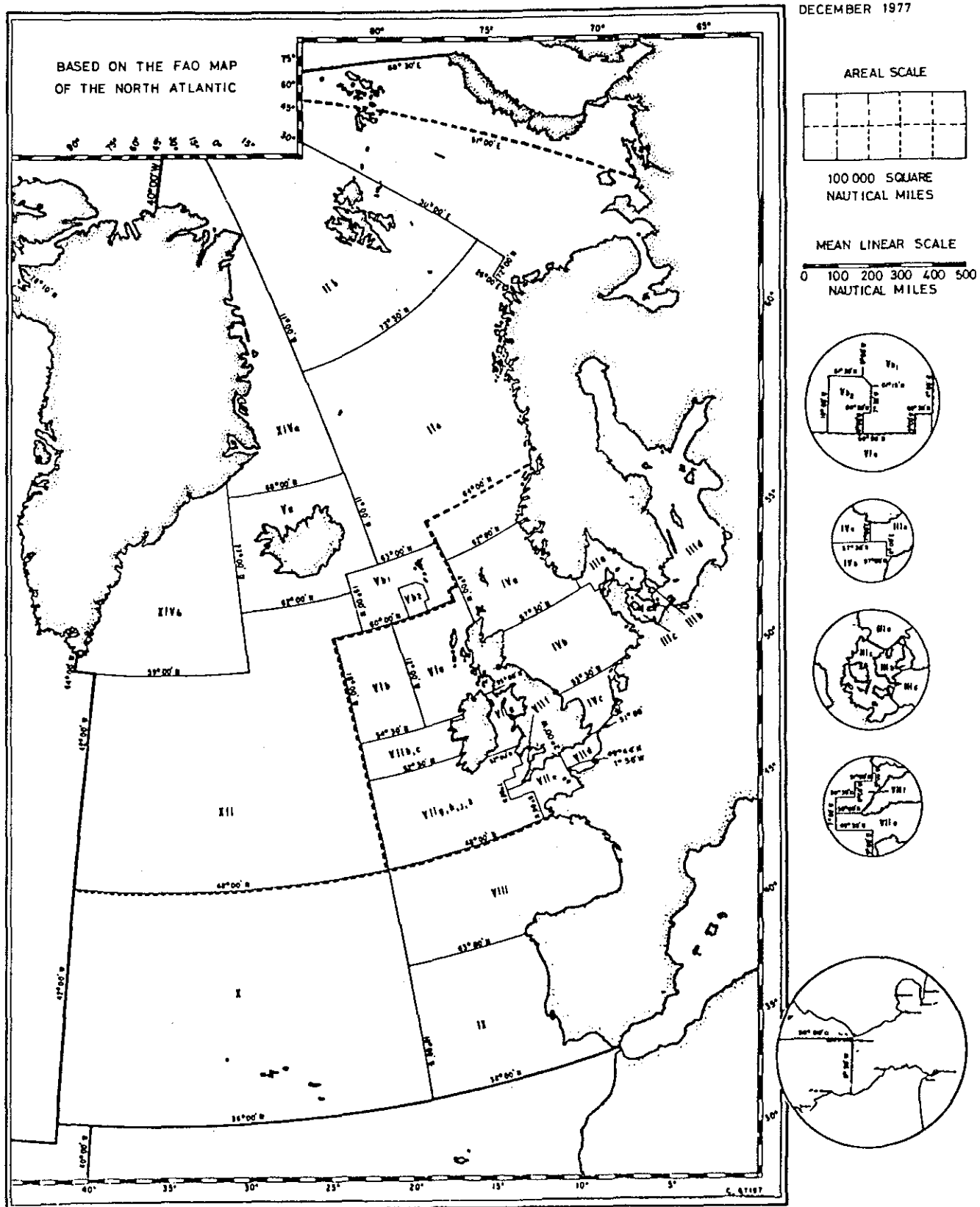


Figure 24. Irish Sea and Bristol Channel - total demersal yield and fishing effort, 1954-79.

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ICES FISHING AREAS

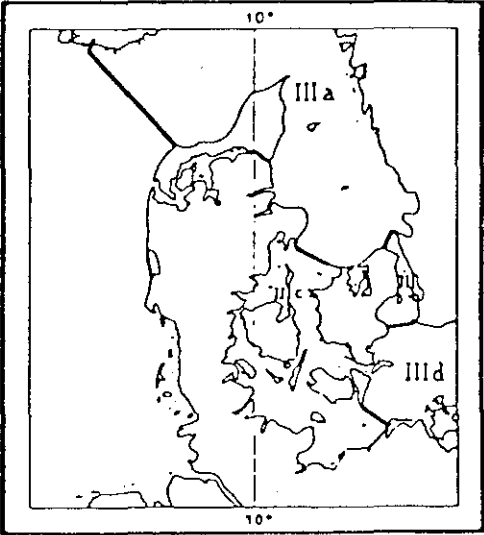


Chart of former statistical Divisions  
referred to in the Report.

#### IV. REPORT OF ACFM TO THE 6th SESSION OF THE INTERNATIONAL BALTIC SEA FISHERY COMMISSION

##### INTRODUCTION

As requested by certain management bodies which receive advice from ICES, ACFM, in this report, gives the effects of various changes in fishing mortality in 1981 on the yield which can be expected in that year, and of the estimated effect of taking that catch on the stock which will remain to spawn in the following year. Advice in this form is given only for those stocks for which it is appropriate, and where the assessment data are adequate to permit it.

It is hoped that advice in this form will be found useful by the management bodies in formulating their fisheries regulations for 1981. ACFM has, however, adopted this change with some reservations because it considers that such advice could be open to misinterpretation and could result in adverse long-term effects on the stocks and on the fisheries which exploit them. Such illustrative indications of the effects of different changes in fishing mortality rates can show only the very short-term effects on yields and stocks. It is inevitable that increasing the fishing mortality rate in any one year will result in a higher yield than would have been taken in that year by a lower mortality rate. The longer term effect, however, will, in most cases, be a lower yield in subsequent years unless the fishing mortality rate is increased still further, and ultimately a lower yield irrespective of the level of fishing mortality applied.

The curves of spawning stock biomass in the subsequent year are perhaps more revealing than the yield curves, although they too suffer from the defect that they illustrate only the very short-term effects of an increased exploitation rate. The longer term effect must, if these enhanced fishing mortalities are maintained, be to drive the spawning stock down to successively lower levels each year, unless the stocks are temporarily increased by above average recruitment. And it should be appreciated that the chances of getting above average recruitment are likely to be seriously diminished once the spawning stock falls below a certain level.

It should also be appreciated that the curves of spawning stock biomass in the succeeding year give a rough indication of the stock which will be available for exploitation in that year, as a result of the management policy adopted in the preceding one. They are therefore roughly indicative of the effects of this policy on the catch rates which will be achieved in the following year. In the present situation of the fisheries reducing future catch rates in this way could have serious effects on their longer term economic viability. The short-term yield and the spawning stock curves given in this report must be interpreted in relation to the long-term effects which sustained fishing at any chosen  $F$  value will have both on the yield and the stock biomass.

It is inherent in the response of stocks to management that a long-term policy is required, if the stocks are to give the optimum yield at an economic cost of harvesting it, rather than short-term expedients adopted to meet current economic and political problems. ACFM, in its report of June 1978, advocated a policy of gradually reducing the exploitation rate of stocks which were being fished excessively hard, by about 10% per year, until a more acceptable level of exploitation was reached. The Liaison Committee had in previous years adopted a similar, if less firmly defined, policy of reducing exploitation rates. Although the time scale is still rather short, it might be instructive at this stage to look at the exploitation rates of some stocks, to see what progress has been made in

this respect. In the text table below are given the estimated mean fishing mortality rates for some of the more important stocks, over the period 1976-79, and the  $F_{max}$  as some indication of the ultimate goal to be achieved. It should be appreciated that the precision of the estimates of fishing mortality declines as one approaches the final year. Where therefore the reduction achieved has been small, it is rather dubious if any progress has been made.

Species and Sub-division	Mean fishing mortality rates, on fully exploited age groups, as estimated in 1980				$F_{max}^1$
	1976	1977	1978	1979	
Cod in SD 22	1.59	1.52	1.27	1.3	0.26
Cod in SD 24	1.23	1.37	1.12	1.23	0.32
Cod in SD 25-32	0.59	0.47	0.39	0.49	0.40
Herring in SD 22-24	0.73	1.2	0.79	0.64	0.48
Herring in G. of Riga	0.90	0.58	0.45	0.72	0.40

1) Measured as the F value of the most heavily exploited age group, given the current exploitation pattern.

These figures would suggest that, in practice, for most of the heavily exploited stocks little real progress has been made in improving the situation. There would seem to be three main reasons for this: a) for the majority of stocks there has been little effective enforcement of TACs, as evidenced by the large number of cases mentioned in the assessments below where even the agreed TAC has been seriously exceeded; b) in many cases landings are a poor indicator of catches because of discarding and c) in too many cases the estimates by Working Groups, and by ACFM, of the TAC which can be taken at a given fishing mortality rate has been highly optimistic. It would seem clear that under these conditions a management policy of reducing F by 10% annually, from a rather imprecisely known level, can result in making little, if any, progress towards the defined long-term goal. Where, therefore the state of the stocks permit greater reductions in the F values without requiring very large reductions in the absolute size of the yields, ACFM has based its recommendations, in this report, on somewhat larger cut-backs of F.

ACFM would also wish to draw the attention of the Commission to the fact that satisfactory assessments of the effects of management measures are dependent on these being done by unit stocks, which have little interchange with neighbouring stocks. In the Baltic it appears probable that some of the units used for management purposes have interlinks not only with neighbouring Baltic units, but also with other stocks in adjacent areas outside the Baltic. This situation must have some effect on the precision of the assessments, and must be taken into consideration in deciding on the management policy to be adopted. More important, however, it must be realised that the yields recommended as TACs apply only to the populations for which they are assessed. Any switching of proportions of these TACs to other management units is highly undesirable, and could nullify any gains to be expected from management.



# A. REVIEW OF NOMINAL CATCHES IN THE BALTIC, 1969-78

1. The nominal fish catches in the Baltic from 1969-78 are summarised in the text table below, in thousand tonnes:

Year Species	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
Cod	201	192	160	186	189	189	234	255	213	195
Herring	295	312	335	345	404	407	415	393	413	419
Sprat	119	153	185	207	213	242	201	195	211	132
Flatfishes	21	19	19	20	18	21	24	19	22	23
Salmon	3	3	2	2	3	3	3	3	2	2
Freshwater species	19	17	14	17	23	21	20	20	22	22
Others	42	49	51	54	62	58	60	50	30	41
Total ...	700	745	766	831	912	941	957	935	913	834

Cartilaginous species as well as unsorted and unidentified fish are included in the "Others" category, whereas anadromous species, except salmon, shellfish catches and seaweed products 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 d. 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 sections below dealing with stock assessments.

2. The present report includes three tables of nominal catches from 1963-79 for cod, herring and sprat, and one table (1963-78) for flatfishes. The 1963-78 figures are those officially reported to ICES by national offices. The 1979 figures are preliminary ones. (See Tables 1-4.)

A combined table of recent catches by Sub-divisions and recommended TACs is given on page 204 (Table 5).

3. Total catches of all fish species combined had grown steadily from 700 000 tonnes in 1969 to a peak of 957 000 tonnes in 1975; thereafter they started to decline at approximately the same rate as they had previously increased. Thus the 1978 catch of 834 000 tonnes was close to the catch level in 1972, and slightly below the average for the period under consideration.
4. Catches of Cod were subject to relatively small fluctuations during 1969-74, except in 1971 when there was a drop in the catches of practically every country engaged in the fishery. The average catch during this period was about 186 000 tonnes. In 1975 the catch increased sharply to 26% above this average, and this increase continued in 1976 when 255 000 tonnes were caught (37% above this average). In 1977, however, the catch dropped to 213 000 tonnes, and further decreased to 195 000 tonnes in 1978 which was still 5% above the pre-1975 average level. This decline is confirmed by bio-statistical data used by the Working Group on Assessment of Demersal Stocks in

the Baltic (which also converted to nominal catch, figures for earlier years erroneously reported in landed weight by one member country). These data indicate a quick recovery of the catches in 1979 to a record level of about 271 000 tonnes.

5. After a decline in 1976, following a period of steady growth from 1969-75, Herring catches recovered in 1977 and further increased in 1978 to a record level of 419 000 tonnes. The recovery is confirmed by biostatistical data used by the Working Group on Assessment of Pelagic Stocks in the Baltic, which take into account herring and sprat by-catches in each of those fisheries. These data, which show even higher actual levels of herring catches in the late 1970s, indicate that purely herring removals in 1978 only marginally exceeded those in 1977 (whereas in 1979 the record catch was taken, which was nearly 7% above the 1978 level).
6. Having reached a peak of 242 000 tonnes in 1974, catches of Sprat decreased and fluctuated around approximately 200 000 tonnes in 1975-77. In 1978 there was a sharp drop to 132 000 tonnes, i.e. by 79 000 tonnes from the 1977 level or 29% below the average. This figure is confirmed by biostatistical data used by the Working Group on Assessment of Pelagic Stocks in the Baltic, which indicate a continued steep decline in 1979 to a level of 80 000 tonnes.
7. Catches of Flatfishes were relatively stable during the period under consideration, fluctuating from 18 000 tonnes to 24 000 tonnes, with the 1978 catch amounting to 23 000 tonnes. Flounder continued to predominate in the catches, making up nearly 43% of the total in 1978, with plaice (about 28%) and dab (5%) following amongst species items reported individually. Twenty-four percent of the total catch within this category was not reported by the individual species items breakdown.
8. Catches of Salmon fluctuated between 2 000 tonnes and 3 000 tonnes. In 1978, as in 1977, they amounted to 2 000 tonnes.
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 catches of 22 000 tonnes in both 1977 and 1978 were no exception. The leading individual species items in the 1978 catch were perch (17%), roach (13%) and pike (10%).
10. Catches of "Other Species" increased from 42 000 tonnes in 1969 to an average stable level of 60 000 tonnes in 1973-75. After that, they decreased to 50 000 tonnes in 1976 and, further, to 30 000 tonnes in 1977. In 1978 they showed a partial recovery to 41 000 tonnes, though this figure is still 18% below the average. Pelagic species (amongst which garfish predominated) accounted for 5% of the total within this category in 1978, gadiformes with whiting clearly dominating for 3%, and demersal percomorphs for 38% (shares of sticklebacks and eelpout were 19% and 18%, respectively). Fifty-four percent of the total was reported as unsorted and unidentified species.

#### B. THE BALTIC PELAGIC FISHERIES

11. The Working Group on Assessment of Pelagic Stocks in the Baltic met at ICES headquarters from 5-13 May 1980 to:
  - a) estimate TACs for herring and sprat stocks in the Baltic area;
  - b) compile available data on the by-catch of herring in the sprat fisheries and in the industrial fisheries;

- c) assess the effects of by-catches of juvenile herring in the sprat fisheries and industrial fisheries on herring stocks, and consider means of minimising these effects;
- d) assess the quantities of juvenile herring taken in directed herring fisheries with reference to any proposed minimum landing sizes for herring, proposals of minimum mesh sizes appropriate to these minimum landing sizes, and other proposals to protect juvenile herring.

## B.1 Herring Stocks

### B.1.1 General

12. Recent catches<sup>1)</sup> of herring and TACs in thousand tonnes:

Sub-divisions	1977			1978			1979			1980	
	Recom. TAC	IBSFC TAC	Actual catch	Recom. TAC	IBSFC TAC	Actual catch	Recom. TAC	IBSFC TAC	Actual catch <sup>2)</sup>	Recom. TAC	IBSFC TAC
22-24 25, 26 27, 28 <sup>3)</sup> , 29S G. of Riga 29N, 30, 31 32	400	422	75 152 68 24 64 50	290	444	78 142 73 15 73 53	68 115 65 16 78 44	405	93 172 64 17 70 47	67 118 61 15 73 40	420.2
Total			433	397		434	386		463	374	

Sub-divisions	1981
	Recom. TAC
22-24 25-27 28 <sup>3)</sup> , 29S Gulf of Riga 29N, 30, 31(E) 29N, 30, 31(W) 32	71 115 28 15 62 ? 50
Total	341

- 1) Working Group data (including by-catches in sprat fisheries)
- 2) Preliminary
- 3) Excluding Gulf of Riga

Herring catch data presented to the Working Group for 1978 and 1979 include some data on herring catches in mixed fisheries and exclude some sprat catches in herring fisheries. Data presented on herring by-catches in sprat fisheries, sprat by-catches in herring fisheries and on herring discards were very incomplete. As a result little progress can be reported on Items b), c) and d) above.

The 1979 herring catches were the largest ever taken in the Baltic. the preliminary figure amounting to 463 248 tonnes, that is about 29 000 tonnes more than in 1978. This increase was due to the very high yield in Management Unit 1. In other Management Units, the landings decreased.

13. In 1978 and 1979, assessments of herring stocks have been carried out by the following groups of Sub-divisions: 22-24, 25+26, 27+28 (Gulf of Riga excluded) + 29S, Gulf of Riga, 29N+30+31, and 32. Considering the need for a closer relation between assessment units and stocks, or groups of stocks, with similar vital parameters, the Working Group made a re-arrangement by combining Sub-divisions 25, 26 and 27 into one unit, and leaving Sub-divisions 28 (Gulf of Riga excluded) and 29S as another. Sub-divisions 29N, 30 and 31 were divided by a central line into eastern and western assessment units, as was suggested in last year's report. Stocks of spring and autumn spawning herring were assessed as one unit. The importance of autumn herring is very low in all the Sub-divisions. The natural mortality rates were taken to be: in Sub-divisions 22+24 - 0.3, in Sub-divisions 25+26+27 - 0.2, in Sub-divisions 28 (Gulf of Riga excluded) + 29S - 0.2, in the Gulf of Riga up to 1979 - 0.15 and in 1980 and 1981 - 0.2 (owing to an 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. Herring spawning stocks ( $\geq 3$  years, except in the Gulf of Riga and in Sub-divisions 22+24  $\geq 2$  years) estimated by VPA, in thousand tonnes.

