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International Council for the
Exploration of the Sea

C.M.1993/Assess:13
Ref.:M

REPORT OF THE STUDY GROUP ON NORTH-EAST ATLANTIC SALMON FISHERIES

Copenhagen, 1-4 March 1993

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CONTENTS

1 INTRODUCTION

1.1 Terms of Reference

The terms of reference for the Study Group were set out in ICES C.Res.1992/2:8:4 as follows:

"The Study Group on the Norwegian Sea and Faroes Salmon Fishery will be renamed the Study Group on North-East Atlantic Salmon Fisheries (Chairman: Mr E.C.E. Potter, UK) and will meet at ICES Headquarters from 1-4 March 1993 to prepare the relevant data for presentation to the Working Group on North Atlantic Salmon at its meeting in March 1993. The national run-reconstruction model should be re-run for the 1989 and 1990 smolt releases and a sensitivity analysis should be made".

The terms of reference for the Working Group on the North Atlantic Salmon are given in Appendix 1. The Study Group addressed the relevant questions under items 1, 2, 4 and 5 of these terms of reference, the remaining items being the responsibility of other Study Groups or the Working Group.

1.2 Participants

Walter Crozier	UK (Northern Ireland)
Lars P. Hansen	Norway
Marianne Holm	Norway
Arni Isaksson	Iceland
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Etienne Prévost	France
Alexei Sharov	Russia
Alexander Zubchenko	Russia

2 CATCHES OF NORTH ATLANTIC SALMON

2.1 Nominal Catches of Salmon

Revised estimates of the total nominal catches of salmon by country were provided for 1991, and provisional estimates for 1992 were collated. Total nominal catches are presented in Table 2.1.1 and discussed in Section 4.2.2

2.2 Catches in Numbers and Weight by Sea Age

Provisional data on the sea age composition of catches were provided for several northeast Atlantic countries and are presented in Table 2.2.1. Specific information, where available, is given in Section 4.2.3.

2.3 Unreported Catches

2.3.1 Unreported catches within national EEZs

The total guess-estimated unreported catches within national EEZs in the North East Atlantic Commission (NEAC) Area of NASCO for the years 1987-1992 are given in Table 2.3.1. Data for some countries were incomplete estimates. The unreported catch for 1992 (1,825 t) was greater than for the two preceding years. However, the Study Group emphasized that, as these were very imprecise figures, the difference could not be considered significant. In addition, it was noted that several countries estimate unreported catches as a proportion of total or regional declared catches; as a result, there was a tendency for the total unreported catch to alter in line with the nominal catch. Thus, the decrease in the values given for 1990 to 1992 (average 1,720 t) compared with the preceding years (average 2,216 t) reflects the decline in declared catches in most countries.

A radio tracking study carried out in the Teno River, Finland, in 1992 indicated that out of a sample of 66 radio-tagged fish entering the river none was caught illegally before spawning time.

2.3.2 Unreported catches in international waters

Sightings by Icelandic and Norwegian coastguards of vessels fishing for salmon in international waters to the north of the Faroes EEZ were reported to NASCO. NASCO informed the Study Group that 2 sightings were reported in the 1991/1992 season both in May 1992. The catch in this area during the season is therefore estimated to have been similar to 1990/1991, namely 25 t - 100 t.

The Study Group was aware of reports of by-catches of salmon in a horse-mackerel fishery in the Northern Norwegian Sea, but no new data were available.

3 STATUS OF STOCKS IN NORTH-EAST ATLANTIC COMMISSION AREA

3.1 Organisation of Stock Status Information

As in previous years, the Study Group collated and assessed available data on stock status in the north-east Atlantic. These comprised catch data, historical and recent counts (or estimates) of smolt and adult runs (see Section 3.2), marine survival estimates based on returns of tagged smolts to coastal waters (ie. before homewater exploitation) and returns to freshwater for wild and hatchery fish (see Section 3.3).

The Study Group also considered the types of data required to describe status of stocks with respect to escapement against spawning targets (Section 3.4).

3.2 Measures of Abundance and Escapement

Catches: Total nominal landings of salmon in the north-east Atlantic in 1992 (Table 2.1.1) increased relative to the 1991 value, but remained lower than the averages for the previous 10 years. The overall catch figures are not particularly informative, as various regulatory measures have reduced the catch in some countries (e.g., Norway), while in Iceland catches are influenced by ranching. The presence of fish farm escapees in commercial catches is significant in at least one country (Norway), and thus, the catch statistics may give an overestimate of the abundance of wild fish. Furthermore, catch statistics may not reflect the true abundance of wild stocks, given the range of factors that affect catches, such as effort variations, fishing conditions and variable run timing in relation to fishing seasons.

Freshwater productivity: Counts or estimates of wild smolt production are available from 11 stocks in the northeast Atlantic, as well as indices of juvenile salmon abundance from the River Bush (UK, Northern Ireland) and estimates of total 0+ population in the R. Nivelle (France) (Table 3.2.1). Although these examples may not be representative of larger groups of stocks, they may indicate trends in freshwater productivity within regions. Annual variation in juvenile/smolt counts is evident in all stocks, with in most cases no apparent trend in fluctuations, except as previously noted in the Burrishoole (Ireland), R. Högvadsån (Sweden) and Imsa (Norway) (Anon., 1992a). Smolt numbers in the R. Burrishoole (Ireland) recovered in 1992, with the count being close to the previous 12 year average. Smolt production on the R. Högvadsån fell to very low levels due to acidification in the late 1970s and has since been restored by liming. In most rivers the 1992 counts fell within the range observed in the last 10 years, except in the R. Bush (UK, Northern Ireland) and the R. Bresle (France). Whether the low smolt count on the R. Bush in 1992 is attributable to density-dependent mortality at high ova depositions or recent environmental degradation cannot be determined.

Despite concerns in several countries that reduced adult runs in 1990 and 1991 may have resulted in inadequate spawning populations, there is no widespread evidence in 1992 that juvenile production has been affected.

Adult escapement: Adult counts (or estimates) for 20 wild stocks are presented in Tables 3.2.2 and 3.2.3, including new data for the R. Bresle (France) and additional historical time series for the Rivers Kola and Zap. Litca (Russia). Although year to year variations in adult numbers counted in monitored rivers are evident, runs were generally higher in 1992 compared with either or both of the previous two years. In about two thirds of the rivers monitored, adult runs in 1992 were comparable to or greater than average runs for the whole time series. For the R. Högvadsån in Sweden, wild adult counts have not increased in the last 4 years despite earlier increases attributed to mitigation liming. In 3 Russian rivers (Kola, Yokanga and Zap. Litca), adult counts were above the range for the last 10 years. These high numbers could be partly explained by management measures taken in Norway, leading to reduced exploitation on Russian stocks, though natural factors governing the dynamics of these stocks must also be considered. Given that in some cases counts/estimates represent minimum figures for adult runs, the 1992 figures for the north-east Atlantic provide some evidence that conditions causing poor adult runs in 1990 and 1991 may have been transitory.

3.3 Survival Indices

Estimates of marine survival for wild smolts from 6 stocks returning to homewaters (ie., before homewater exploitation) and for 9 stocks into freshwater (ie., including coastal exploitation) are presented in Tables 3.4.1 and 3.4.2, respectively. Marine survival rates for hatchery smolts are given in Tables 3.4.3 and 3.4.4 for return to homewaters (6 stocks) and freshwater (5 stocks), respectively. The Study Group noted that estimates of return to homewaters are likely to present a clearer picture of marine survival than returns to freshwater because of variation in exploitation in coastal fisheries.

Survival to coastal return as 1SW salmon of wild smolts (Table 3.4.1) from the 4 monitored stocks where estimates are available was higher for the 1991 smolts than for the 2 previous year classes, except for the R. Bush (UK, Northern Ireland), where a reduction relative to the 1990 year class (but not 1989 smolts) was noted and for the R. Imsa where survival was similar for 1991 and 1989 smolts. The higher levels of coastal returns were also reflected in improved survival of wild smolts to 1SW salmon into freshwater (Table 3.4.2) in 8 rivers where data are available. For 3 of the 4 stocks for which data are available, survival to coast and to freshwater of 2SW fish was still relatively poor for the 1990 smolt year class, suggesting that these fish were affected by the marine conditions that led to reduced runs in several countries of 1SW fish from this year class.

Survival indices for 1991 hatchery-reared smolts returning as 1SW fish to coastal waters in 1992 were more variable than for wild fish (Table 3.4.3), with 3 stocks having decreased coastal returns and 2 increased relative to the 1990 year class. Different trends were noted for separate smolt age groups from the R. Bush (UK, Northern Ireland). Similar variability was evident in 2SW coastal returns. With the exception of the Kollafjordur (Iceland), 1SW hatchery-reared returns to freshwater were generally lower for 1991 smolts than 1990 smolts (Table 3.4.4). Returns to freshwater of 2SW hatchery-reared fish in 1992 were poorer than in the previous year, in agreement with data from wild fish.

Although there are some inconsistencies in trends from wild and hatchery smolts, compared to 1991, there is evidence among the monitored river data that while 2SW survival indices still reflect poor marine survival of the 1990 smolt year class in many areas, the 1991 year class has displayed improved marine survival, reflected in 1SW returns in 1992.

3.4 Stock Targets

Data on abundance and escapement by themselves, while useful in indicating possible trends in numbers of salmon through time, are of limited use in assessing stock status. This is especially true of catches in homewater fisheries where catch levels can be affected by effort variations and weather condition during fishing seasons. Similarly, rod catches and freshwater escapements are susceptible to climate-induced variation. Wild smolt counts or estimates are available for only a limited number of monitored rivers, and, as smolt counts are river-specific, these cannot be routinely used to infer status of stocks outside the river in question.

The Study Group considered that status of stocks would best be appraised by considering adult escapement (in terms of ova depositions) evaluated against spawning targets, in a similar manner to that adopted for Canadian stocks (Anon., 1992a). Ideally, biologically based spawning targets would be set for each river system, such that the target for each would represent the number of ova required to optimise smolt production from that system. This would not only provide a baseline against which annual ova depositions could be compared, but allow for the possibility that estuarine and in-river fisheries for single stocks could be managed to crop only adults in excess of the target spawning number. Targets should be set sufficiently high to allow compensation for density-independent variation.

Spawning targets would ideally be set for each river system based on knowledge of the number of spawners required for optimum productivity obtained from the stock-recruitment relationship and applied to survey data of the available areas of riverine and lacustrine habitat. However, data on stock/recruitment relationships are only available for the small number of "monitored" rivers in the north-east Atlantic (Anon., 1987) plus a tributary of the R. Dee (Scotland) and some Russian rivers. Canadian spawning targets are based on different levels of freshwater productivity and may not be appropriate for north-east Atlantic rivers. Accordingly, there is a need to carry out further research to define stock/recruitment relationships in a range of north-east Atlantic rivers and to determine whether productivity levels so far observed can be applied to other river systems. It is noted that data required for assessing stock/recruitment relationships are currently being collected in several other monitored rivers, including the R. Högvadsån (Sweden), R. Oir, R. Bresle and R. Nivelle (France), and the R. Orkla (Norway). The Study Group strongly recommends that these studies should continue.

As an example of the first use of such data, preliminary modelling of the R. Bush stock/recruitment relationship suggests that the target ova deposition in the river lies in the region of 3.7-5.5 ova m^{-2} of usable salmonid habitat, corresponding to a whole river ova deposition of approximately 2.03 million. Natural ova deposition (derived from trap counts of potential spawning female fish) has exceeded this target for 7 of the last 8 years.

Several significant factors need to be taken into account in setting and expressing individual river targets, such as variation in sex ratio of spawners, changing fecundity through time, changing 1SW:MSW ratios and the desired sea age composition of the spawning fish. This approach to stock assessment allows appraisal of whether target shortfalls are local in nature or more widespread, such that aggregated national targets are not being met.