Assessment units	From VPA								Acc. to input $F_s$ and prognoses				
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
22+24	259	271	275	267	228	198	156	138	175	217	211	239	264
25+26+27			1000	1028	990	1057	979	889	860	808	643	465	383
28 (excl.G. of Riga) + 29S			150.6	162.7	143.3	142.7	135.4	108.0	158.7	143.1	110.6	66.7	85.7
Gulf of Riga	44.0	37.1	61.5	63.4	60.9	60.3	42.3	60.1	44.0	37.7	23.3	33.7	42.1
29N+30+31(E)				271.6	288.0	303.5	318.1	302.9	360.1	360.0	317.9	264.6	291.0
32	114.9	85.9	69.4	129.9	123.0	107.4	100.0	88.1	131.7	113.3	106.0	90.0	123.7

#### Sub-divisions 22, 23 and 24

15. On the basis of results from German Democratic Republic young herring abundance investigations, a hydroacoustic survey, and from VPA, the 1978 year class was estimated to be average ( $3.1 \times 10^9$  fish), the 1977 and 1979 year classes well above average ( $4.6 \times 10^9$  fish). The 1980 and 1981 year classes have been assumed to be of average strength. The catch in 1980 was estimated to be about 86 000 tonnes. This implies a reduction in the exploitation rate by 15% from the 1979 level. For 1981 a further reduction of the exploitation rate, to the  $F_{max}$  level, is recommended. The corresponding catch would be 67 000 tonnes, which is the same amount as was recommended for 1980. Although no assessment can be done for Sub-division 23, the catch from this area should be reduced in the same proportion as for Sub-divisions 22 and 24 (i.e. by about 40%) to 4 000 tonnes.

The ACFM accordingly recommends a TAC for 1981 of 71 000 tonnes in Sub-divisions 22, 23 and 24.

The yield in 1981 and the spawning stock in 1982 resulting from various  $F$  levels in 1981 relative to that in 1979 are shown in Figure 1.

Sub-divisions 25, 26 and 27

16. The reported landings for 1979, of 194 000 tonnes, are 20 000 tonnes higher than in 1978. The increased catch is partly due to an increase in effort. A diversion of effort from Division IIIa has contributed to the increase in effort. In this management unit there are three distinct stocks with different vital parameters. As a result, assessing them as one unit is not entirely satisfactory; but this is the best that could be done in 1980, in the time and with the data available. In future it is hoped to assess the stocks separately, although for management purposes the individual stock TACs will have to be aggregated into one management unit TAC.

The exploitation rate and pattern in 1979 were estimated mainly from the acoustic surveys in 1978 and 1979. Based on these surveys the 1979 year class was estimated to be twice as large as the 1978 year class. As each of the three year classes 1977-79 appears to be below average level, it was considered to be safer to assume that the 1980 year class was also smaller than average. This year class was therefore set at 50% of the average.

The recommended TAC for 1980 in Sub-divisions 25 and 26 was 118 000 tonnes. Taking into account both the contribution from Sub-division 27 and the increase in the TAC by about 12% agreed by the IBSFC the most probable catch in 1980 was estimated to be about 155 000 tonnes.

The 1979 exploitation rate will have to be increased by a factor of 1.3 to obtain this catch. This was not, however, considered unrealistic, taking into account restrictions on fishing in 1979 caused by the quotas in operation.

On the assumption that about 155 000 tonnes will be caught in 1980 even a decrease in fishing mortality in 1981 to the 1979 level, corresponding to a catch of 115 000 tonnes, will result in a further decrease of the spawning stock. It must be stressed that the heavy exploitation on the 1- and 2-group makes the exploitation pattern far from optimal. Curves of the yield in 1981 and spawning stock biomass in 1982 at various levels of  $F$  in 1981 are given in Figure 2.

With a decreasing spawning stock, and with the current exploitation rate of younger age groups being exceedingly high, the ACFM recommends a TAC for 1981 of not more than 115 000 tonnes.

Sub-divisions 28 and 29S

17. As in previous years, two separate assessments were carried out in this area - one for the stock inhabiting the Baltic proper and one for the Gulf of Riga.

18. Based on the rather high number of 0-group herring in the USSR experimental trawl catches, the 1979 year class was estimated to be  $2.4 \times 10^9$  fish, or 120% of the average. The abundances of the 1977 and 1978 year classes were estimated from VPA, as respectively 37% and 17% of the average. The 1980 and 1981 year classes were assumed to be average. The 1979 exploitation rate and pattern applied to the 1980 stock estimate the yield at 32 000 tonnes in 1980, whereas in 1981 the catch would be 29 000 tonnes. Taking into account the higher herring TAC agreed for 1980 by IBSFC, the corresponding catch figures for Sub-divisions 28+29S would be 45 000 tonnes in 1980. A catch of that level in 1980 was not considered to be unrealistic, but it requires higher effort to be applied ( $F_{1980} = 1.5 F_{1979}$ ) and results in a lower spawning stock size. Returning the stock to the 1979 exploitation rate would result in a catch of

28 000 tonnes in 1981. ACFM would recommend a TAC of 28 000 tonnes in 1981.

Curves of yields in 1981 and spawning stock biomasses in 1982 are given as Figure 3.

19. On the basis of data on young herring abundance, the 1979 year class of the Gulf of Riga herring was estimated to be  $2.3 \times 10^9$  fish or 117% of the average. The abundances of the 1977 and 1978 year classes were taken from the VPA as 37% and 27% of the average. The 1980 and 1981 year classes were assumed to be average. The 1979 exploitation rate applied to the 1980 and 1981 stocks gives yields of 15 000 tonnes and 18 000 tonnes, respectively. Fishing mortality on this stock is far beyond the  $F_{max}$  value; therefore a 20% decrease in  $F$  values in 1981 (as compared to the 1979 level) is recommended. This corresponds to a catch of about 15 000 tonnes. ACFM would recommend a TAC for Gulf of Riga herring of 15 000 tonnes in 1981.

A figure of yields in 1981 and spawning stock biomasses in 1982 is given as Figure 4.

Sub-divisions 29N, 30, 31(east)

20. Based on the results of larval abundance investigations, the 1979 year class was estimated to be 158% of average or  $6 \times 10^9$  fish. The 1980 and 1981 year classes were set as average. An increase of 10% above the 1979 level in fishing mortality was estimated to correspond to the TAC in 1980 (65 000 tonnes). As fishing mortality is below the  $F_{max}$  value and the spawning stock is at a relatively high level, this 1980 fishing mortality level was also applied in 1981. The resulting catch is 62 000 tonnes. ACFM would recommend a TAC of 62 000 tonnes in 1981.

A figure of yields in 1981 and spawning stock biomasses in 1982 at various  $F$  levels is given as Figure 5.

Sub-divisions 29N, 30, 31(west)

21. Owing to lack of data, ACFM cannot recommend a TAC for this unit.

Sub-division 32

22. The results of larval surveys suggest that the 1979 year class is above average. It was set at the level of 156% of the average or  $5 \times 10^9$  fish. The 1980 and 1981 year classes were assumed to be average. Fishing mortality on the stock is close to  $F_{max}$  and the spawning stock seems to be stable. If it is assumed that the exploitation rate remains at the 1979 level in 1980 and 1981 it will give catches 45 000 tonnes and 50 000 tonnes respectively in those years. Therefore 50 000 tonnes is recommended by ACFM as the TAC for this Sub-division in 1981.

A figure of yields in 1981 and spawning stock biomasses in 1982 at varying  $F$  levels in 1981 is given as Figure 6.

## B.2 Sprat Stocks

### B.2.1 General

23. Recent catches<sup>1)</sup> of sprat and recommended TACs in thousand tonnes.

Sub-divisions	1977			1978			1979			1980		1981
	Recom. TAC	IBSFC TAC	Actual catch	Recom. TAC	IBSFC TAC	Actual catch	Recom. TAC	IBSFC TAC	Actual catch <sup>2)</sup>	Recom. TAC	IBSFC TAC	Recom. TAC
22,24,25	240	275	36	210	184.3	22	34	161	18	17	80.5	15
26, 28			85			73	80		32	46		31
27,29,32			60			38	41		30	14		14
Total			181			133	155		80	77		60

1) Working Group data (excluding herring by-catches)

2) Preliminary

Catch data presented for 1978 and 1979 include sprat catches in mixed fisheries but exclude herring catches in sprat fisheries. Compared to the 1978, sprat catches declined in 1979 by about 39% (52 800 tonnes). Catches decreased mainly in the southeastern, eastern and northern Baltic. In Sub-division 22 they increased.

As in 1978 and 1979, sprat stocks were assessed by the following three groups of Sub-divisions: 22+24+25; 26+28 and 27+29+32. The 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 for the years 1970-75 - 0.2 and from 1976 onwards - 0.3. The latter value was used because of an assumed increased effect of cod on the sprat stock resulting from the cod invasion of the northern Baltic in that year.

### B.2.2 State of the Stocks and Catch Predictions

24. Sprat spawning stock biomass ( $\geq 2$  winter rings) estimated by VPA, in 1970-82, in thousand tonnes.

Assessment units	From VPA								Acc. to input Fs and prognoses				
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
26+28	662.2	623.3	486.7	425.6	456.0	354.5	215.8	284.0	231.7	123.9	194.5	191.0	196.2
27+29+32	398.2	413.4	318.4	249.6	301.9	232.3	157.2	244.4	153.6	94.4	49.8	29.6	34.3

Sub-divisions 22+24+25

25. Due to changes in the data base it was not possible to make an analytical assessment in these Sub-divisions. Bearing in mind the general downward trend in the abundance of sprat stocks in the Baltic, ACFM recommends, as a precautionary measure, that the catches in 1981 in Sub-divisions 22, 24 and 25 should be lower than in 1979 and should not exceed 15 000 tonnes.

Sub-divisions 26+28

26. Compared to 1978, catches in 1979 decreased by about 56% (by 66% in Sub-division 28 and by 47% in Sub-division 26). Based on results of young sprat abundance estimations in Polish landings and from the acoustic survey, the 1979 year class was estimated to be 66-70% of the average. The abundance of the 1980 and 1981 year classes was assumed to be of the same magnitude.

To take the 46 000 tonnes recommended for 1980 for these Sub-divisions, F values will have to be increased in comparison with the 1979 values by 63%. Returning to the 1979 fishing mortality level in 1981 would result in a catch of 31 000 tonnes in that year. ACFM would accordingly recommend a TAC for sprat in 1981 of 31 000 tonnes in these Sub-divisions.

Yields in 1981 and the resulting spawning stock biomasses in 1982 at varying F levels in 1981 are shown in Figure 7.

Sub-divisions 27+29+32

27. The 1977, 1978 and 1979 year classes are very poor; the estimated abundance of the 1979 year class being at the same level as the 1977 year class. The 1980 and 1981 year classes were set at the average level, calculated on the basis of the 1970-78 year classes but excluding the very strong 1972 and 1975 year classes. The 1979 exploitation rate applied to the 1981 stock estimate predicts a yield of about 14 000 tonnes.

ACFM accordingly recommends a TAC for sprat in Sub-divisions 27, 29 and 32 of 14 000 tonnes in 1981.

The yields in 1981 and spawning stock biomasses in 1982 are shown in Figure 8 for various options of exploitation rate in 1981.

### B.3 Juvenile Herring

28. As in previous years, data on landings of juvenile herring in the Baltic area are incomplete. Very few data were presented on by-catches of herring in sprat fisheries, and on discards at sea. From the available information it was estimated that in 1978 at least 40 000 tonnes and in 1979 at least 25 000 tonnes of immature herring were caught. This apparent decrease may have been due to a decrease in sprat fishing, to a series of poor year classes in the herring stocks, or to some new national regulatory measures. The general opinion of the Working Group members was that the amount of discards at sea has increased in recent years.

Data presented strongly suggest that the provisional separation lengths of juveniles and adults in catches need re-estimation, as a large proportion of herring above these lengths is still immature.

The impact of herring exploitation rates on yield and spawning stock size were considered. The potential gains from decreasing the fishing mortality rates on young herring are substantial in the southern and western parts of the Baltic. In the other areas the gains are moderate or small. Gains to the herring fisheries in some areas can be expected from an increase in the legal minimum mesh size.



Lack of adequate data on by-catches prevents evaluation of the proportions by which the use of small-meshed gears (10 mm bar length) contributes to the present exploitation pattern of herring stocks. Also further data on selectivity in herring trawls are needed.

### C. THE BALTIC DEMERSAL FISHERIES

29. The Working Group on Assessment of Demersal Stocks in the Baltic met at ICES headquarters 5-10 May 1980 to:

- (1) provide advice on TACs for cod for each stock/fishery unit;
- (2) assess the effects on cod stocks of fishing with smaller meshed gears than those applied for cod.

30. Recent catches of cod<sup>1)</sup> and TACs, in thousand tonnes.

Sub-divisions	1977			1978			1979		
	Recom. TAC	IBSFC TAC	Actual catch	Recom. TAC	IBSFC TAC	Actual catch	Recom. TAC	IBSFC TAC	Actual catch <sup>2)</sup>
22	27.2	185	30	28	173.8	24	29	175	26
24	12.4		15	12		15	10		16
25-32	120.0		165	131		154	136		222
Total	159.6		210	171		193	175		264

Sub-divisions	1980		1981
	Recom. TAC	IBSFC TAC	Recom. TAC
22	19	235	17
24	14		10
25-32	179		170
Total	212		197

1) Working Group data

2) Preliminary

#### C.1 Cod in Sub-division 22

31. The landings in 1979 amounted to 26 305 tonnes, which is 9% higher than those in 1978. Apart from 1978, the landings in 1979 were the lowest on record. The recommended TAC for 1979 was 29 000 tonnes. Discards in 1979 were estimated to be 3.9% of the catch (1 050 tonnes), whereas discards in 1978 were estimated to be 10% of the catch. This difference may be explained by the weak 1978 year class in the 1979 fishery.

32. Natural mortalities were assumed to be 0.2 for all age groups.

Fishing mortalities in 1979 were assumed to be the same as those used in last year's Working Group report, apart from the 1-group fish. For these the average F for 1974-77 was used.

According to a young fish survey and the VPA, the year classes 1977, 1978 and 1979 are below the average strength of 1-year olds ( $77 \times 10^6$ ). If the same exploitation rate is retained in 1981 the catches in that year will be considerably greater than the spawning stock biomass. Although the spawning stock has increased compared to last year this underlines how heavily overfished the stock is.

The 1978 year class is estimated to be only 24 million as 1 year olds. The spawning stock biomass should not be allowed to fall below 20 000 tonnes in 1982. To achieve this, the level of fishing mortality will have to be reduced by 20% of the 1979 level. The catch in 1981 will then be 17 000 tonnes and ACFM would recommend this as the TAC for that year.

A figure showing the yields in 1981 and the spawning stock biomasses in 1982 is given as Figure 9.

In relation both to the assessment of this cod stock, and that in Sub-division 24 below, the effects of migrations on the accuracy of the predictions of the state of the stocks under different management regimes are likely to be considerable and therefore a cautious approach is advisable.

#### C.2 Cod in Sub-division 24

33. The average annual catch of cod in the period since 1965 is 15 150 tonnes. These catches include by-catches in sprat and herring fisheries but not discards. The catch in 1979 increased by 12% to 16 290 tonnes.

34. The accuracy of the assessment is seriously limited by lack of effort data for recent years. The VPA was run with input Fs close to the mean for the period 1974-77, implying a slight increase in fishing mortality in 1979 from the 1978 level.

The mean number of 1 year old cod at the beginning of the year in the period 1966-76 was  $35 \times 10^6$ . Young fish surveys indicate that the 1978 and 1979 year classes are well below average,  $15 \times 10^6$  for the 1978 year class.

The stock in numbers derived from the VPA at the beginning of 1979 indicates that the 1978 year class is  $19 \times 10^6$ . The 1979 year class is assumed to be  $22 \times 10^6$ , which is the lowest figure in the period 1965-78.

Catch predictions were made on the assumption that the exploitation rate and pattern will be the same in 1980 as in 1979. ACFM would recommend that in 1981 the fishing mortality rate should be reduced by 20% of the 1979 level. Assuming the 1980 year class to be average ( $35 \times 10^6$ ), the catch in 1981 will then be 10 000 tonnes.

ACFM recommends for cod in Sub-division 24 a TAC for 1981 of 10 000 tonnes.

The yields in 1981 and spawning stock biomasses in 1982 at various levels of F in 1981 are shown in Figure 10.

#### C.3 Cod in Sub-divisions 25-32

35. The total catch in 1979 increased by 45%, from 152 922 tonnes in 1978 to 222 268 tonnes in 1979. An increase in catch was observed for all countries except the German Democratic Republic. The higher catches seem to be partly due to an increase in stock size, as indicated by higher

catch per unit effort values, partly due to environmental conditions which resulted in concentration of the stock into a smaller area, especially in the eastern part of the area (Gdańsk Deep and Gotland Deep). In 1979, as in 1978, cod were unusually abundant in the Gulf of Finland and in the Gulf of Riga.

36. As the increase in the total catch in 1979 is believed to be mainly due to an increase in stock size and not due to higher fishing mortality, the same input Fs were used as in the 1979 VPA for ages 3 and older.

The F on age group 2 was thought to be higher in 1979 than in 1978. Because of a decrease in the oxygen content in the deep water layers and low temperatures in the shallow waters, the young cod were concentrated on the same grounds as adult fish, especially during the winter and spring. The very heavy catches also hampered the selectivity of the cod ends resulting in a higher catch of juveniles. F for age group 2 in 1979 was accordingly estimated to be 0.12. As in former years the natural mortality rate was taken to be 0.3.

The mean and the 95% confidence limits of the number of 2 year old cod at the beginning of the year, in the period 1966-76 is  $396 \times 10^6 \pm 97 \times 10^6$ .

The VPA shows a year class strength at age 2 in 1977 equal to  $506 \times 10^6$ . This agrees with the 1979 Working Group estimate ( $470 \times 10^6$ ).

Results of young fish surveys suggest that both the 1978 and 1979 year classes are weak, with a strength of about 300 million.

The exploitation patterns used in the predictions for 1980 and 1981 are assumed to be the same as in 1979, except in the case of age group 2, on which the fishing mortality rate was exceptionally high. The F value for age group 2 used in predictions was kept at the level found in the years immediately preceding 1979, of 0.08.

Assuming an effort level in 1980 similar to that in 1979, and that the 1981 F values will be reduced to 80% of those in 1979, the catch in 1981 will be 170 000 tonnes and the spawning stock will remain well above the mean value of 1966-77.

ACFM accordingly recommends a TAC for 1981 of 170 000 tonnes for cod in Sub-divisions 25-32.

The yields in 1981 and spawning stock biomasses in 1982 at various F levels are shown in Figure 11.

#### C.4 By-Catch of Cod in Gear with Smaller Mesh Sizes than those applied for Cod

37. In all management units no adequate information was supplied about catches of cod taken with small meshed gear. ACFM regrets that under these circumstances it is again unable to make any suggestions as to how to resolve this problem.