In order to begin to assess stocks with respect to spawning targets the following data are needed:

Baseline data: As stock/recruitment data will not be available for each river for which targets are to be set, it will be necessary to apply optimal egg deposition rates from a limited number of experimental rivers to other rivers, provided that equivalence of productivity and ecological characteristics can be reasonably assumed. Ranges of freshwater productivity are known for many more rivers than stock/recruitment relationships, enabling them to be placed into groups. It will also be necessary to measure or estimate the total area of usable salmonid habitat in each river, such that optimal targets can be extrapolated for whole river systems. Different target egg deposition rate values will need to be applied to lacustrine and riverine habitats.

It is recommended that a standardised method of expressing targets should be adopted, such that these are comparable among rivers. The Study Group agreed that target egg deposition rates should be expressed as numbers of eggs per square metre of usable habitat. River targets should be expressed either as total numbers of eggs required by each river system, or more simply as the required numbers of spawning fish (possibly for each sea age group).

Annual assessment data: For rivers where targets have been established, it will be necessary to assess the numbers of potential spawning adults. These can be estimated directly from traps or counting fences or indirectly from tag and recapture data. From these, estimates of ova deposition can be derived using fecundity measurements applied to the sex ratio, separately for each sea age group.

In order to provide meaningful data, the number of monitored rivers would need to be increased, and this would have resource implications outside the remit of the Study Group. It should, however, be noted that the parameters required for this type of assessment comprise only annual data on spawning escapement and biological composition of potential spawners. As significant factors affecting stocks at a national level (such as acidification or increased natural marine mortality) are likely to be felt among many rivers, it would only be necessary to monitor relatively few rivers nationally to detect significant trends with respect to targets. It should be possible to set provisional targets for several river types based on currently available information, but it should be emphasised that resources should continue to be made available towards refinement of target assessment methodology and more importantly into reasons why targets may not be met in many stocks.

The Study Group recommended that a workshop be held, to consider available evidence that might be used to set stock targets and to identify what further data are necessary to implement assessment of stock status with respect to targets.

3.5 Causes of Apparent Reduced Survival of Salmon in Recent Years

In recent years there has been growing concern that marine survival of Atlantic salmon has been decreasing. This has been fuelled mainly by the observation in some countries that catches have decreased. However, other factors such as freshwater production and conditions in the fisheries need to be taken into consideration. The best data available to answer this question comes from the relatively small number of monitored stocks for which survival of wild or hatchery reared smolts to homewaters is available.

The Study Group considered the likely effects of factors operating at different stages in the marine phase of the life cycle. It was recognised that changes in return rates of stocks over a wide geographic area were likely to indicate factors operating in the sea rather than during the freshwater phase. Factors reducing the survival of post-smolts early in the marine phase would affect the numbers of both 1SW and MSW fish returning in succeeding years. Factors operating later could affect only one sea age group. The period in which survival was affected might also be seen by comparing changes in tag return rates in distant water fisheries and homewaters. Finally, environmental influences in homewaters may affect the ability of fish to enter freshwater quickly; delayed fish might suffer increased mortality.

Smolt survival estimates from UK (Northern Ireland) indicate that survival to coastal return of wild 1SW fish from the 1989 smolt year was below the previously observed range but improved considerably for the 1990 smolt year class. Data for the Burrishoole show low smolt survival for 1989 but improved for 1990 for both wild and hatchery smolts. However, Norwegian data from the R.Imsa indicate that smolt survival to 1SW returns was poor for the 1990 and 1991 smolts; changes in survival to 2SW are more difficult to assess because of the variability of the annual estimates, which tend to be based on few returns. A similar pattern is seen in the North Esk (UK (Scotland)). There was poor survival, relative to previous years, for both the 1989 and 1990 smolt year classes in terms of 1SW returns. Returns as 1SW fish from the 1991 smolt year class were still low but higher than in the previous two years. In Iceland, survival to 1SW returns in 1991 was high in comparison with the previous two years.

It, therefore, appears that salmon stocks over a wide range in the north-east Atlantic have experienced reduced survival of the 1989 smolt year class. Survival of the 1990 smolt year class has been low in most, but not all, areas. However, there are now indications from 1SW returns in 1991, that survival may be increasing again. Given that recent reduced smolt survival has been observed in three out of the four countries where estimates are available, that both 1SW and 2SW returns are affected and that none of these countries are thought to have problems with freshwater productivity, it would seem that the cause of reduced survival is a marine problem that occurs at a stage between entry into the sea and the first sea winter.

The cause of the reduced survival is unclear. The Study Group noted the work of Friedland and Reddin (in press) that suggested good correlations between salmon catches in Europe and the available area of marine habitat within certain temperature ranges. There is also some hydrographical information available from Iceland relating to the observed pattern of survival of ranched fish. This suggests that during the years where 1SW returns were poor, sea conditions were unusual, with cold East Greenland currents dominating North Icelandic waters rather than warmer Gulf stream currents. It is interesting to note that capelin catches also correlated with the prevailing hydrographic conditions, suggesting that capelin stocks may have been affected by the same factors as salmon.

The Study Group also noted that several countries had recorded unusually dry weather in some recent years. This was known to have affected salmon movements into freshwater in some areas. As a result, catches were affected in many rivers although, in some, adequate numbers entered the rivers late in the season and spawned successfully. In the absence of spawning targets and stock counts in most areas, it is not possible to assess the extent of the problems arising in recent years.

4 FISHERIES IN THE NORTH-EAST ATLANTIC COMMISSION AREA

4.1 Description of the Fisheries at Faroes

4.1.1 Gear and effort

Gear in use in the Faroese fishery did not change in the 1992.

The fishing effort was greatly reduced in the 1991/1992 season due to the buy-out of the Faroes quota by various interested parties for the years 1991-1993. Only one research vessel operated during the fishing season, under the direction of the Faroese Fisheries Laboratory. A total of 52 sets was fished by this vessel during 6 trips in the 1991/1992 season.

4.1.2 Catches and discards

The research fishery followed very much the normal pattern of previous seasons, beginning close to the islands and moving in a north-easterly direction out to the fishery limit during the season (Figure 4.1.1). The total catch in the 1991/1992 season was 31 t and the preliminary catch for the calendar year 1992 was 23 t, all catches being by the research fishery (Tables 4.1.1 and 4.1.2). The catch in number by month is given in Table 4.1.3. As in the last two seasons, the weather in January was very bad.