### D. BALTIC SALMON STOCKS

38. The Baltic Salmon Assessment Working Group met at ICES headquarters on 10-15 March 1980 to assess a TAC for 1981 and to consider the effects of increasing the minimum mesh size of drift nets used for salmon fishing in the Baltic, and any resulting requirement for a change in the minimum landing size.

The Baltic salmon stocks have not previously been considered by ACFM.

39. The total international catches of Baltic salmon are summarised below for the 1970-79 period for Sub-divisions 24-32, in tonnes.

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 <sup>x)</sup>
Tonnes	2 497	2 044	2 162	2 601	2 928	3 001	3 045	2 631	1 995	1 915

x) Preliminary

#### D.1 Sub-divisions 24-31

40. The fishery for Baltic salmon has experienced a decline from the 1975 peak of 3 000 tonnes to the present level of slightly below 2 000 tonnes. This is the combined effect of a reduction in effort and a decline in stock abundance. The decline in stock is probably due to fishing and to an outbreak of UDN disease in 1976. Sixty percent of the stock in numbers is maintained by releases from hatcheries. Recently some hatcheries have reported difficulties in catching a sufficient number of female spawners. The present level of survival from smolt to spawner is about 1.8%, while maintenance of some major wild stocks requires a survival of about 2.4%.

The fishery starts on 1 September and ends in June of the following year. It would therefore be appropriate to manage this stock by fishing season (1/9 - 15/6 (1/7 in Sub-division 32)). However, the TAC advised in this report refers to the calendar year 1981, in accordance with the request from IBSFC.

41. The TAC for 1981 has been estimated on the basis that the exploitation rate and pattern for the 1978-79 fishing season will also be applicable to the 1979-80, the 1980-81 and the 1981-82 seasons. This, however, may be a dubious assumption since changes in fisheries jurisdiction in the area seem to have had a major impact on fishing activities.

The biological management objective relevant to these stocks in their present state is to ensure a sufficiently high escapement of spawners to the rivers. The present escapement is about 75% of that required to maintain the output of wild smolts at the level of optimal potential smolt production. It is therefore advisable to reduce the exploitation pressure on the sea life phase of Baltic salmon.

The releases from hatcheries are likely to be at the same level as in previous years. Assuming the production of smolts from the wild stocks remains unchanged compared to recent years, the catch predictions for 1981, and the corresponding escapements of spawners in 1982, are shown in Figure 12.

Figure 12 and Table 6 show that in order to provide for an escapement of 2.4%, the TAC for 1981 should be 1 550 tonnes, corresponding to an overall reduction of 25% in fishing mortality, to be applied to all fisheries exploiting this stock. Continuation of fishing at the 1978/79 level would yield about 1 900 tonnes, but the escapement of spawners would be only 1.8%.

ACFM therefore recommends that a TAC of not more than 1 550 tonnes be set for 1981.

The yield is directly related to the quantity of artificially reared smolts released in 1979 and 1980. The escapement in absolute numbers of female spawners, and thus the state of the stocks, is also influenced by the number of artificially reared smolts released. If the state of the stock is improved, whether through stocking, regulations of the sea and/or river fisheries, or other measures, other biological considerations than improving the escapement of spawners may become relevant.

42. The effects increasing the mesh size in drift nets to 167 mm or 177 mm was estimated under the assumption of no change in the overall fishing mortality rate. The data base on which to calculate effects of a changed mesh size had serious gaps. Selectivity data were available only for a 160 mm mesh size. Also, for the 160 mm mesh size there was a high degree of variability between sets of data. With these reservations the calculated effects of an increase to 167 mm and 177 mm on the yield and escapement are summarised below.

Legal mesh size		167 mm	177 mm
Minimum landing size		64 cm	68 cm
Yield <sup>1)</sup>	1981	-8	-16
	Long term	-4	- 7
Escapement <sup>2)</sup>	1982	9	17
of spawners	Long term	12	25

1) In percentage of the corresponding yield with a 157 mm mesh size

2) In percentage of the corresponding escapement with a 157 mm mesh size

43. Increased problems with undersized discards in the long-line fishery will result from an increase in the mesh size and a corresponding increase in the minimum landing size. Taking the uncertainties into account no change of mesh size for drift nets is recommended.

#### D.2 Sub-division 32

44. Reported catches for the period 1970-78 are summarised below, in tonnes:

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978
Tonnes	136	124	138	135	111	74	81	75	82

No catch data were available for 1979.

The catches taken by USSR are not broken down by Sub-divisions and are not included in the figures given above.

45. Based on evidence currently available salmon in the Gulf of Finland have been treated as a separate stock component for which no assessment is possible. As the trend in the catches apparently follows that of the rest of the Baltic Sea, a precautionary TAC is recommended of 4% of the TAC advised for Sub-divisions 24-31, or 65 tonnes.

Table 1. Nominal catch (tonnes) of herring in Divisions IIIb,c,d, 1963-79

(Data for 1963-78 as officially reported to ICES)

Country Year	Denmark	Finland	German Dem. Rep.	Germany, Fed. Rep. of	Poland	Sweden	USSR	Total
1963	14 991	48 632	10 900	16 588	28 370	27 691	78 580 <sup>a)</sup>	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 <sup>b)</sup>	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	41 841	124 479	393 488
1977	25 467	78 051	62 450	7 660	60 212	52 871	126 000	412 711
1978	26 620	89 468	46 261	7 808	63 850	54 629	130 642	419 278
1979	33 911 <sup>*)</sup>	81 000 <sup>*)</sup>	57 203 <sup>*)</sup>	6 672 <sup>*)</sup>	80 646 <sup>*)</sup>	85 703 <sup>*)</sup>	118 655	463 790

\*) Preliminary.

\*) Working Group data, by-catch of sprat excluded and by-catch of herring in sprat fisheries included.

a) Including Division IIIa.

b) 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, 1963-79  
(Data for 1963-78 as officially reported to ICES)

Country Year	Denmark	Finland	German Dem. Rep.	Germany, Fed. Rep. of	Poland	Sweden	USSR	Total
1963	2 525	1 399	8 000	507	10 693	101	45 820 <sup>a)</sup>	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	713	113 217	194 775
1977	16 933	3 213	17 241	713	50 502	433	121 700	210 735
1978	10 797	2 375	13 710	570	28 574	807	75 529	132 362
1979	9 354 <sup>*)</sup>	6 500 <sup>*)</sup>	4 018 <sup>*)</sup>	691 <sup>*)</sup>	12 395 <sup>*)</sup>	2 226 <sup>*)</sup>	45 727	80 911

\*) Preliminary.

\*) Working Group data, by-catch of herring excluded and by-catch of sprat in herring fisheries included.

a) Including Division IIIa.

Table 3. Nominal catch (tonnes) of cod in Divisions IIIB,c,d, 1963-79  
(Data for 1963-78 as officially reported to ICES)

Country Year	Denmark	Finland	German Dem. Rep.	Germany, Fed. Rep. of	Poland	Sweden	USSR	Total
1963	35 851	12	7 800	10 077	47 514	22 827	30 550 <sup>a)</sup>	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	22 802	51 516	255 276
1977	74 495	310	10 967	31 560	47 703	18 327	29 680	213 042
1978	50 907	627	9 345	16 918	64 113	15 996	37 200	195 106
1979	59 964 <sup>*)</sup>	1 400 <sup>*)</sup>	8 997 <sup>*)</sup>	19 375 <sup>*)</sup>	79 754 <sup>*)</sup>	23 093 <sup>*)</sup>	78 730	271 313

\*) Preliminary.

\*) Working Group data (provisional).

a) Including Division IIIa.



**Table 4.** Nominal catch (tonnes) of flatfishes in Divisions IIIb,c,d, 1963-78  
(Data as officially reported to ICES)

Country Year	Denmark	Finland	German Dem. Rep.	Germany, Fed. Rep. of	Poland	Sweden	USSR	Total
1963	9 888	-	3 900	794	2 794	1 026	1 460 <sup>a)</sup>	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 <sup>b)</sup>	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	582	3 018	19 397
1977	7 239	203	3 378	960	4 879	484	4 754	21 897
1978	9 184	227	4 034	1 106	5 418	396	2 500	22 865

a) Including Division IIIa.

b) Excluding subsistence fisheries.

Table 5. Recent catches<sup>a)</sup> and recommended TACs (in '000 tonnes)

Fishery and Sub-divisions	1976		1977			1978			1979			1980		1981
	Recom. TAC	Actual Catch	Recom. TAC	IBSFC TAC	Actual Catch	Recom. TAC	IBSFC TAC	Actual Catch	Recom. TAC	IBSFC TAC	Actual Catch <sup>b)</sup>	Recom. TAC	IBSFC TAC	Recom. TAC
<u>Herring</u>														
22-24	400	64	400	422	75	290	444	78	68	405 <sup>d)</sup>	93	67	420.2 <sup>d)</sup>	71 <sup>f)</sup>
25,26		155			152			142	115		172	118		115 <sup>f)</sup>
27,28 <sup>c)</sup> ,29S		65			68			73	65		64	61		28 <sup>f)</sup>
Gulf of Riga		27			24			15	16		17	15		15
29N,30,31		65			64			73	78		70	73		62 <sup>g)</sup>
32		51			50			53	44		47	40		50
Total ...		427			433	397		434	386		463	374		341
<u>Sprat</u>														
22,24,25	240	34	240	275	36	210	184.3	22	34	161	18	17	80.5	15
26,28		65			85			73	80		32	46		31
27,29,32		67			60			38	41		30	14		14
Total ...		166			181			133	155		80	77		60
<u>Cod</u>														
22	41	33	27.2	185	30	28	173.8	24	29	175	26	19	235	17
24		15	12.4		15	12		15	10		16	14		10
25-32		203	120.0		165	131		154	136		222	179		170
Total ...	191	251 <sup>e)</sup>	159.6		210 <sup>e)</sup>	171		193 <sup>e)</sup>	175		264 <sup>e)</sup>	212		197

a) Working Group data by Sub-divisions (taking into account herring and sprat by-catches in each of those fisheries).

b) Preliminary.

c) Excluding Gulf of Riga

d) Including 78 000 tonnes allocated to Management Unit 3 (Sub-divisions 29N, 30, and 31).

e) Excluding catches from Sub-division 23 (of 712 t in 1976; 1 716 t in 1977; 1 777 t in 1978 and 2 754 t in 1979).

f) Sub-division 27 combined with Sub-divisions 25 and 26.

g) Eastern part.

Table 6. Salmon. TAC for 1981 and corresponding escapement of spawners calculated for various management options. The factor applied to the exploitation pattern is the relative change of fishing mortality compared to the 1978-79 season.

Factor applied to the exploitation pattern	Escapement of spawners in % of smolts		TAC 1981 (tonnes)
	Spring 1982 <sup>x</sup> )	Long term	
1 (present)	1.8	1.8	1 880
0.83	2.2	2.3	1 680
0.75	2.4	2.6	1 555
0.50	3.2	3.7	1 140

\*) It is assumed that the level of exploitation in 1981 is maintained in 1982.

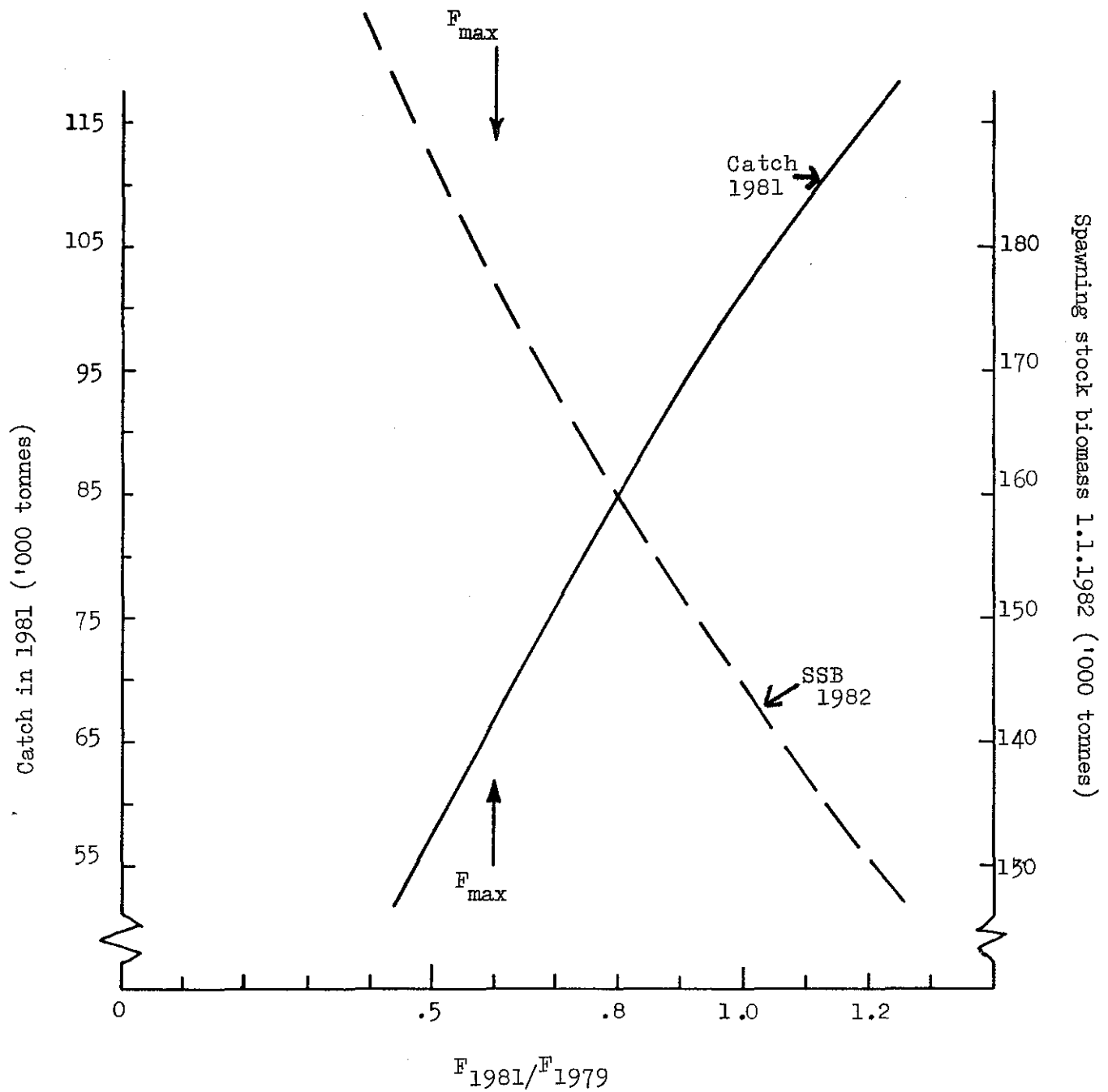


Figure 1. Herring in Sub-divisions 22+24. Predictions for catches in 1981 and spawning stock biomasses in 1982.

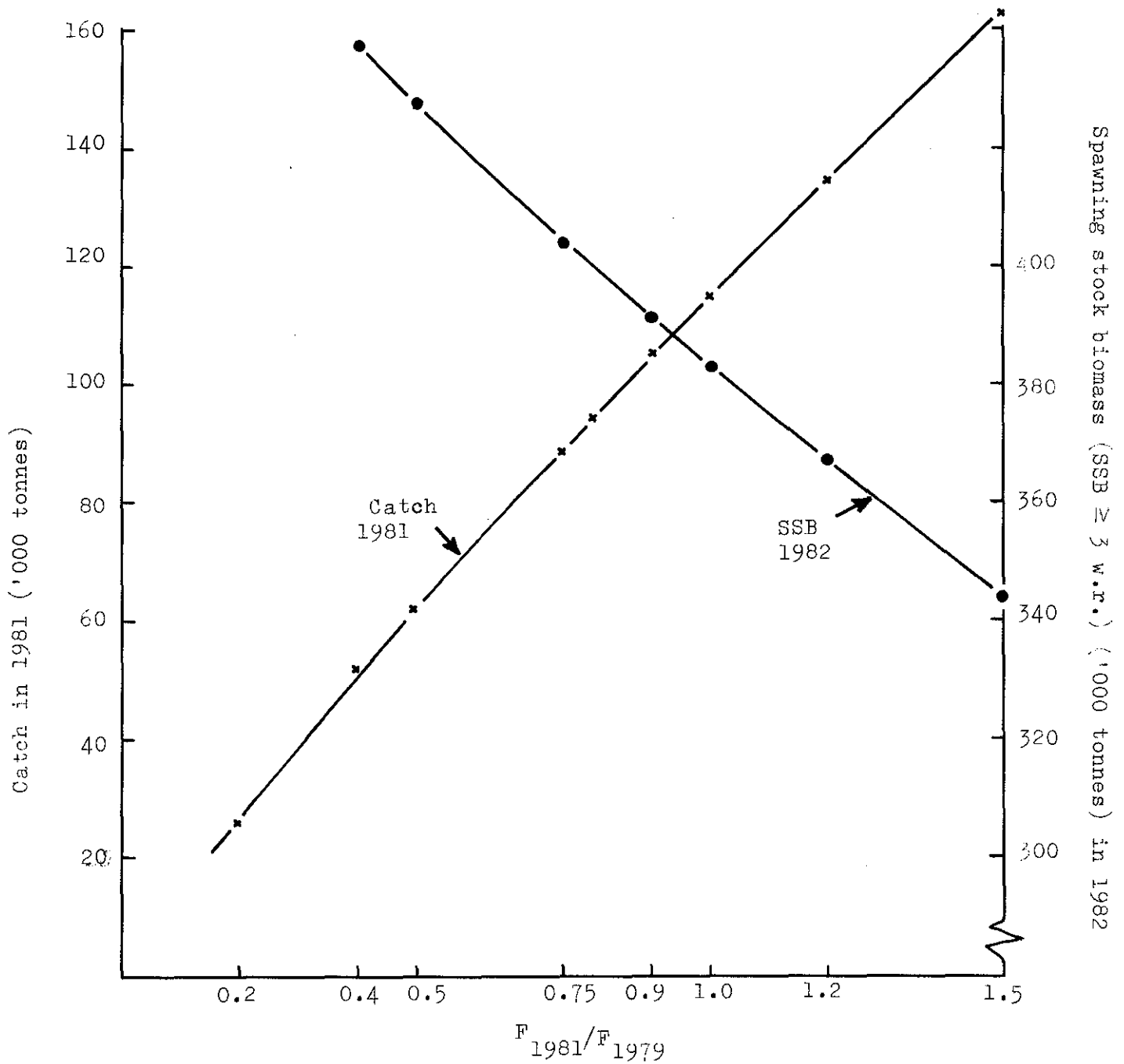


Figure 2. Herring in Sub-divisions 25, 26 and 27.  
Predictions for catches in 1981 and spawning  
stock biomasses in 1982.

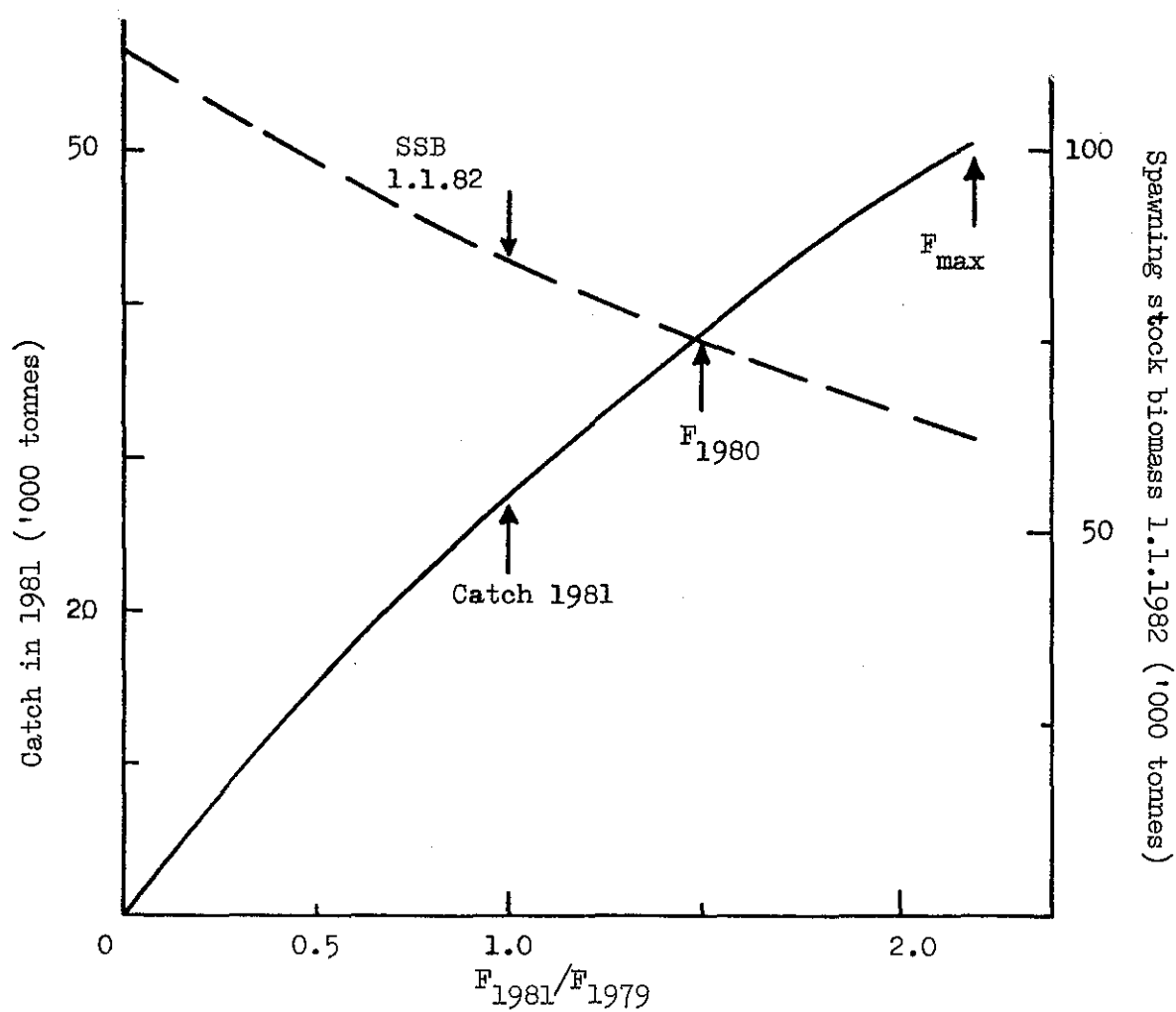


Figure 3. Herring in Sub-divisions 28 (excluding Gulf of Riga) + 29S. Predictions for catches in 1981 and spawning stock biomasses in 1982.

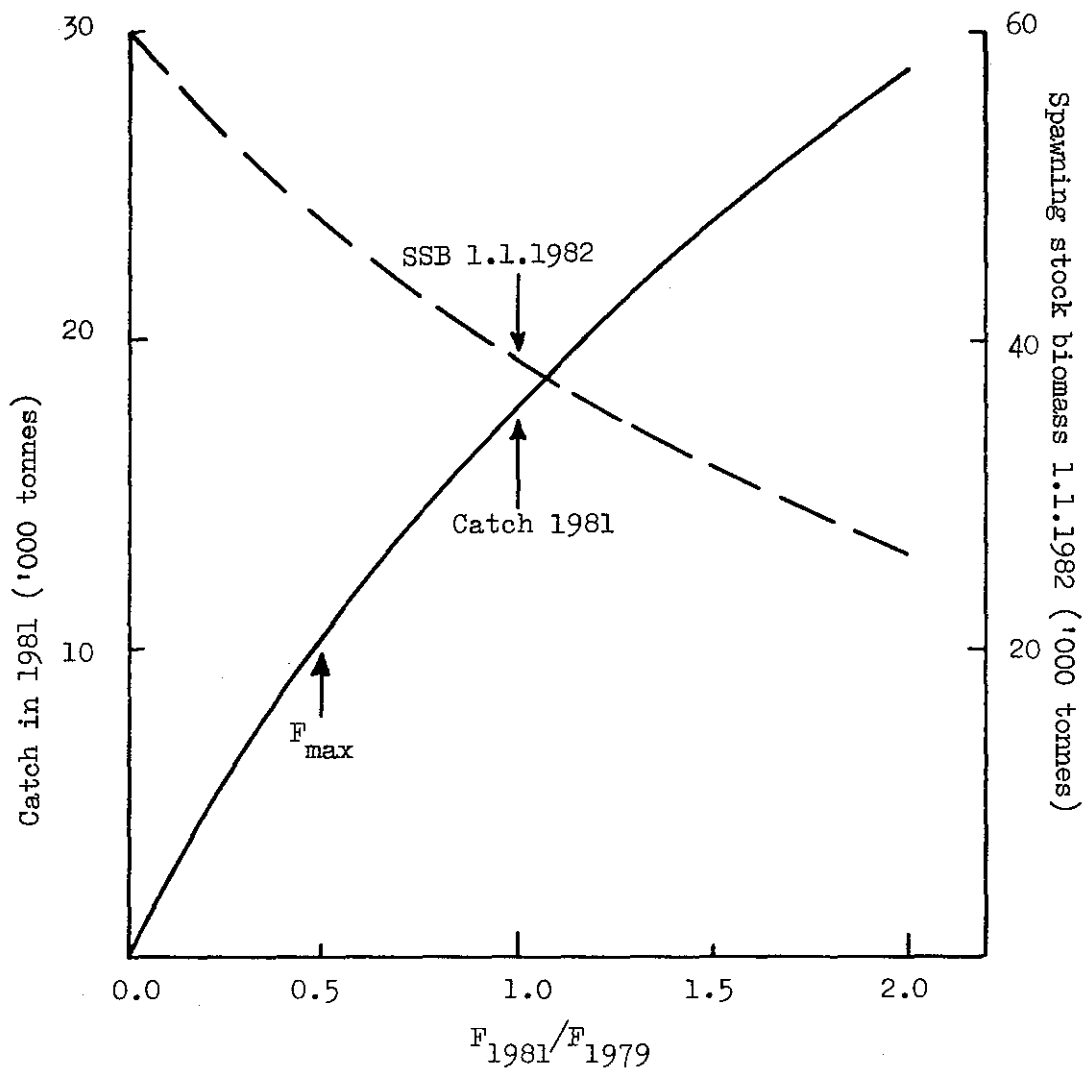


Figure 4. Herring in the Gulf of Riga. Predictions for catches in 1981 and spawning stock biomasses in 1982.

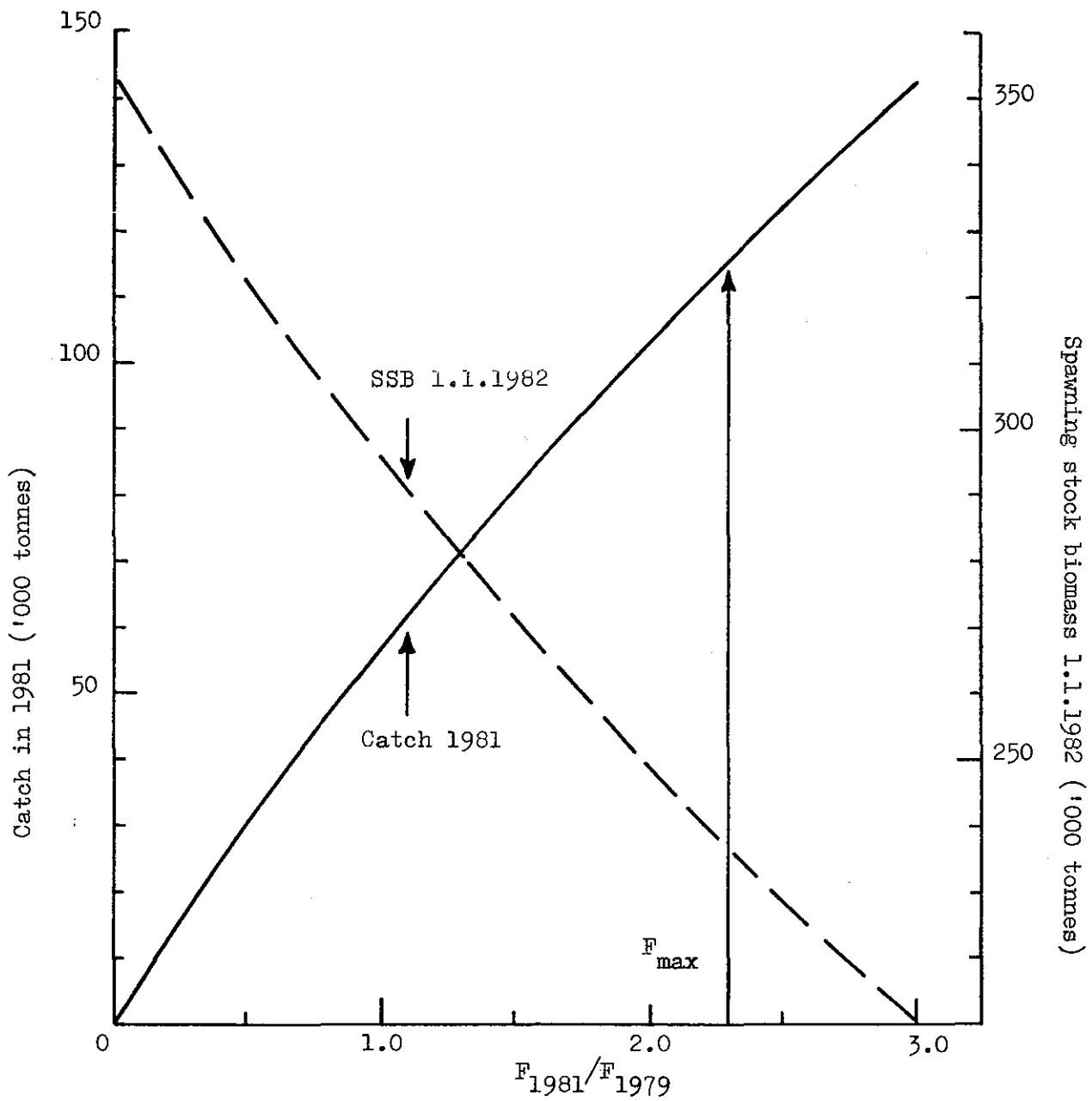


Figure 5. Herring in Sub-divisions 29N, 30 and 31 (East). Predictions for catches in 1981 and spawning stock biomasses in 1982.



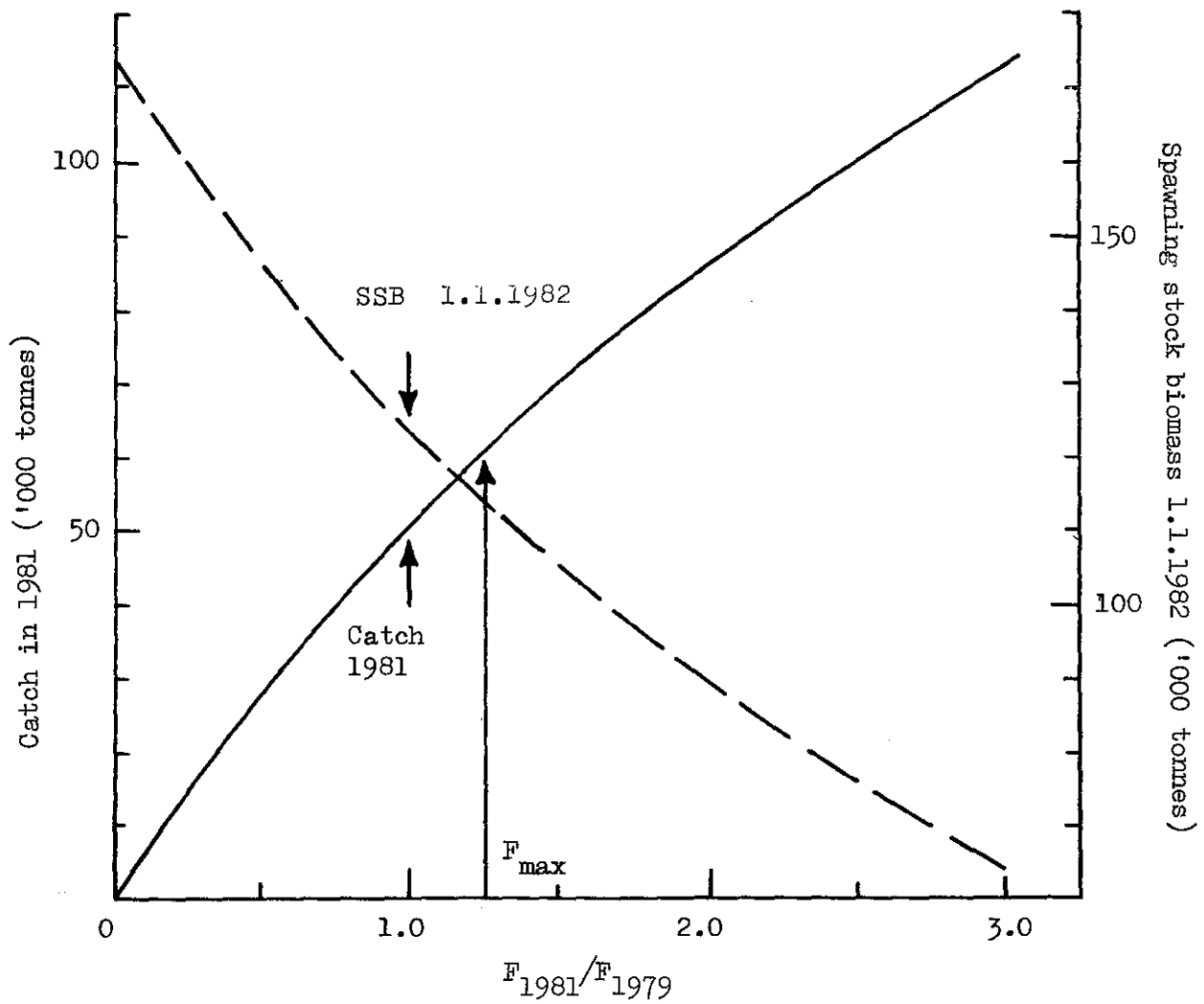


Figure 6. Herring in Sub-division 32.  
Predictions for catches in 1981 and spawning stock  
biomasses in 1982.

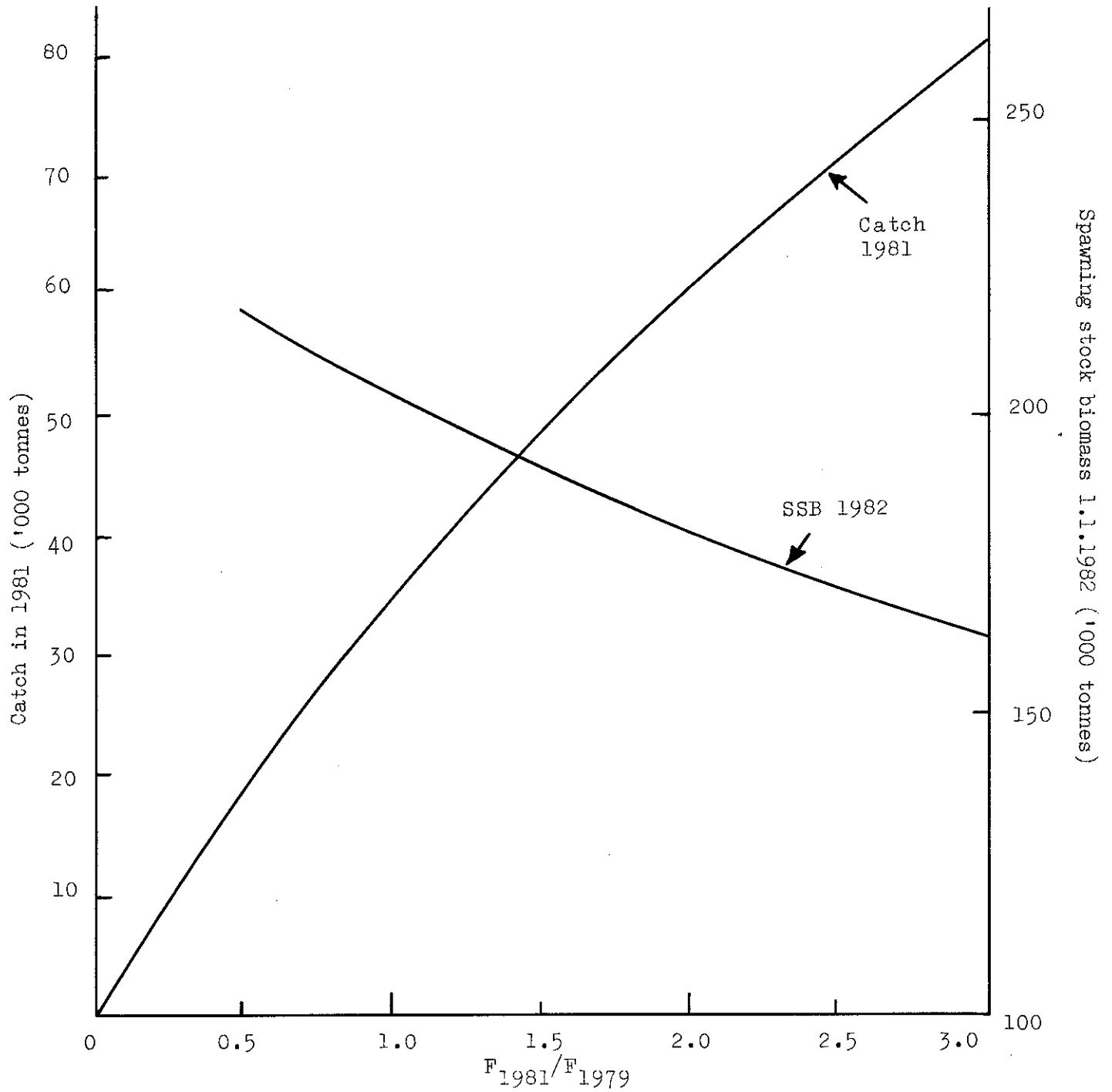


Figure 7. Sprat in Sub-divisions 26 and 28. Predictions for catches in 1981 and spawning stock biomasses in 1982.