All salmon caught were measured, and the discard rate from each trip is given in Table 4.1.4, which also includes other parameters sampled in the research fishery, such as scale samples, number of finclipped salmon and tagged fish. A total of 8,927 fish was measured of which 782 were less than the permitted 60 cm total length. The discard rate from the catch ranged from 2.5 to 15.7%, and the overall estimate was 8.8% (Table 4.1.4). This value is within the range observed since the 1982/1983 season (Table 4.1.5). As noted in the two preceding seasons (Anon., 1992b) the proportion of discards tends to decline as the season progresses.

4.1.3 Catch per unit effort

The catch in number (divided by 10) by statistical rectangle is shown in Figures 4.1.2 to 4.1.6. The catch in number per 1000 hooks (CPUE) is shown in Figures 4.1.7 to 4.1.10 and for the whole season in Figure 4.1.11. As in the last few seasons, the CPUE in the first part of the season was very high and as in 1988/1989 it remained high during February and March and dropped off in April (Table 4.1.6a). In the 1991/1992 season no fishery took place outside the Faroes EEZ (Table 4.1.6b).

It should be noted that the overall CPUE of 79 salmon per 1000 hooks for the 1991/1992 season is the highest on record since the 1981/1982 season (Table 4.1.6a). One reason for this might be the fact that the research vessel M/S "Polarlaks" has been one of the best vessels in the salmon fishery in previous seasons. However, as only one vessel was operating, it would not have had the opportunity to benefit from receiving information from vessels fishing in other areas to enable it to find the best fishing areas. In this case several vessels spread over the area would have a higher chance of spotting areas with good catches than just one vessel. If, on the other hand, the reduced exploitation in the fishery resulted in increased concentrations of salmon within the Faroes EEZ compared with previous years, more salmon would be available to the single vessel, thereby increasing the catch and the CPUE. A third, and possibly the most likely explanation, could be the high number of reared salmon observed in the Faroes area in the 1991/1992 season. As much as 37% of the salmon caught were estimated to be of reared origin (Jacobsen *et al.*, 1992), and samples from the 1990/1991 and 1989/1990 seasons also indicate similar numbers of reared fish in the Faroes area. The presence of high numbers of reared salmon in the Faroes catch could mask a decline in the wild stock in the area.

4.1.4 Biological composition of the catch

Production of farmed salmon in the north-east Atlantic is shown in Table 5.1. When assessing salmon fisheries and wild salmon stocks, it is important to estimate the farmed and ranched component. If a high proportion of such fish is present, but is not accounted for, the catches of wild salmon will be overestimated and the size and status of the wild stocks will be masked. There is direct evidence that salmon that have escaped from Norwegian farms are caught in the long-line salmon fishery north of the Faroes (Hansen *et al.*, 1987), and recent observations have shown that escaped reared fish are numerous in catches in these areas (Jacobsen *et al.*, 1992). As a part of the sampling programme of Atlantic salmon in the long-line fishery at Faroes, fish were examined in order to estimate the occurrence of reared salmon in the fishery. Material was available from February 1990, December

1990, December 1991 and February, March and April 1992 (Table 4.1.7). In the majority of the fish sampled, body length (fork length) was recorded to the nearest cm.

Identification was carried out by scale analysis (Lund *et al.*, 1989; Lund and Hansen, 1991) In 31 fish (5% of the total number examined) it was not possible to judge if the fish were reared or wild; in the analysis these fish were taken to be wild.

In all samples, reared salmon were observed in relatively high frequencies (Table 4.1.7). Both in February and December 1990, more than 40 percent of the fish examined were estimated to be of reared origin. During the 1991/1992 fishing season, when sampling occurred over a large part of the fishing season, the average proportion of reared salmon was 37%. This season, the estimated proportion of reared fish was significantly lower in March and April (25-28%) than earlier in the season (36-48%)(X^2-test, $P<0.01$). The methodology used to discriminate between wild and reared fish tends to underestimate the proportion of reared fish, in particular those escaped at the freshwater stage, or at an early marine stage (Lund *et al.*, 1989; Lund and Hansen, 1991). Thus, potential error classification is directed towards reared fish being classified as wild rather than vice versa. It is not thought that these are fish that have been deliberately released because tagging programmes have shown that such fish contribute relatively little to the fishery.

The high frequency of escapees from fish farms at Faroes is in the same order of magnitude as in Norwegian home water fisheries. In 1989, 1990 and 1991 the average proportions of farmed salmon in fisheries on the outer Norwegian coast were estimated to be 45, 48 and 49%, respectively, whereas in fjord fisheries the corresponding proportions were 14, 15 and 10% (Lund, Økland and Hansen, 1992). The reason for this difference is that a large proportion of escaped farmed salmon enter fjords and rivers after the fishing season has closed. In a single salmon fishery in western Scotland, Webb and Youngson (1992) estimated that 22% of the catch were of reared origin. Because this value was based on morphological data alone, it cannot be compared directly with the values obtained in Norway.

Research carried out in Norway indicates that in most cases escaped farmed fish return as adults to the area from where they escaped (Hansen and Jonsson, 1991). The high proportion of farmed salmon in the Norwegian home water fisheries combined with the fact that Norway accounts for the major production of farmed salmon in the Atlantic, strongly suggest that most farmed salmon occurring in the Norwegian Sea are of Norwegian origin. It is also reasonable to assume that farmed fish escaping from cages in Scotland, Faroes and Ireland also contribute to the Faroese fishery.

To examine whether the presence of reared salmon affect the description of the composition of the catch, some biological characteristics of wild salmon obtained from scale samples were compared with those of reared fish. Age was determined by scale analysis in accordance with conventional rules described in Anon. (1984a) and smolt lengths were estimated by linear back-calculation. In reared fish, age and smolt length calculation may frequently be complicated by a diffuse transition between the freshwater and sea zones of the scale confusing the position of the last winter-band in freshwater (Lund and Hansen, 1991). When this occurred, the estimation was based on the minimum value. Back-calculation of smolt size was carried out with some of the scales taken from wild fish (the samples from 1990 and a sub-sample from February 1992).

In samples from all three seasons, the wild fish were significantly larger than the reared fish (Mann-Whitney U-test, $p<0.01$). There also appear to be significant differences in size within all sea-age groups compared (1-3)(Mann-Whitney U-test, $p<0.01$) (Figure 4.1.12). Reared 1SW fish were significantly larger than wild 1SW fish, whereas among the 2SW and 3SW groups, the wild fish were larger. However, although the sea age of ranched fish are usually aged correctly, misinterpretation of sea-age may be common in salmon reared in sea pens (Lund and Hansen, 1991). This may explain the extensive size overlap between the sea-age groups in reared fish. It is possible that the sea-age composition of the reared fish is actually similar to the wild fish but their growth is different.

Among the reared fish, 12 out of 240 individuals (5.0%) were less than 57 cm in fork length, and thus discarded, whereas among the wild fish 13 out of 356 fish (3.7%) were discarded. This difference is not significant ($p>0.05$). The size distribution of wild and reared fish in samples taken in 1991/1992 are shown in Table 4.1.8.

Sea age distribution

The sea-age of the reared and wild fish interpreted from scale reading also differed significantly (Figure 4.1.13) (Mann-Whitney U-test, $P<0.001$). However, in both categories, the majority of the fish were 2SW salmon, accounting for 85% of the wild fish and 70% of reared fish. 1SW fish, on the other hand, appeared from the scale reading to be more numerous among the reared fish (25%). Thus, the estimated average sea-age of reared fish was lower (1.8 years) than for the wild fish (2.1 years). However, this difference may reflect errors in the reading of the reared fish scales.

The sea age composition of the total catch has been estimated on the proportion of the catch thought to be of wild origin. The division of the catch into wild and reared components was based on the four samples of scales examined (Table 4.1.7). The sea-age composition of the wild component was based on the age composition of the wild components of each sample (Table 4.1.9) and are shown in Table 4.1.10. In comparison to previous seasons (Table 4.1.11), there was an increase in the proportion of 3SW fish in the catch and a consequent decrease in the proportion of 2SW fish. However, it was noted that no correction had been made to the previous years' data to account for reared fish; this may have resulted in a significant error in estimating the age composition of the catch using either scale readings or a length split.

Weight distribution

The weight composition of the catch is only available for wild and reared fish combined (Table 4.1.12). This confirms the increase in the proportion of large (>5 kg) fish relative to the previous seasons.

Smolt age distribution

In the pooled samples, the smolt age (estimated from scale reading) of the reared fish was significantly higher than for the wild fish (Figure 4.1.14) (Mann-Whitney U-test, $p<0.001$). The mean smolt age of the wild fish was 2.6 years (range 1-5 yrs), while it was 3.3 years for the reared fish (range 1-7 yrs). However, in commercial rearing of Atlantic salmon, smolts are exclusively 1 or 2 years old. The high smolt age readings from the scales are consistent with previous evaluations of scale interpretation of reared fish, which exhibit false winter-bands (Lund and Hansen, 1991). This error in the smolt age reading of farm escapees will bias the estimates of smolt age composition of the total catch if it is not accounted for. Table 4.1.13 gives estimates for wild fish alone in 1991/1992. These data give a similar smolt age composition of the catch to previous seasons; however, no account has been taken of the possible presence of farmed fish in samples in previous years, which will have resulted in some smolt ages being overestimated.

Smolt size

The range of variation in the back-calculated smolt lengths was far greater in reared fish (9-41 cm) than in the wild fish (8-19 cm) (Figure 4.1.15), and the average smolt length was significantly higher in reared fish (21.9 cm) than in wild fish (12.8 cm) (Mann Whitney U-test, $p<0.001$). The production of large smolts is often a production goal in commercial rearing.

4.1.5 Origin of the catch

The distribution of tag recoveries in the Faroes fishery for the period 1981/1982 to 1991/1992 is given in Table 4.1.14. In 1991/1992 tags were recovered principally from Irish salmon originating from Shannon River hatchery releases. As the overall release of this particular group was large (320,000) and tags of Irish origin are recovered regularly from the Faroes fishery, this number of tags is not unexpected.

Individual tags were also recovered from 3 rivers in UK (England and Wales) and 2 rivers in UK (Scotland).

One French origin tag was recovered in the Faroes fishery in the 1991/1992 season. This is the first French microtag recovery, although Carlin tags have been recovered in the past.

Table 4.1.15 shows the derivation of raising factors for the 1984/1985 to 1991/1992 fishing seasons, and Table 4.1.16 gives an estimate of the total number of microtagged salmon killed (including discards) in the Faroes by sea age class and catch rates per 1,000 fish tagged. These catch rates were much lower than previously recorded due to the reduction in fishing effort and lower catch in the fishery.

The total number of external tags recovered in the Faroes fishery in the 1991/1992 season is shown in Table 4.1.17. Due to the lower catch in the experimental fishery, the number of external tags recovered was also lower than in previous years.

The Study Group noted at their last meeting that the external tag recoveries should be validated and finalised before the 1993 meeting in order to compare the catch rates per 1,000 released with data from the microtag recovery programme. Where possible this has been carried out. These values are presented by country of origin in Tables 4.1.18, 4.1.19, and 4.1.20, and summarised in Table 4.1.21 and Figure 4.1.16.

The data confirm previous observations on the relative catch rates at which stocks from different countries were represented in the fishery. All sets of data indicate a decline in the catch rate reflecting the drop in catch at Faroes in 1991/1992.

4.1.6 Exploitation rates in Faroese fishery

The calculation of exploitation rates in the Faroese fishery on several stocks from Norway, Sweden and UK (Scotland) is shown in Tables 4.1.21 to 4.1.26 and the results are summarised in Table 4.1.27.