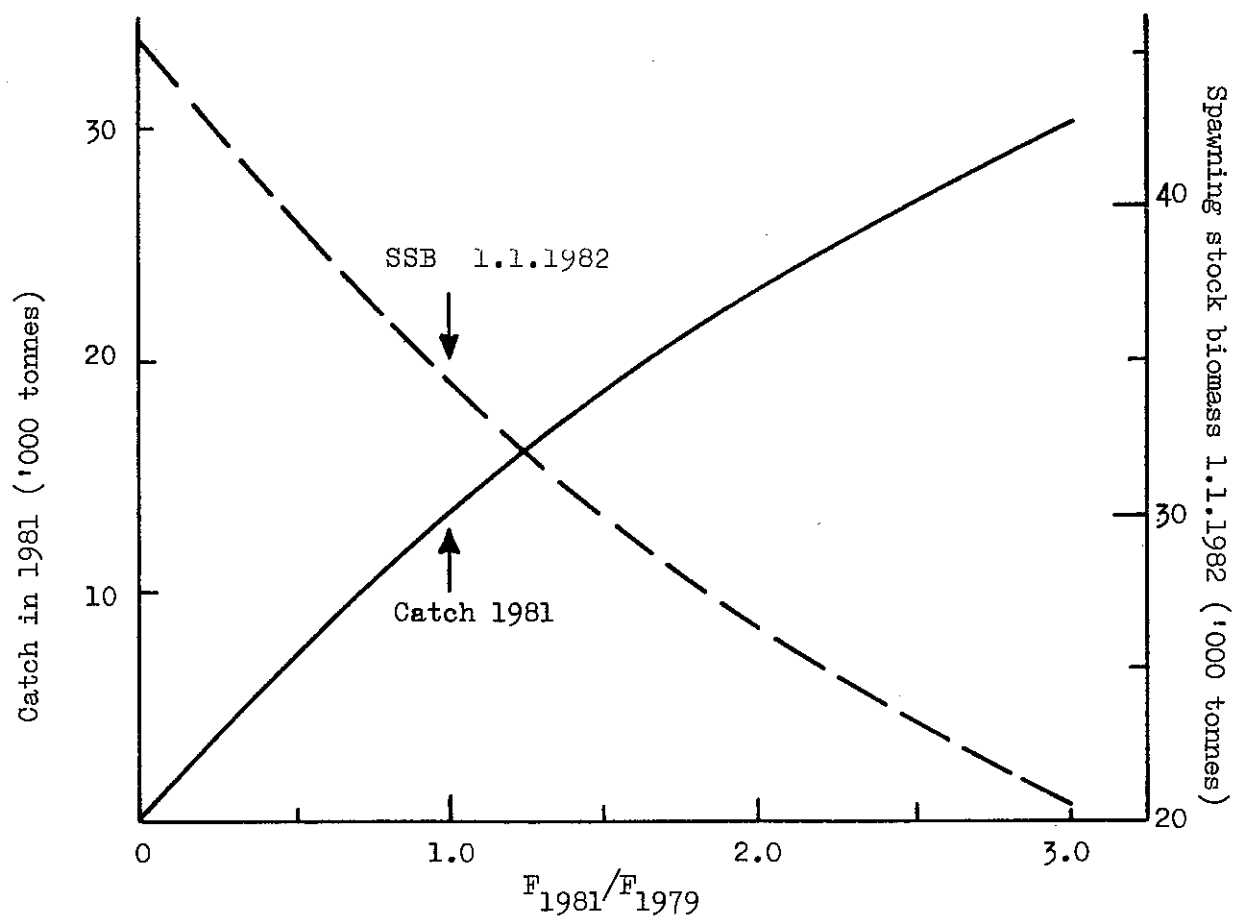


Figure 8. Sprat in Sub-divisions 27, 29 and 32.  
Predictions for catches in 1981 and spawning  
stock biomasses in 1982.

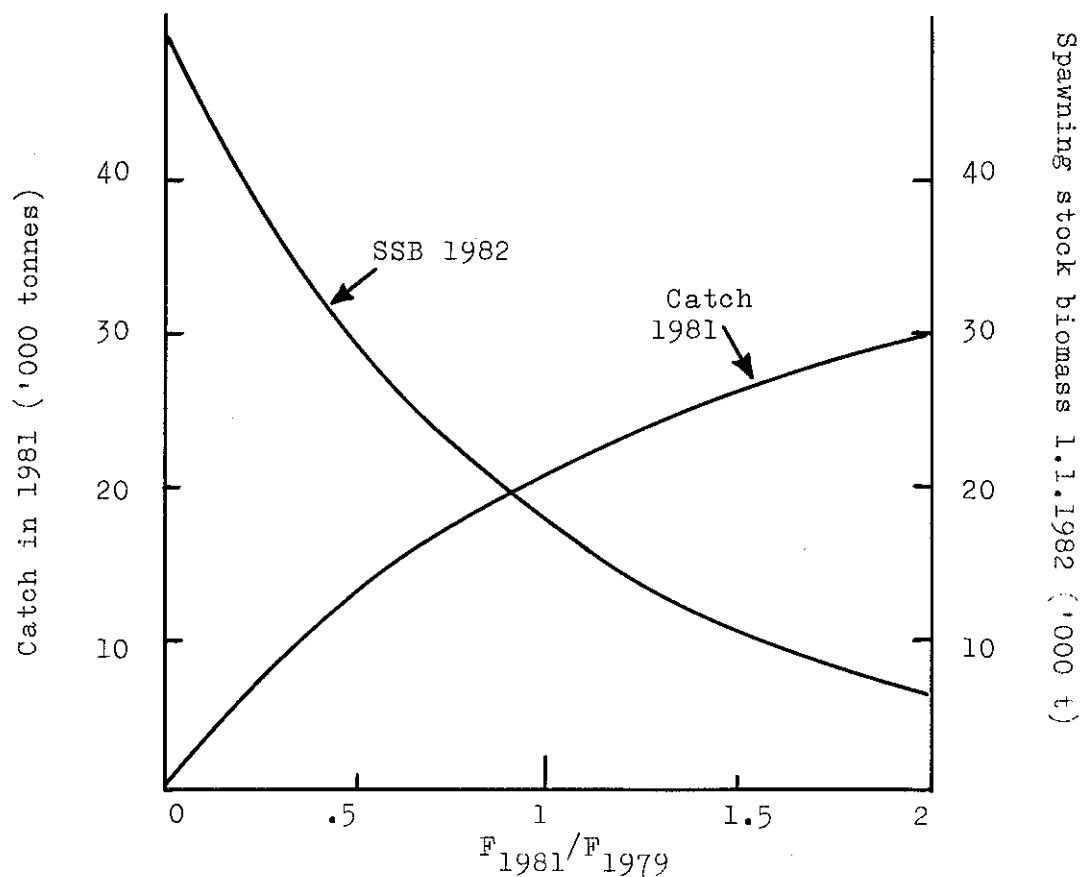


Figure 9. Cod in Sub-division 22. Predictions for catches in 1981 and spawning stock biomasses in 1982.

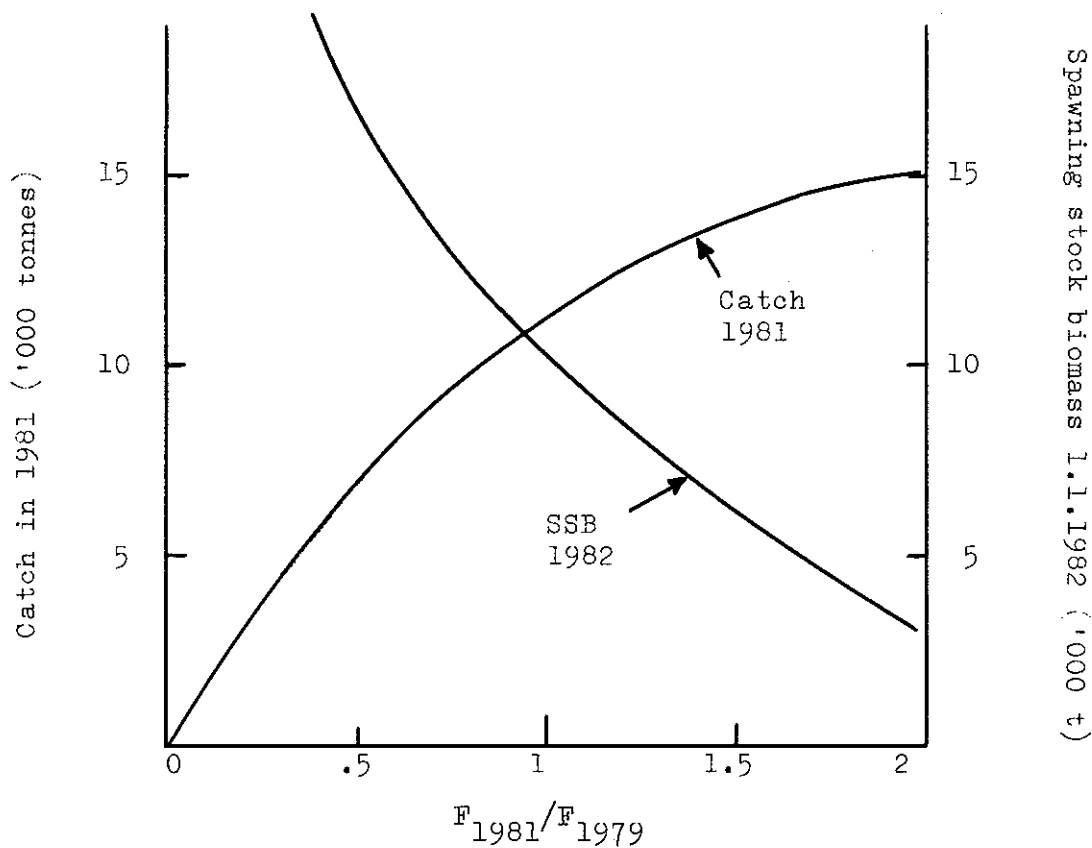


Figure 10. Cod in Sub-division 24. Predictions for catches in 1981 and spawning stock biomasses in 1982.

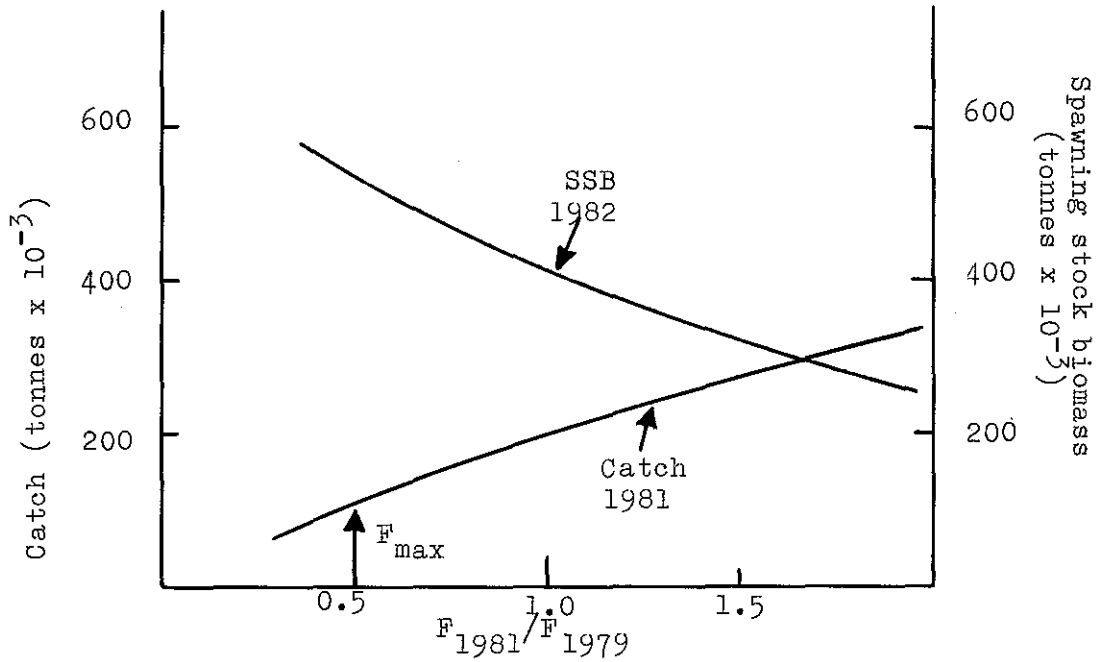


Figure 11. Cod in Sub-divisions 25-32. Predictions for catches in 1981 and spawning stock biomasses in 1982.

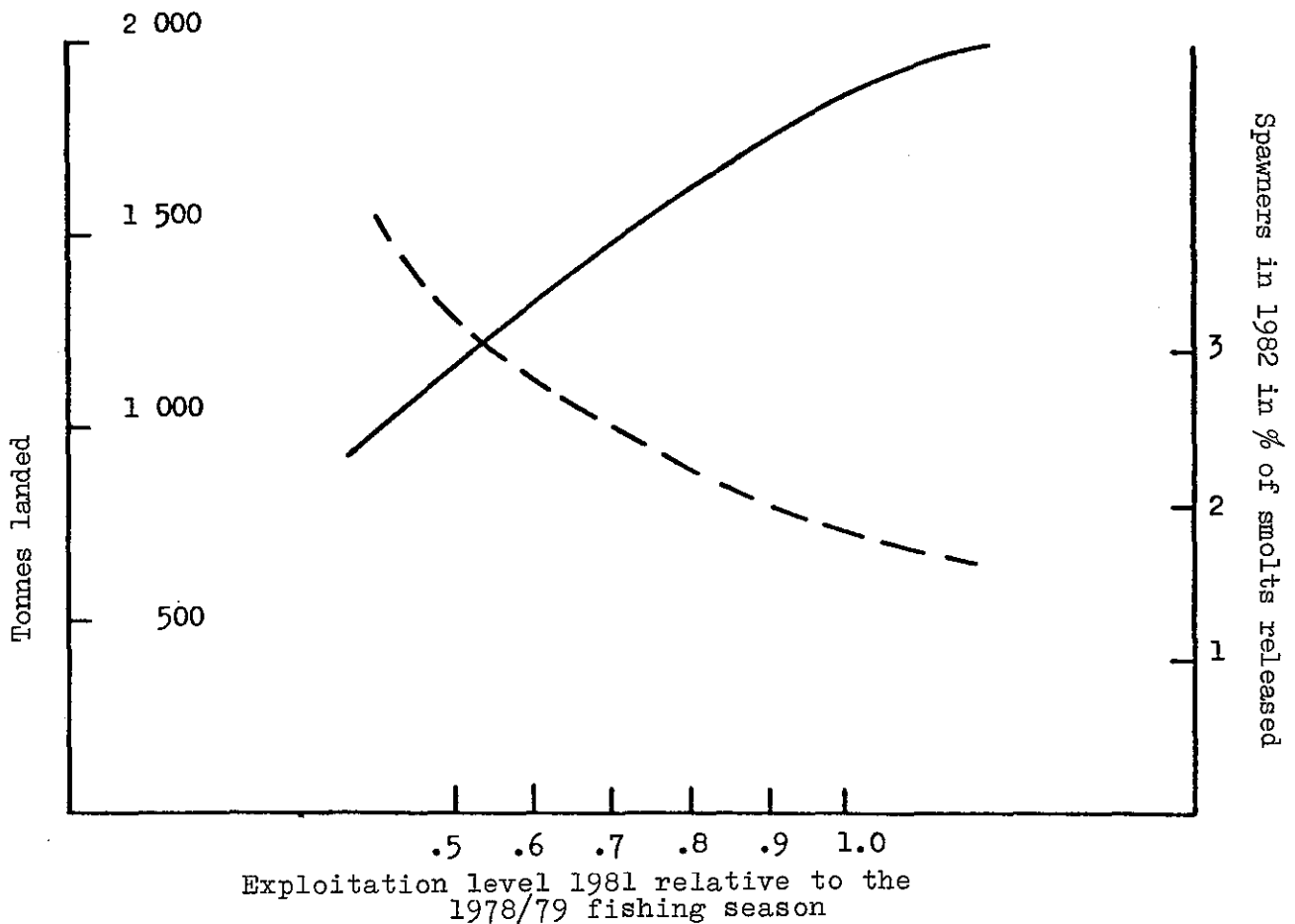
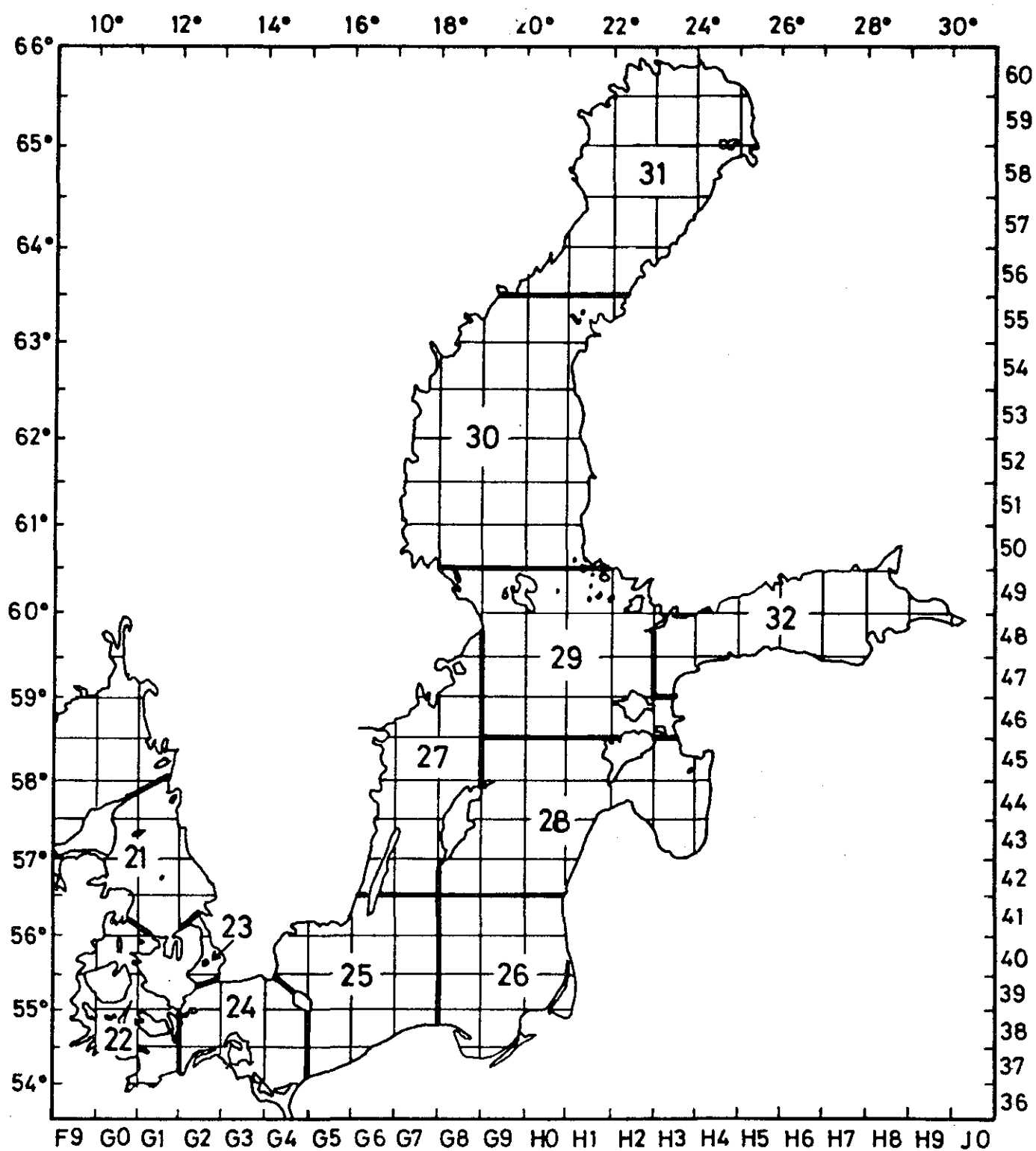


Figure 12. Yield in 1981 (—), assuming a release of 4 million artificial smolts units in 1980, and escapement of spawners in spring 1982 (-----) as a function of the exploitation level. An initial loss of 80% of smolts is assumed.