The exploitation of hatchery stocks from the Drammen (Norway) and Lagan (Sweden) have shown similar changes with levels being quite low in the 1986/1987 and 1987/1988 seasons and higher in 1989/1990 and 1990/1991. Also the exploitation on the Imsa stocks (wild and hatchery) increased in 1989/1990 and 1990/1991 compared with the preceding years. The exploitation rates on wild fish from North Esk have been lower in the last five years than previously.

Exploitation rates in 1991/1992, after the cessation of the commercial fishery, were below 5% for all stocks. This was considerably lower than the average for the preceding five-year period. The exploitation on the Norwegian Drammen and Imsa hatchery 2SW fish decreased from an average of 21% and 23% to 2% and 1%, respectively.

4.2 Description of Homewater Fisheries

4.2.1 Long-term changes in effort

In order to provide a picture of management measures taken to control effort in homewater fisheries, the Study Group compiled lists of the numbers of gear units used or licensed each year (over the past 10-25 years) by country and gear type (Table 4.2.1a+b and Figures 4.2.1a to c). It must be emphasized that these data cannot be used to estimate CPUE and may not be comparable between countries (for example, a drift net unit in Norway will be less than 100 m while in other countries it may be several times this length).

Finland: In both recreational and commercial fisheries there has been an increase in the number of gear units used over the past 10 years.

France:The number of rod and line licences issued has decreased since the early 1980s. The number of commercial freshwater net licences has declined since 1989 following the introduction of quotas on catches in 1987 although it is still greater than in the early 1980s. Licences issued for the commercial fishery in the Adour estuary show a decline in the last 10 years. However, it is felt that these figures overestimate the actual number of licences being used.

Ireland: The number of drift-net licences issued increased from the 1960s to peak in 1973. Since then the number of all commercial licences has decreased steadily. The number of rod and line licences issued shows an increase in the latter part of the series.

Norway:The numbers of bag and bend net units recorded annually in Norway show opposite trends, the number of bag nets decreasing by a factor of 5.5 to the year 1988, and the number of bend nets increasing by a factor of 2. This reflects the greater ease of operation of bend nets as opposed to bag nets with the introduction of modern materials. Since 1989, when restrictions were introduced in the bend net fishery, there has been a slight decrease in the number of bend nets and an increase in the number of bag nets. Drift net licences were introduced in 1979 and, from this year to 1988, the number of nets decreased by a factor of 1.5; their use was banned in 1989. The number of lift nets fished decreased by a factor of 7 over the period 1966 to 1990.

Sweden: About 80% of the coastal catch is taken by bag nets. The number of bag nets fished between 1980 and 1990 ranged from 70 to 80. The 1993 figure is about 65 bag nets.

UK (England and Wales): There has been a decrease in the number of all net type licences issued over the past 10 years, the main reduction being in the number of licences for hand-held nets.

UK (Scotland): Data providing an index of effort for Scotland, by month and annually, for both the net and cobble and fixed engine fisheries were provided for the years 1982 to 1991. These figures were derived from the reported number of minimum and maximum crews fishing in the case of the net and cobble fishery and from the minimum and maximum number of traps fished in the case of the fixed engine fisheries. They do not represent an absolute value of effort but provide an index. For both types of fishery, effort is greater in the summer months when the 1SW fish are available to the fisheries and has decreased over the past 10 years. Buy-outs of net fisheries in recent years and a perceived low abundance of salmon are possible explanations for this trend.

UK (Northern Ireland): Total net licenses issued have declined by 36% over the last 10 years. This is mainly accounted for by reductions in the draft net fishery.

The data available from Norway, UK (England and Wales) and UK (Scotland) all indicate a decrease in the numbers of gear units used. In Norway, the decrease has been particularly marked with the closure of the drift net fishery in 1989. In Ireland, effort in commercial fisheries appears to have decreased while rod licences increased.

4.2.2 Gear and effort changes in 1992

There were no reported changes in the fishing methods and gear used in 1992 for any countries. However, new regulations were introduced in some countries and a new national rod licensing scheme was introduced in UK (England and Wales). Generally, effort reflected the perceived low abundance of salmon.

Ireland: No changes were reported in gear usage in general, but extensions to the fishing season were granted for draft net fisheries on 8 rivers (7 extended for 5 days and 1 extended for 2 days) and for rod fisheries in 5 rivers (extended by two weeks each). A by-law introduced in 1990 restricting the areas and seasons for commercial drift netting in the Western Region was maintained for 1992. This by-law was principally aimed at protecting sea trout but also allowed more salmon into rivers.

Norway: All salmon fishing was prohibited in the R. Vosso and some minor limitations were introduced in the Sognefjord and Österöy areas.

Sweden: New regulations introduced in 1992 for all Swedish west coast fisheries for salmonids standardised the closed season at 16 September to 28 February. As before, there are zones around river mouths where fishing is prohibited or restricted. Bag nets remain the primary fishing gear although set gill nets may be used between 20 June and 20 July. The closed season for the rod and line fishery was also standardised from 15 October to 28 February. In Svinesund, the boundary area with Norway, new regulations set the closed season at 16 August to 9 May. During the open season bag nets and set gill nets may not be operated from 6 pm Friday to 6 am Monday.

UK (Northern Ireland): The number of fishing licences issued in 1992 (232) was slightly lower than the 1991 figure (239), although overall effort was higher than in the previous year. In the Foyle fishery area, the season started one week earlier than usual and finished one month earlier than usual. The management policy of variable early closure in response to counter-based measures of escapement has been suspended. In future, the commercial netting season will stop on the last day of July. The angling season in the R. Bush has been extended by 2 weeks to 15 October.

UK (England and Wales): A new national rod licence was introduced enabling all anglers to fish for migratory salmonids subject to local access regulations. Netting restrictions on the River Camel (southwest region) ceased following a 3-year rehabilitation scheme. In the southern region, a net fishery on the R.Itchen was operated exclusively by the NRA to provide fish for tracking purposes. Also, in the south-west region 2 seine net licences were not renewed for Rivers Taw, Torridge and Tavy. Anglers had mandatory bag limits on the Taw and Torridge.