ICES 27.3.03.00 (Baltic)

V. ADDENDUM TO THE REPORT OF THE ACFM TO THE 19th ANNUAL MEETING OF NEAFC

(October, 1980)<sup>1)</sup>

INTRODUCTION

In its Report to the Nineteenth Annual Meeting of NEAFC, ACFM, during its mid-term meeting in July 1980, had to defer providing advice on a number of topics because the requisite data were not then available. These items have been dealt with during a meeting held in conjunction with the ICES Statutory Meeting, in October 1980. This report should be considered as a supplement to the ACFM Report issued in July 1980, and should be read in relation to what was said on these topics in that report.

B. REGION 1 FISHERIES

B.2 North-East Arctic Cod and Haddock

1. The Arctic Fisheries Working Group met at ICES headquarters from 1-5 October 1980 to assess TACs for 1981 for cod and haddock taking into account the advice given to the Working Group by ACFM at its May 1980 meeting. In addition, ACFM received a letter from its member, Dr V K Zilanov (USSR) requesting that the Arctic Fisheries Working Group should also consider stock and recruitment relationships of cod, and the mixture of Arctic cod and coastal cod in Norwegian waters.

B.2.1 North-East Arctic cod

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

1977			1978			1979			1980	1981
Rec. TAC	Total quota	Actual catch	Rec. TAC	Total quota	Actual catch	Rec. TAC	Total quota	Actual catch*	Rec. TAC	Rec. TAC
850	850	905	850	850	699	600	700	444	390	?

\* Preliminary

3. Revised figures for cod landings in 1979 amounted to 444 016 tonnes. This is about 256 000 tonnes below the agreed 1979 TAC (Murman cod included). The estimated catch for 1980 is about 400 000 tonnes. A detailed description of the recent trend in the cod fisheries may be found in the July 1980 ACFM report.

4. Both in the ACFM report, and that of the Working Group (C.M.1980/G:12) difficulties were reported in assessing and interpreting the level of total international effort, and stock abundances derived from catch per unit effort data. Despite total revision of the United Kingdom data base and careful re-examination of other countries' cpue data, it would appear that the 1979 cpue overestimates the abundance of the stock in 1979, and as

<sup>1)</sup> M J.A. Pereiro and Professor J. Popiel were prevented from participation in this meeting, and Dr V.P. Ponomarenko substituted for Dr V.K. Zilanov.

a result fishing mortalities and effective fishing effort are underestimated. Since the trawl fisheries in Sub-areas I and IIb concentrate on the 4-7 year old cod, which appear to be concentrated in the western part of Sub-area I due to extreme hydrographic conditions in 1979, no way could be found to assess the likely overestimate of abundance from cpue. The Working Group, therefore, followed the line indicated by ACFM in basing an estimate of fishing mortality, and stock size in 1979 and 1980 on "reliable survey results".

5. Two sets of data were available, the Norwegian acoustic surveys in 1978, 1979 and 1980 and the USSR groundfish surveys in 1979 and 1980. The results of both these sets are also affected by the environmental factors mentioned above. Both these sets also do not fully cover the distributional range of the cod stock; this applies particularly to the area in which the older fish occur. Difficulties with the acoustic equipment during the 1980 survey may have introduced an additional bias into the Norwegian survey estimate which will lead to a revision of the results. Therefore, these stock estimates must be regarded as underestimates, but, as with the cpue data, it is not possible to assess the magnitude of the under-estimation.
6. Mortality estimates derived from the gill net effort on the older fish were calculated for 1979. These were used for stock estimates in 1979 and 1980. But when the 1980 catches were applied to them the mortality estimates were absurdly low.
7. The Working Group investigated whether there was reason to suppose that the level of exploitation, or its pattern, was different from those of recent years. The average fishing mortality on each age group over the period 1971-77, from the VPA in the previous Working Group report (C.M.1980/G:12), was used. The resultant figure for the 1975 year class in 1979 is of about the same order as the one derived from the Norwegian acoustic survey. Furthermore, fishing mortality in 1979 on older fish (8+), as derived from effort estimates in gill net units, has been considered as an underestimate since the increasing trend in catchability of these gear is believed to have continued, due to the increasing use of monofilament net material (C.M.1980/G:12, Fig.2). On this basis the procedure of using the 1971-77 average Fs as inputs for 1980 appears to be justified.
8. Calculated stock biomasses clearly show that both the total stock and the spawning stock, in 1980, are at the lowest level on record since 1950. Even if one assumes that the input F values for 1980 are too high, no likely adjustment would reverse the obvious trend of declining total biomass since 1974. The declining trend in spawning stock biomass since 1973 was interrupted by a relatively small contribution to the spawning stock by the rich 1970 year class, which was heavily fished at younger ages, in 1977-78.  
Recruitment from the 1976-79 year classes at age 3 is estimated to be poor, based on results from the USSR youngfish survey.
9. The results of the catch prediction together with the historic development of yield and spawning stock biomass are given in Figure 1. In the following text table a number of options are presented.



Species: COD

Area: ICES SA I and II

1980				MANAGEMENT OPTION FOR 1981	1981				1982	
STOCK BIOM. (3+)	SPAWNING STOCK BIOMASS (8+)	$\bar{F}$ (8-12)	CATCH (3+)		STOCK BIOM. (3+)	SPAWNING STOCK BIOMASS (8+)	$\bar{F}$ (8-12)	CATCH (3+)	STOCK BIOM. (3+)	SPAWNING STOCK BIOMASS (8+)
1 560	222	0.7	401	Doubling 1980-81 Spawning stock bio- mass	1 380	244	0.06	50	1 620	430
				$F_{0.1}$			0.15	137	1 516	418
				$F_{(MAX)}$			0.25	220	1 411	380
				Maintaining 1980 TAC			0.50	400	1 181	298
				Maintaining 1980 level of exploi- tation			0.70	521	1 028	246
				$F_{1980} \times 0.5$			0.35	296	1 313	345

Weights in thousands of tonnes

10. In the 1979 report of the Arctic Fisheries Working Group (C.M.1979/G:20) it was pointed out that, based on a Ricker stock/recruitment relation, the optimum level of spawning stock biomass ranges from 500 000 tonnes to 1 000 000 tonnes. Only by ceasing to fish in 1981 would the spawning stock reach the level of 500 000 tonnes at the beginning of 1982. The exploitation of the stock in 1981 at a level of  $F_{0.1}$  would increase the spawning stock by 70% at the beginning of 1982. The 1981 TAC would then be about 140 000 tonnes. If this management strategy were continued up to the mid-1980s there would be a continuous increase in spawning stock biomass up to about 1 000 000 tonnes in 1984 (table next page). This was the level between 1950 and 1960.

The TAC levels associated with this management policy are expected to be very low in the next few years, unless extremely abundant year classes recruit to the fishery.

Fishing at  $F_{max}$  in 1981 would increase the spawning stock in 1982 by about 55% from the 1981 level to 380 000 tonnes. This level of  $F$  in 1981 would require a reduction in TAC from the present level to 220 000 tonnes in 1981. Continuation of this management policy would increase the spawning stock further in 1983 and 1984 to about 650 000 and 800 000 tonnes respectively. This estimated increase is mainly due to the contribution expected from the 1975 year class, which will enter the spawning stock in 1983. Since the following year classes are estimated to be poor, no further increase in spawning stock size can be expected in the later 1980s. However, it might be possible to keep the spawning stock biomass above a dangerously low level if this long-term management strategy were followed (see table next page). Maintaining the level of fishing mortality (0.5) which is associated with a TAC in 1981 equal to that of 1980 would increase the spawning stock biomass to about 300 000 tonnes in 1982, followed by a further increase to about 400 000 tonnes in 1983 and 1984. Under this management option the spawning stock is not expected to reach even the lower level of its optimal range. The estimated catch in 1982 associated with this management policy is 362 000 tonnes.

Maintaining the present level of exploitation ( $F = 0.7$ ) into the mid-1980s would, after a marginal increase in 1983, reduce the spawning stock further below the present level which is already dangerously low. This option, therefore, should not be considered for the management of the stock.

11. Fishing mortality in 1980 is estimated to be 0.7, a level which is considerably above  $F_{max}$ . Following ACFM management policy to reduce  $F$  stepwise, it is obvious from the state of the spawning stock, that a considerable step toward  $F_{max}$  has to be made. A 50% reduction in  $F$  from the 1980 level would increase the spawning stock by about 55% above the 1980 level to 345 000 tonnes. This option is associated with a fishing mortality of 0.35 and gives a catch of 296 000 tonnes. Maintaining the same level of exploitation in 1982 would increase the spawning stock further, to above the lower level of its optimal range, at 540 000 tonnes.

Estimated spawning stock biomass 1981-85 and estimated catch 1981-82 at different levels of exploitation (catch figures for 1983-85 are dependent on recruitment estimate and are therefore not given in the table).

Year	No. fishing	0.15 ( $F_{0.1}$ )		0.25 ( $F_{max}$ )		0.35		0.5		0.7	
		SSB	Catch	SSB	Catch	SSB	Catch	SSB	Catch	SSB	Catch
1981	244	244	137	244	220	244	296	244	400	244	521
1982	484	418	164	380	243	345	301	298	362	246	405
1983	1033	780		647		536		405		279	
1984		1 048		797		590		404		235	
1985		1 136		794		510		328		163	

In general the spawning stock biomass in the mid-1980s is expected to be very low unless there is a drastic reduction in the overall level of exploitation. This is due to the heavy overexploitation of the rich 1973 and 1975 year classes. Their contribution to the spawning stock in coming years will be less than it would have been if they had been only moderately exploited.

When the poor 1976-80 year classes enter the spawning stock in the mid- to late 1980s, there is a possibility of a further reduction in spawning stock biomass as can be appreciated from the table on page 221. This is particularly the case if the level of exploitation exceeds that of F 0.35 in 1981 and 1982.

12. Two principles have to be seriously considered if management aims at rebuilding the spawning stock to levels at which the probability of recruitment failure due to low spawning stock size will be minimised. These are: (a) the contribution to the spawning stock by the 1973-75 year classes, although small compared to their original potential, should be maintained over as long a time period as possible in order to avoid the spawning stock biomass falling below the present level. This would require a drastic reduction in the overall level of exploitation in 1981 and subsequent years; (b) in order to ensure a continuing contribution to the spawning stock from incoming year classes an improvement of the exploitation pattern is necessary. In this way a more stable age composition of the spawning stock could be achieved, thereby avoiding large fluctuations in spawning stock biomass, and also stabilising the spawning stock at a safe high level.

This can be achieved by introducing an 155 mm minimum mesh size for towed gears as already recommended by ACFM in its 1979 report.

13. Purely on biological consideration, therefore, ACFM would advise that both the exploitation rate should be very sharply reduced and the exploitation pattern markedly improved by a major increase in the minimum mesh size, if this stock is to be allowed to recover as quickly as possible to its former high level of productivity. It is realised, however, that these measures will have serious implications for the fishing industries which are dependent on this stock. ACFM therefore feels unable to give any specific recommendation on the TAC for 1981 for the fishery on northeast Arctic cod.

#### B.2.2 North-East Arctic haddock

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

1977			1978			1979			1980	1981
Rec. TAC	Total quota	Actual catch	Rec. TAC	Total quota	Actual catch	Rec. TAC	Total quota	Actual* catch	Rec. TAC	Rec. TAC
110	120	110	150	150	95	206	206	102	55-78	?

\* Preliminary

The revised figures for haddock landings in 1979 amounted to 102 172 tonnes, the estimate of total landings in 1980 is 71 000 tonnes.

15. Average fishing mortality on 3 to 6 year old haddock in 1979 was estimated to be 0.5, based on the cpue figures in the USSR groundfish survey. This corresponds to 0.48 on ages 7 to 14.

Applying the 1980 catch data to the calculated 1980 stock size gives an estimate of 0.53 for ages 7-14 in 1980. This is about twice the  $F_{max}$  level.

It should be noted that since the advice for 1980 was given the weight at age data have had to be changed, particularly for younger age groups. This has resulted in a change in the yield per recruit curve. The differences in estimated fishing mortality rates for 1980, compared with the prognosis given in the previous report, are due to some high values on age groups with only small populations. These have considerable effect when calculating unweighted mean values.

16. The 1976 year class is of about average size, the following year classes, 1977 and 1978, are poor according to the USSR youngfish survey.

17. The results of the catch predictions are given in Figure 2. In the text table below two management options are given.

18. The size of the spawning stock is very low at present (1980), at about the same level as in 1964 and 1965, which was the lowest on record. The 1969 year class which increased the spawning stock to the level of 400 000 tonnes in 1975 and 1976 has since been fished down, and is now of minor importance to the spawning biomass.

Under the two management options considered the spawning stock is expected to increase above the 1971-80 average of about 190 000 tonnes by 1982, due to the contribution of the relatively abundant 1975 year class.

Fishing at  $F_{0.1}$  would result in a spawning stock biomass of 277 000 tonnes in 1982 and would allow a catch of 60 000 tonnes in 1981 which is about 15% below the estimated 1980 catch. Fishing at  $F_{max}$ , equivalent to a 50% reduction in fishing mortality from the 1980 level, would result in a spawning stock biomass of 231 000 tonnes in 1982, and is associated with a TAC of 107 000 tonnes for 1981. This is of the same order as the catch level in the preceding years. Since the 1977 and 1978 year classes are expected to be poor a cautious approach in long-term management policy is advisable.

19. As the catch taken from this haddock stock has in the past been predominantly a by-product of the fishery for cod, the management advice for one stock cannot be determined in isolation from that for the other. Since ACFM has been unable to give specific advice on management measures for the north-east Arctic cod stock it also finds itself unable to give a firm recommendation on a TAC for 1981 for north-east Arctic haddock.

Species: HADDOCK

Area: ICES SA I and II

1980				MANAGEMENT OPTION FOR 1981	1981				1982	
STOCK BIOM. (3+)	SPAWNING STOCK BIOMASS (6+)	$\bar{F}$ (7-14)	CATCH (3+)		STOCK BIOM. (3+)	SPAWNING STOCK BIOMASS (6+)	$\bar{F}$ (7-14)	CATCH (3+)	STOCK BIOM. (3+)	SPAWNING STOCK BIOMASS (6+)
372	71	0.53	71	Doubling SSB= $F_{(MAX)}$	398	114	0.27	107	345	231
				$F_{0.1}$			0.14	60	401	277

Weights in thousands of tonnes

## E. REGION 2 FISHERIES

### E.1.1 Division IIIa herring

20. The strength of the recruiting year classes has been estimated from the February International Young Fish Surveys and in September 1979 and 1980 from joint Danish-Swedish acoustic surveys. The IYFS in 1979 had suggested that the 1978 year class was extremely weak, while this year class has been estimated both in the 1979 and 1980 acoustic surveys to be 30-40% of average strength. The 1979 year class appeared in the 1980 IYFS to be of average strength while the estimate from the acoustic survey indicates a strength similar to that of the 1978 year class. The estimates of year class strength from the acoustic surveys seem to be reflected in the estimates obtained from the commercial catches.

21. The acoustic survey in September 1979 gave a rather high estimate of the 2 winter-ring herring compared to the age compositions for previous years. This year class, 1977, has again showed up in the 1980 acoustic survey with a strength comparable to the 1979 estimate. This should have caused an increase in the spawning stock biomass in 1980. But the next two year classes (1978 and 1979) which will recruit to the spawning stock will counteract this improved situation, as these year classes are both weak.

22. The estimated distribution, from the acoustic surveys, of the herring stock between Skagerrak and Kattegat was drastically changed from 1979 to 1980. While only 40% of the herring biomass was found in Skagerrak in 1979, Skagerrak held almost 90% of the herring biomass in September 1980.

23. The preliminary total international catch, reported up to mid-September 1980, is about 47 000 tonnes. In the remaining part of 1980 an additional catch of 10 000 tonnes might be taken.

24. In July 1980 ACFM advised an upward revision of the TAC for 1980 to 50 000 tonnes, corresponding to the  $F_{max}$  point. Stabilising the fishing mortalities at this level corresponds to a yield of 53 000 tonnes in 1981, under the assumption that the 1980 catch will be 58 000 tonnes. The best estimate which can be made of the spawning stock biomass in 1981 is approximately 100 000 tonnes. ACFM accordingly recommends that the TAC for 1981 be set at 53 000 tonnes.

### E.4.1 North Sea sole

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

1977			1978			1979			1980		1981
Rec. TAC	NEAFC TAC	Actual catch	Rec. TAC	EEC TAC	Actual catch	Rec. TAC	EEC TAC	Actual catch	Rec. TAC	EEC TAC	Rec. TAC
6.7	12.5	18.2*	8	10	20.3*	13	15	22.5**	14	15	15

\* Including estimates of non-reported landings

\*\* Preliminary and including estimated non-reported landings.

26. No major changes occurred in the fleets fishing for North Sea sole in 1979. The Group included the unreported landings in the assessment. Accordingly the 1979 TAC of 15 000 tonnes was exceeded by some 7 500 tonnes.
27. Due to the cold winter of 1979 the year classes 1977 and 1978 were reduced by an unusually heavy natural mortality to a strength, as 1-group recruits, of 39 and 43 millions, respectively. Average recruitment for the period 1957-76 was estimated to be about 102 million.
28. In 1980 the 1979 year class will recruit to the exploited stock. This year class appeared to be abundant, as 0-group, in surveys of the continental and United Kingdom nursery grounds. However, surveys at this age do not currently allow the strength of a year class to be quantified. On the basis of the September 1-group survey in 1980, which is the only survey series which has, to date, shown a significant relationship to year class strength, this year class is estimated as 150 million recruits as 1-group, about 1.5 times the average recruitment value. The confidence limits of this estimate are 180 - 120 million. This value of 150 million was used for the prognosis. In all the 1980 0-group surveys, the 1980 year class also appeared to be well above average strength.
29. Maintaining the 1979 F in 1980 and 1981, the expected catches would be 16 215 tonnes in 1980, and 16 916 tonnes in 1981. The spawning stock would then decrease to 32 320 in 1981, and would rise again to 42 200 in 1982.
30. In previous reports of the Working Group, the short-term objective was adopted of increasing the spawning stock biomass to 50 000 tonnes. This limit was set taking into account the possibility of recruitment failure at stock levels lower than those previously recorded. To achieve a spawning stock biomass of 50 000 tonnes in 1982, a TAC of 9 500 tonnes in 1981 would be required. However, there is some evidence from recent years of spawning stocks below this level generating above average recruitment.
31. A TAC in 1981 to achieve  $F_{max}$  on the yield per recruit curve would mean a value of 15 000 tonnes and result in a spawning stock biomass of 44 000 tonnes in 1982. This assumes that the exploitation pattern in 1981 will be the same as in 1979-80. As the 1979 year class will be a major component of the recruited biomass in 1981, this assumption may not be valid. It should also be appreciated that a TAC at this level will entail a reduction in effort of approximately 14% from 1980 to 1981. ACFM would recommend a TAC of 15 000 tonnes for 1981.

The effects of this catch, and other options for TACs in 1981, on the residual spawning stock biomass in 1982 are shown as Figure 3.

#### F. STOCKS IN REGIONS 2 AND 3

##### F.1 Eastern and Western Mackerel Stocks

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

32. As explained in the ACFM report from the July meeting, difficulties in interpreting the tag data made it impossible to do an analytical assessment of the North Sea stock at that juncture. A complete



re-analysis of the whole time series of tag data has been initiated, but no results are yet available. It is hoped that a report of this analysis will be available at the meeting of the Mackerel Working Group in 1981.

33. At the October meeting of ACFM the following data were available, in addition to what was presented to ACFM at its July meeting:

1. Preliminary catch data for the 1980 fishing season up to September.
2. Some age composition data of commercial catches in 1980.
3. Preliminary results of a Norwegian egg survey in the North Sea in June-July 1980, which provide an estimate of the spawning stock size.
4. Catch per unit of effort data from the Norwegian coastal fishery for the period 1970-79.

34. Information on Norwegian catches was available up to 20 September 1980. In Sub-area IV and Division IIIa a total of 42 900 tonnes was taken. In addition a catch of 4 900 tonnes was reported from Division IIa, giving a total Norwegian catch of 47 800 tonnes for the Eastern areas. 14 200 tonnes were taken by traditional gears (gill nets and hook and line) in the coastal fishery, and 33 600 tonnes were taken by purse seine, mostly in Division IVa E and Division IVb. The purse seine fishery was opened on 21 July and was closed on 6 September.

Preliminary data from other countries' fisheries give total catches, up to September 1980, from the North Sea and Skagerrak of 13 000 tonnes by Denmark, 11 000 tonnes by the Faroes, and 6 000 tonnes by the United Kingdom. Thus, the total catch from the North Sea and Skagerrak, up to the end of September 1980, was probably about 80 000 tonnes.

35. Egg abundance indices from Norwegian surveys show in general the same downward trend as do estimated spawning stock sizes from VPA for the period 1973-80. In 1980 the survey was extended, covering the main spawning areas three times, in order to get an estimate of absolute spawning stock size from the observed number of eggs. This estimate is heavily dependent upon information on fecundity. Using fecundity data from Norwegian samples collected in 1980 in the North Sea gives a total spawning stock size of 406 000 tonnes. This value is very similar to the estimate given in the prognosis for 1980 in the Working Group report from 1979 (394 000 tonnes). English data on the fecundity of mackerel in the western area, however, if applied to the North Sea mackerel egg data, give an appreciably lower estimate of spawning stock size (140 000 - 200 000 tonnes). An even lower estimate (90 000 tonnes) results from using fecundity data given by Kändler (1957) for the North Sea. Although the Norwegian fecundity data were based on rather few fish this cannot explain the large differences in observed fecundity, and it should be further investigated whether the differences are real or just an artifact caused by differences in methods used in preparing and subsampling the ovaries. At present it can only be concluded that the egg surveys indicate a spawning stock size in 1980 at the same level or lower than projected by the Mackerel Working Group in 1979 from analysis of tag data.

36. Catch per man-day in the Norwegian coastal fishery with gill net, and with hook and line show rather stable catch rates during the period 1970-79. The gill net data even show an increase in recent years. These

data are, however, difficult to interpret for a number of reasons, and may not reflect the true abundance, even of the older age groups which dominate the catches.

37. Although the age composition analysis presented at this meeting gives further evidence that stock mixing and stock separation are more complex than assumed in the model used earlier when analysing tag recovery data, there is no doubt that the spawning stock of mackerel in the North Sea has been steadily declining, due to recruitment failure. Results of the egg surveys carried out in the North Sea indicate a spawning stock size in 1980 at the level of, or lower than, what was projected in 1979. In view of the very reduced spawning stock, and the fact that there is still no evidence of a strong year class recruiting to the stock, ACFM would recommend, as for 1980, that no mackerel fishing should be allowed in the Eastern areas in 1981.

38. When giving advice for 1980, ACFM recommended that, if a complete fishing ban was considered impractical, the catch in these areas should not exceed 50 000 tonnes. Subsequently EEC and Norway agreed on a TAC of 55 000 tonnes. Preliminary catch figures would indicate that the recommended TAC will be exceeded by at least 30 000 tonnes. If the management bodies again find it impractical in 1981 to have a complete fishing ban, the following considerations should be taken fully into account:

- a) Although it has not been possible to estimate the quantity which has been taken from the North Sea stock in 1980, both the geographical distribution of the fishery and the overfishing of the area TAC recommended by ACFM make it possible that a quantity as high as 40 000 - 50 000 tonnes has been removed from the North Sea stock in 1980. This high removal would, according to the prognosis given by the Working Group in 1979, reduce the spawning stock by about 20% from 1980 to 1981. ACFM would strongly recommend that if a limited fishery is allowed in 1981 the fraction removed from the stock should not exceed what was recommended as a maximum for 1980 ( $F \approx 0.08$ ). This would imply an area TAC of not more than 40 000 tonnes.
- b) During summer-autumn 1980 a number of reports have been received of observations of 0-group mackerel from a number of places along the coast of southern Norway. Although these observations cannot be quantified, it should be noted that observations of 0-group have usually been the first sign of recruitment of a stronger year class. During 1977-79 no 0-group were observed.

39. There are thus some indications that the 1980 year class is stronger than the preceding ones; but its strength cannot yet be estimated. If it is a stronger year class a primary aim of management in 1981 should be to avoid significant catches of 1 year old mackerel, in order to give this year class a chance to rebuild the spawning stock. This could be done by closely following the size composition of the mackerel by time and area in commercial catches, and closing areas to fishing at times when substantial quantities of 1 year old mackerel occur.

40. ACFM would further stress the importance of avoiding by-catches of mackerel in other fisheries. There may be a risk that young mackerel could be caught in substantial quantities in the industrial fisheries. There is, however, little information on the seasonal and areal distribution of mackerel by-catches.

41. It should be pointed out that the data base for the present assessment is rather weak. It is hoped that a better assessment can be made next year when the re-analysis of the tag data becomes available.

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

42. The data from the 1980 egg surveys in the Western areas have not yet been analysed to an extent which makes it possible to re-assess the TAC of 353 000 tonnes in 1981, recommended for the Western stock by ACFM in July 1980. These data will be fully evaluated by the time the Mackerel Working Group meets in 1981. If a fishery is allowed in the Eastern areas, approximately 50% of the catch can be expected to be Western mackerel. This quantity should therefore be subtracted from the Western stock TAC when setting the Western area TAC. For example if a TAC of 40 000 tonnes is set for the Eastern areas in 1981 the appropriate TAC for the Western areas would be 333 000 tonnes. If no fishery for mackerel is allowed in the Eastern areas in 1981 the TAC for the Western areas would then be 353 000 tonnes.

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

F.2.2 Southern stock

43. In its report from the July 1980 meeting, ACFM stressed the importance it attached to reducing the fishing mortality rate on juvenile hake of the Southern stock, in the light of the evidence of depletion of the spawning stock and of declining recruitment. It advocated an increase in the minimum mesh size for hake fisheries to 80 mm, but stated that if this mesh size could not be introduced in 1981 it would recommend a prohibition of trawling on hake nursery grounds, during the period when juveniles constitute a high proportion of the catch.

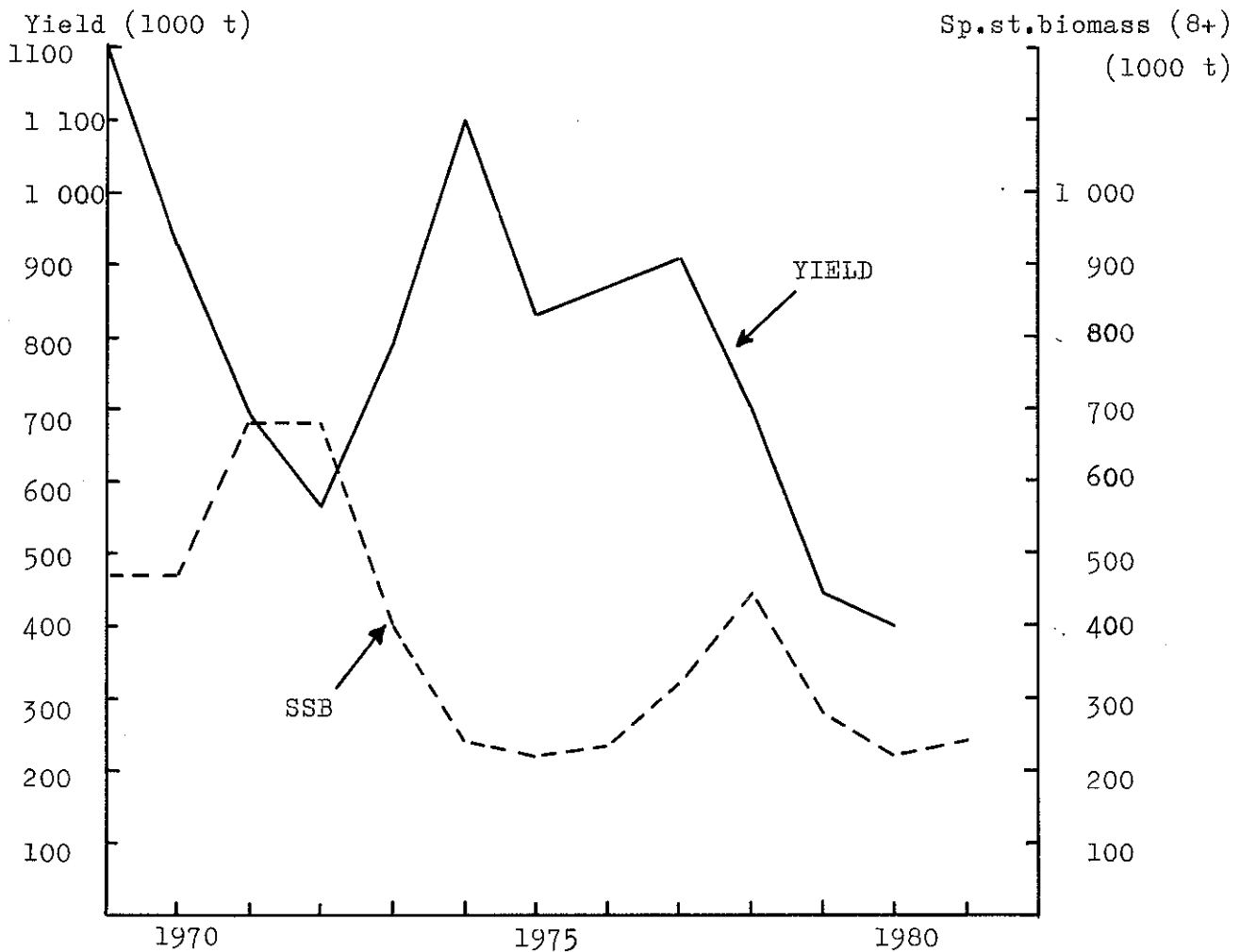
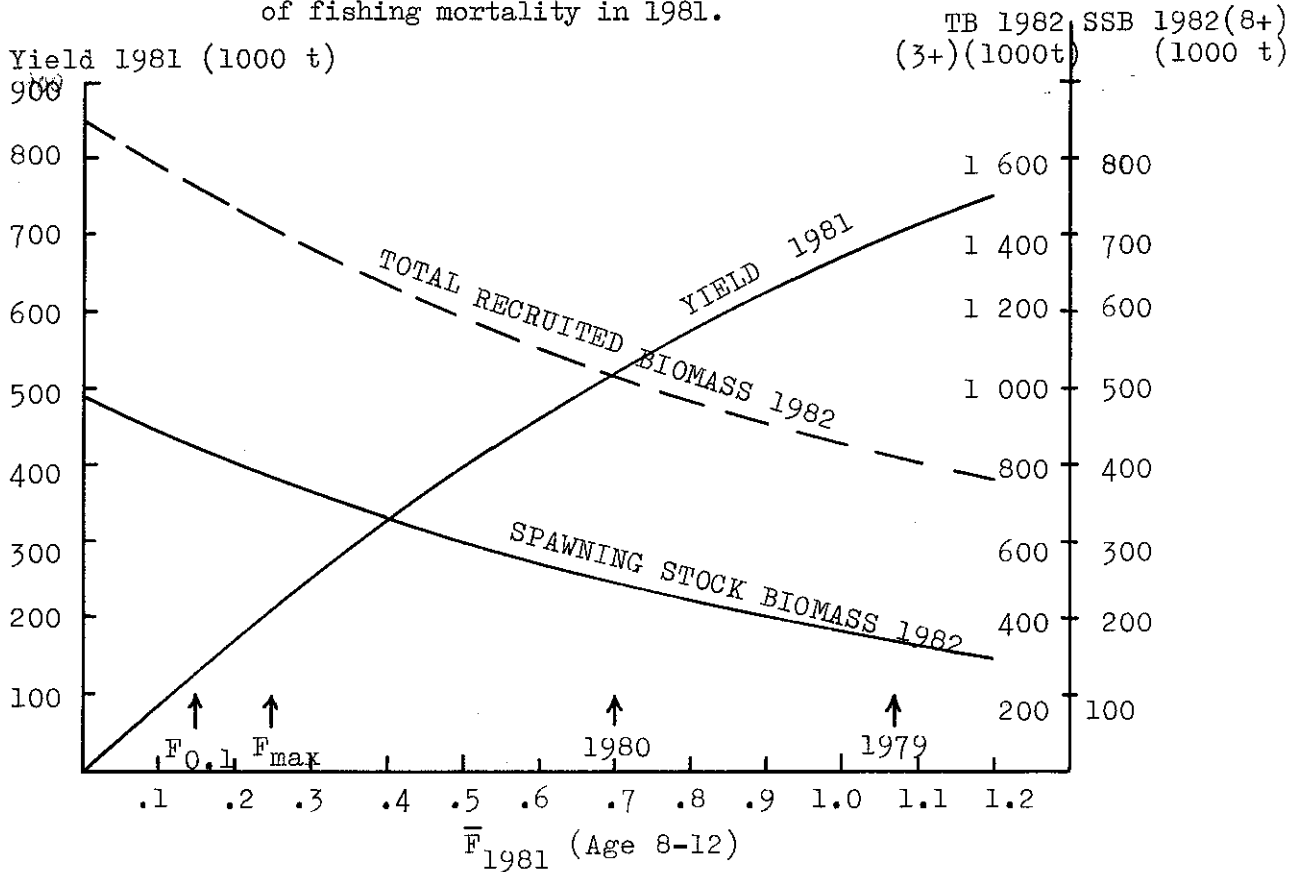
44. Data from Spanish and Portuguese surveys, confirmed by sampling of commercial catches, have now been examined, which allow a definition of the appropriate areas and periods for such a prohibition of trawling. The appropriate areas, within which trawling should be prohibited with mesh sizes less than 80 mm, during the period October to March, in depth of less than 200 meters are:

Prior Cape (43°34'N 8°19,5'W) to Vilano Cape (43°9,7'N 9°12,8'W);  
Corrubido Cape (42°34,7'N 9°5,7'W) to Silleiro Cape (42°6,3'N 8°54,1'W)

37°10'N to 37°50'N;  
39°50'N to 40°20'N;  
41°30'N to 41°50'N.