UK (Scotland): Regulations were introduced in three districts (Tay, Ugie, and Girvan) prohibiting the use of prawns and shrimps as bait. The rod fishing season on the Findhorn Salmon Fishery District was reduced by 6 days. Lawful salmon netting methods were defined.

4.2.3 Catches and catch per unit effort

Revised estimates of total nominal catches by country for the 1991 fishery, and provisional estimates for the 1992 fishery, were available (Table 2.1.1) It should be noted that catches of ranched fish and fish farm escapees are included in these figures (see Section 4.2.4). The figure given in 1992 for UK (Scotland) is incomplete, and the data for Norway, UK (Northern Ireland), UK (England and Wales) and Iceland are provisional. CPUE data were available for UK (England Wales) (Table 4.2.2) and Finland (Table 4.2.3).

The total catch figure available to the Study Group for the 1992 fishery was 3,249 t, 15% up on the 1991 figure but considerably lower than the previous 5 and 10 year averages (Table 2.1.1). All countries, with the exception of UK (England), Norway and Russia, had greater catches than in 1991. The 1992 catches for Finland, Iceland, UK (Northern Ireland) and Sweden were also greater than both the previous 5 and 10 year averages. Specific information was provided as follows:

Finland: The 1992 catch and CPUE (Table 4.2.3) were the highest since the mid-1970s. This is believed to be partly attributable to the coastal netting restrictions introduced in Norway and to high flows which prevented Norwegian salmon weir fishing in the lower part of the Tëno River.

France: The catch was 54% up on the 1991 figure although close to the 5 but below the 10-year averages. 50% of the catch was taken in the southwest of France which had a good year. This pattern may be explained by a combination of dry weather and reduced fishing effort which occurred in all regions with the exception of the southwest.

Iceland: The total catch increased by 17% from the previous year. The average increase in the sports catch, primarily in the grilse component, was about 30%, but on the northeast coast where catches had been depressed, it was about 100%, mostly in the 1SW component.

Ireland: The catch in 1992 was much improved over 1991 which was the lowest recorded in the period 1960-1991. However, the 1992 catch was 28% less than the previous 5-year average. It was generally perceived that good numbers of salmon were in the fisheries but continuing naval protection may have reduced the overall number of fish being landed, particularly in the northern region.

Norway: The total catch was the lowest recorded for more than 30 years, probably reflecting the effects of the regulations introduced in Norway in 1989 and a reduced abundance of fish.

Russia: The total catch was the lowest recorded since 1922, reflecting a perceived low abundance and the effects of limiting the commercial catch to promote the development of the sport fishery.

Sweden: The catch in 1992 increased for the third year in succession and was the second highest on record. Dry weather conditions resulted in an increased coastal catch but a decreased river catch.

UK (England and Wales): Following a succession of unusually dry years (1989-1991), most parts of England and Wales experienced much better weather in 1992. Although conditions for fish movements were improved, the effects on catches were variable with those in parts of the southwest showing a very marked increase while those in the north were generally reduced. CPUE has, however, continued to decline in most areas (Table 4.2.2).

4.2.4 Composition of the catch

The national salmon catches for several Northeast Atlantic countries are summarized in Table 2.2.1. The age classes are separated both by scale analysis and by separating weight distributions in the catches. Specific information on age composition was summarized for the following countries.

France: The overall proportion of 1SW fish (48% in numbers) in the catch was close to the mean of the last 5 years.

Iceland: There was an increase in the 1SW component compared with 1991, especially in northeastern Iceland. The average size of 1SW fish was higher than in the previous year and the sex ratio in 1SW fish was fairly even.

Norway: Catches in Norway were the lowest on record and slightly lower than for the previous three years. There was a slight reduction in the 1SW component.

Russia: As in the 1989-1991 period, 1SW fish dominated the catches (72.5%). The decrease in MSW salmon was primarily due to the depressed state of these stocks that have high proportions of MSW fish.

UK (Scotland): The proportion of the reported catch classified as 1SW fish was greater than in 1990 and 1991, but similar to that observed in the 1985-1989 5-year period

4.2.5 Origin of the catch

Table 4.2.4 indicates the origin of the catch in each country based on recoveries of tags over a number of years. The table has been updated for 1992 to include any previously unreported occurrences of non-national origin tags in homewater water catches and any new records in 1992. Double crosses indicate the principal component of the catch and single crosses represent other stocks contributing regularly to the tag recoveries. Rare recoveries of one country's tags in another country's catches are indicated by dashes and are assumed to indicate very minor contributions to the catches. It must be noted that the table may reflect the relative size of the national catches and does not imply the proportion of the stock from a given country which is taken in another country's catches. In some cases, although the majority of the catch in a given country may originate from that country, the contribution from rivers in adjacent countries may be substantial. Countries with small stocks are not likely to contribute significant numbers of fish to fisheries which mainly exploit fish from other larger stocks . However, the actual numbers of the smaller stock which are taken in the fishery may be high relative to the total size of this small stock.

There is an obvious area of exchange between most adjacent fisheries with the possible exception of the Russian fishery and the French fishery which are at the outer limits of the range of the north-east Atlantic salmon. The Study Group noted that this type of analysis gave very little information on how national stocks are exploited by different countries including the country of origin. A similar table incorporating weights of stock contributing to each national catch would provide a better assessment of the mixed homewater fisheries and this should be incorporated as part of the overall assessment of salmon stocks in the north-east Atlantic. It was felt that sufficient information was available to make, at the very least, an estimate of the contributions of non-national origin stocks to national catches in the same way that the Faroese mixed stock fishery was currently being assessed. The Study Group recommended that an attempt be made to produce such a table in 1994.

Table 4.2.5 shows the estimated contributions of ranched and farmed fish to national catches in recent years. In this context ranching is defined as the release into the wild of reared smolts with the intention of attempting to harvest all of the returning adults. Releases of reared fish to enhance wild stocks or compensate for lost wild production are, therefore, included in wild production. However, it is acknowledged that some fish released for enhancement may not contribute to spawning for various reasons; in this respect they are similar to ranched fish.