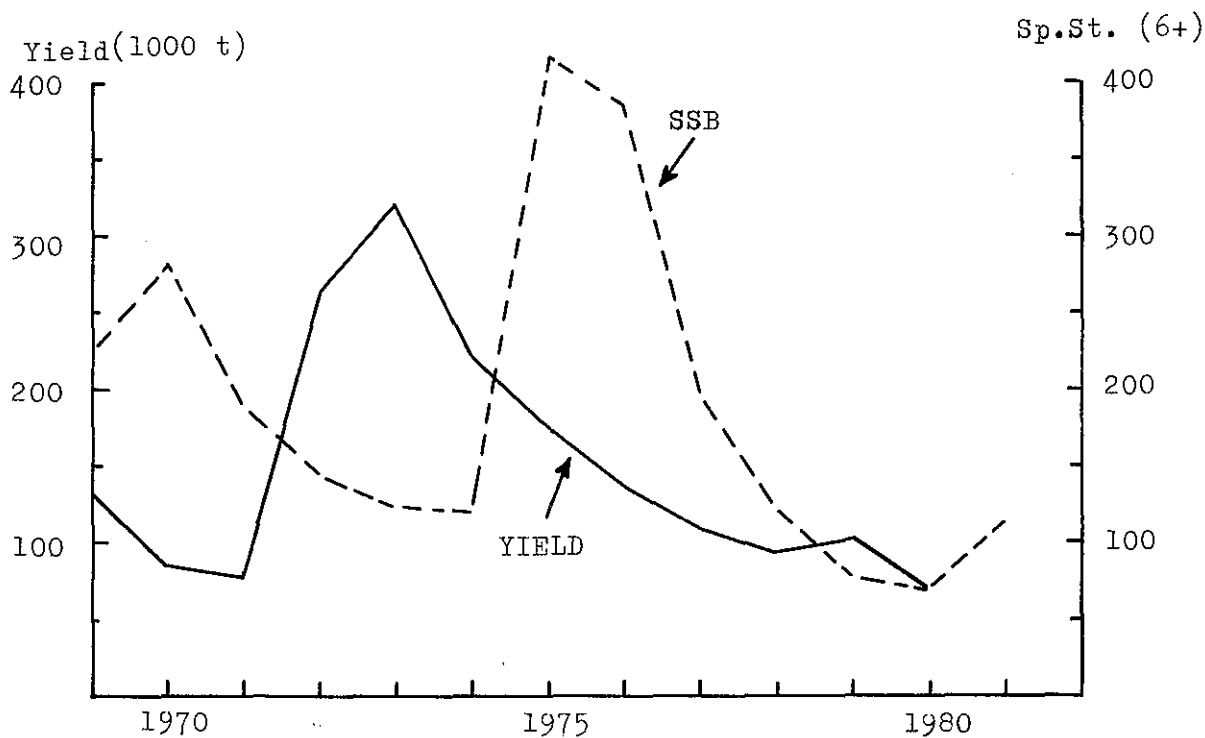
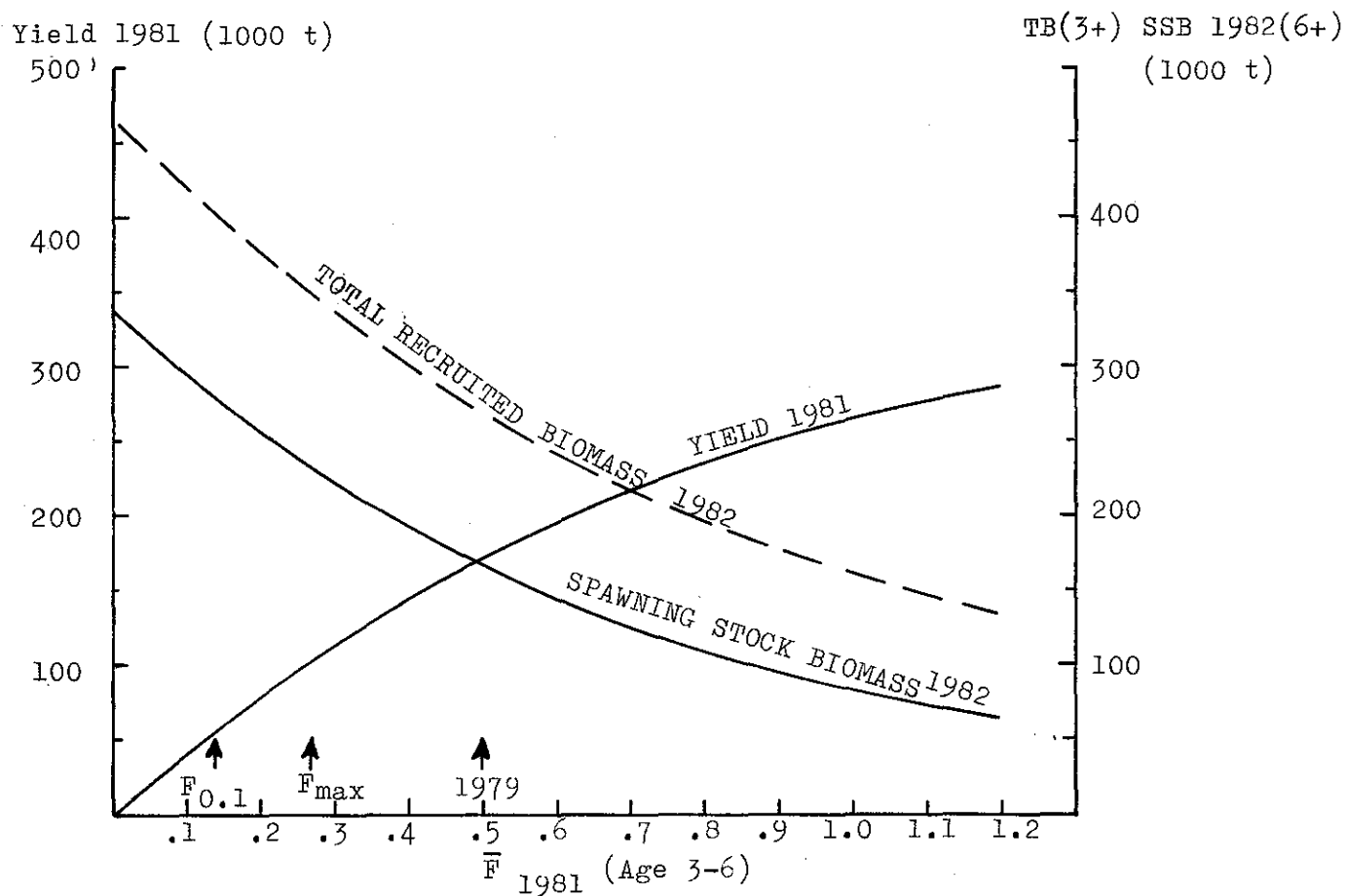
These areas are shown cross-hatched in Figures 4a and 4b.

**Figure 1a.** NE-Arctic Cod. Yield in 1981, total recruited biomass (TB) and spawning stock biomass (SSB) in 1982 at different levels of fishing mortality in 1981.



**Figure 1b.** Historic yield and spawning stock biomass of Arctic cod 1969-80.

**Figure 2a. NE-Arctic Haddock.** Yield in 1981, total recruited biomass (TB) and spawning stock biomass (SSB) in 1982 at different levels of fishing mortality in 1981.



**Figure 2b.** Historic yield and spawning stock biomass of Arctic haddock 1969-1980.

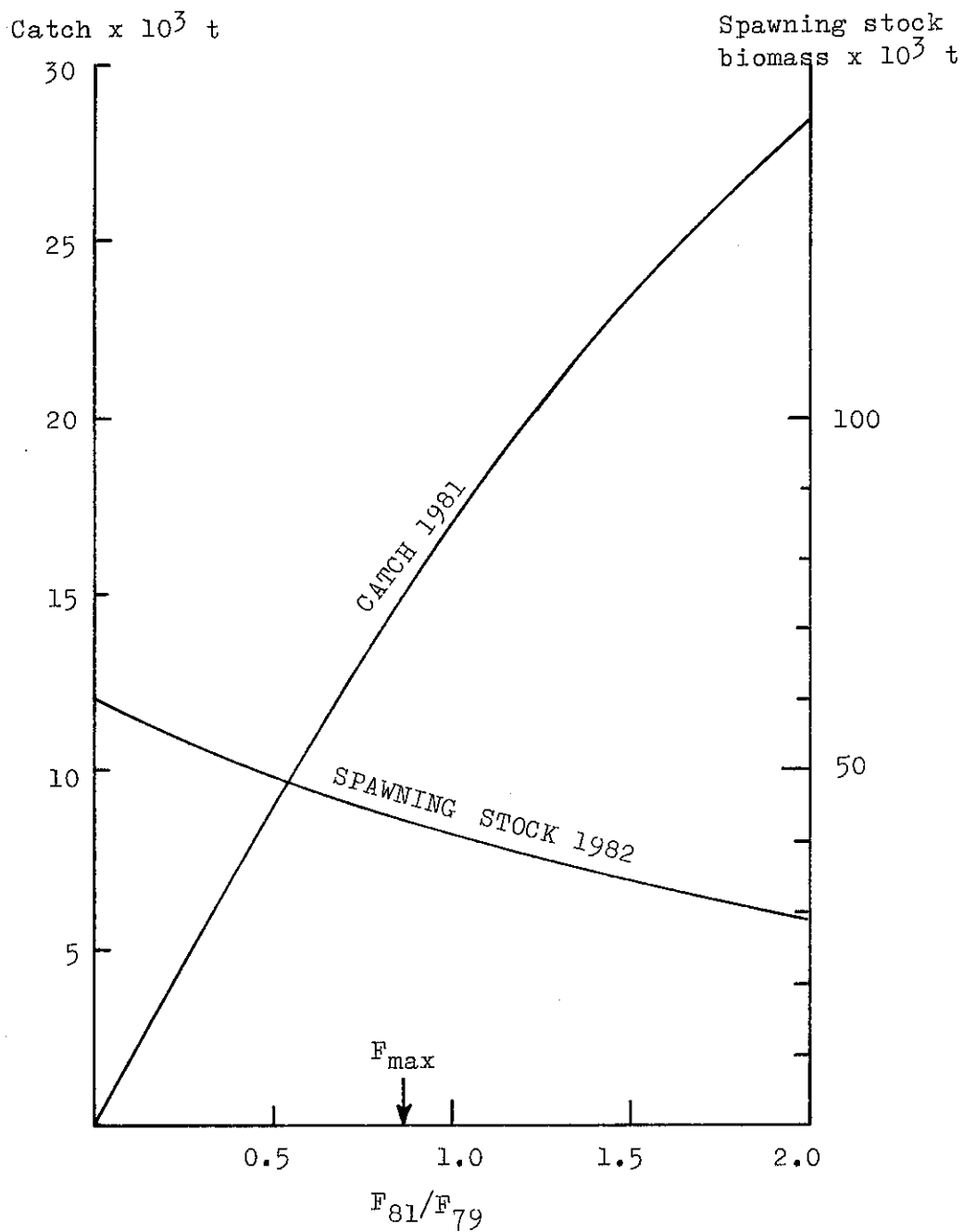


Figure 3. North Sea Sole. Results of catch predictions.

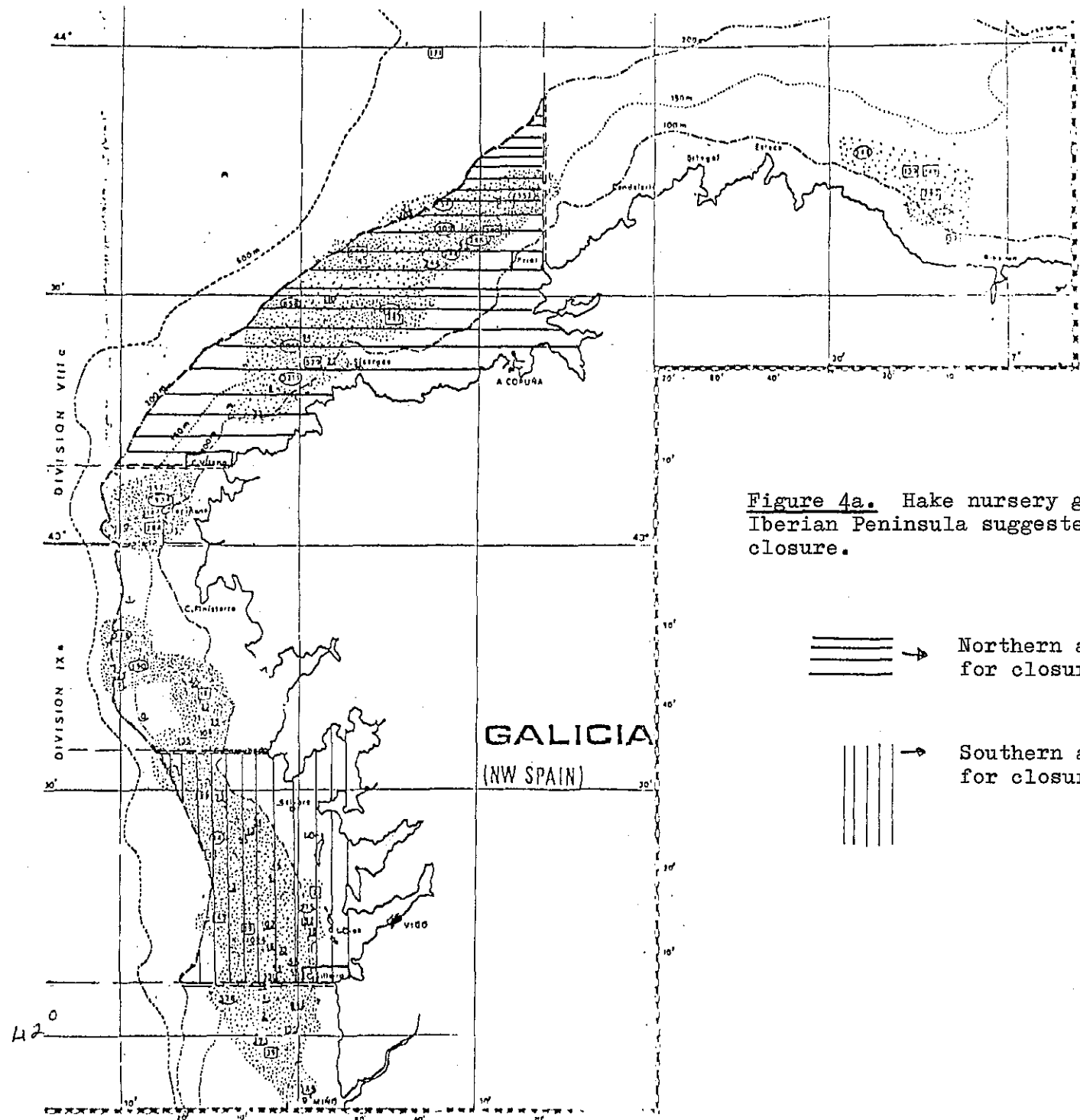
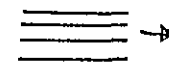
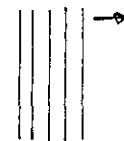


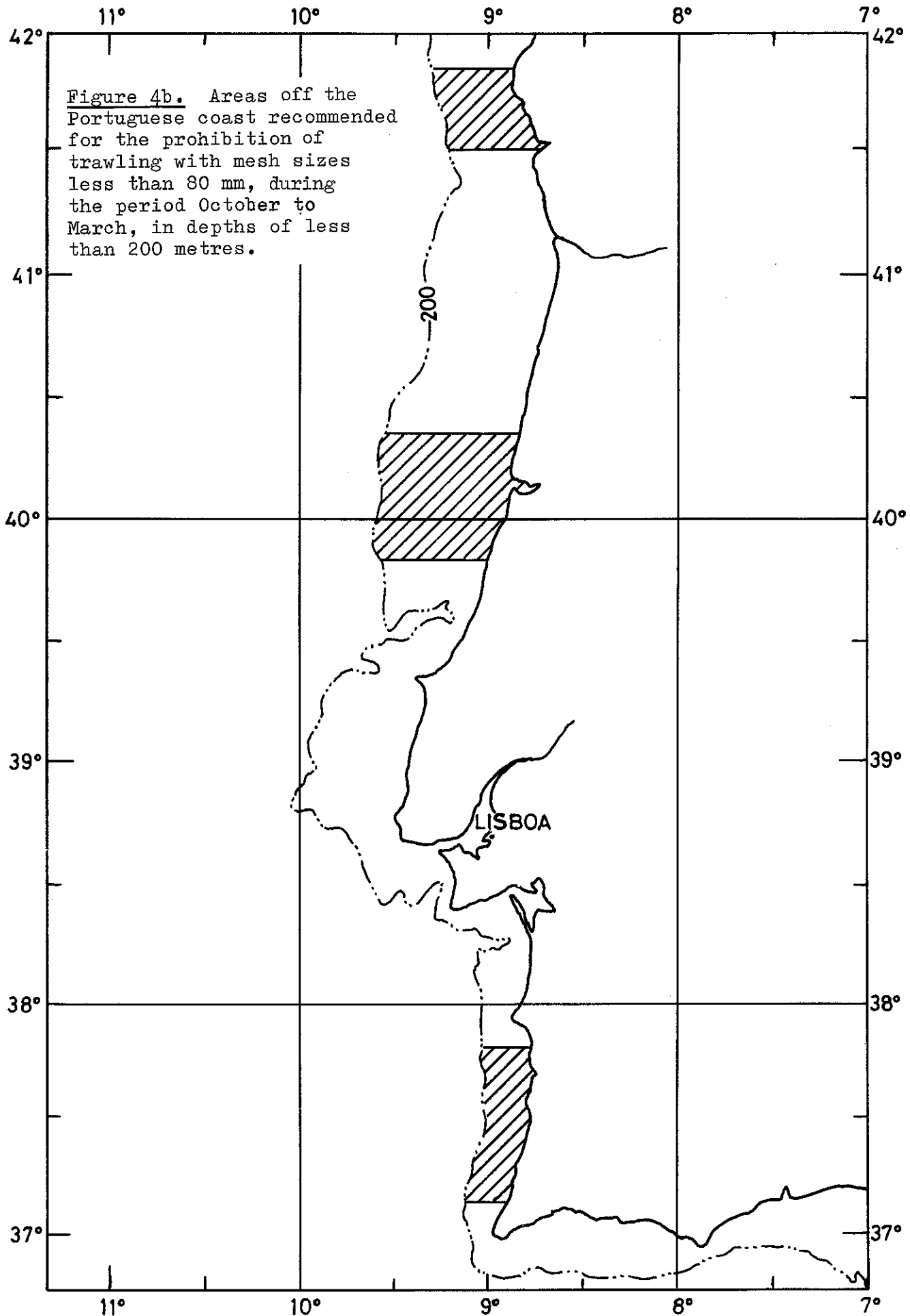
Figure 4a. Hake nursery grounds off the Iberian Peninsula suggested for closure.



Northern area proposed for closure



Southern area proposed for closure





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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