Ranching is carried out on a large scale by Iceland. Ranched fish comprised 76% of the total catch in 1991 and 70% in 1992. In addition 14 t in 1991 and 24 t in 1992 of the Swedish catch were made up of fish which had been released but were not expected to contribute to wild spawning populations. Small-scale ranching for research purposes is carried out from the R. Bush, UK (Northern Ireland) and at several sites in Norway. Ranching to enhance the rod fishery is carried out from the R. Burrishoole, Ireland. In this case only limited numbers of ranched fish have been allowed upstream to supplement wild spawning stocks.

Farmed fish make a significant contribution to the catches of Norway, Faroes and UK (Scotland). The proportion of farmed fish in Norwegian catches have remained relatively stable in the period 1989-1992 (Table 4.2.6). The proportion of farmed fish in freshwater catches is much lower than in catches at sea because reared fish enter freshwater later than wild fish, many of them outwith the season.

In UK (Scotland), sampling in 1990 indicated that most of the reared fish caught in the fisheries had escaped or been lost from sea cages. In 1991 and 1992, however, sampling on the west coast revealed that most of the farm-origin fish were derived from losses or releases of smolts or parr. On the east coast, where the incidence of farm escapees was low, most of the farm-origin fish were adult escapees.

While farmed fish are present in most other countries except Russia, France and UK (England & Wales), the exact contribution is not known. Levels of between 7 and 20% farmed fish have been reported from some catches in regional fisheries (coastal and estuarine) in Ireland. In most other countries, farmed fish are thought to form only a very minor (or negligible) part of the catch.

The Study Group recommends that countries should attempt to estimate the numbers and stages of fish farm escapees in each year.

4.2.6 Exploitation rates in homewater fisheries

Tables giving exploitation rates on stocks from the Rivers Drammen, Imsa, Bush and North Esk stocks are shown in Tables 4.1.21 to 4.1.26 and 4.2.7. The exploitation rates in homewaters for these and a number of other stocks are summarised in Tables 4.2.8 and 4.2.9.

A comparison of exploitation patterns for different stocks does not show any obvious similarities, except that hatchery stocks are often more heavily exploited than wild stocks. This is the case even when wild and reared fish originate from the same stock, as is the case for the R. Bush and R. Imsa stocks.

The levels of exploitation in 1992 seemed to be about average in most cases, except for the Russian River Ponoy where exploitation was reduced. Exploitation rates on the three Russian rivers shown in Table 4.2.9 are adjusted by altering the proportion of days on which fish caught in traps on the rivers are released or killed. In 1991 and 1992, it was decided to reduce the exploitation rate in R. Ponoy in order to increase spawning stocks and make more fish available for the developing recreational fishery.

An illegal fishery of considerable magnitude occurs in many of the Russian rivers. The illegal fishery was estimated to catch 15% of the spawning stock in R. Varzuga, 25% in R. Pechora and 26% in R. Umba. There is no clear sign that the illegal fishery is changing in size from year to year.

4.2.7 Management measures in Norway

Full details of the management measures introduced in Norway in 1989 are given in Anon. (1990), Appendices 2 and 3.

The impact of the measures on catches in Norwegian homewaters between 1989 and 1992 is shown in Table 4.2.10 and Figure 4.2.2. In the period 1982-1988 the nominal catch of salmon fluctuated between 1,076 t and 1,623 t. Since 1989, it has decreased to 850 t to 980 t, probably as a result of the new management measures. Since 1989, the marine catches of salmon have varied between 423 t and 488 t, much lower than for 1982-1988 when catches varied between 841 and 1,324 t. The catch in the marine salmon fisheries, excluding drift netting, was close to the average for this period.

It is likely that the ban on driftnetting in 1989 has resulted in a larger number of salmon being available to other marine homewater fisheries. The additional regulations of these fisheries have probably resulted in a substantial increase in freshwater escapement suggested by increased catches in freshwater despite the fact that freshwater fisheries have also been regulated by extending the annual closed time and that fishing for salmon has been totally banned in several rivers. Between 1989 and 1992, the freshwater catch accounted for 45% to 50% of the total nominal catch, annually, compared to between 18% and 27% over the years 1982-1988. Increased freshwater escapement is also suggested by the reduction in marine exploitation rates on most components of the R. Imsa stock during 1989-1992. This was not evident for the R. Drammen stock, because drift net exploitation on this stock has always been low.

The frequency of net-marked salmon entering a river will also give information about changes in netting effort on the migration route. The proportion of net-marked salmon has been recorded in several Norwegian rivers since 1978. In most of these rivers, sampling took place from 1978 to 1986 and was then re-established in 1990, 1991 and 1992. Table 4.2.11 shows unweighted means of the proportion of net-marked salmon in angling catches from 12 rivers in the period before the extensive homewater regulations were introduced, and the unweighted means of the proportion of net-marked salmon recorded in 1990-1992 in the same rivers. In all except one river, the proportion of net-marked salmon recorded in 1990-1992 was much lower than unweighted means during the period 1978-1988. The reduced proportion of net-marked fish may be accounted for by the management measures introduced in the Norwegian homewater fishery in 1989.

The salmon fishery on the Norwegian coast intercepts stocks from Sweden, Finland and Russia on their way back to their home rivers. Exploitation in Norway on 1SW fish tagged as smolts in the River Lagan, Sweden, in 1989-1992 was lower (average 1%) than in 1985-1988 (average 7%) (Table 4.2.12). Table 4.2.13 shows numbers of external tags recovered in Norway of salmon tagged as smolts in Sweden since 1975. The number of tags recovered in Norway per 1000 smolts released was very high at the end of 1970s and beginning of 1980s. It declined through the 1980s, and from 1989 to 1992 it was extremely low and much lower than all other years. The unweighted mean in the catch years 1977-1988 was 10.9 tags recovered per 1000 smolts released, whereas the corresponding average for 1989-1992 was 0.5. It is concluded that the regulations introduced in the Norwegian homewater fishery in 1989 benefitted Swedish west coast stocks.

CPUE data are available from Finnish fisheries in the Rivers Tana and Neiden (Table 4.2.3). These data show an increase in the catch per angler day and per angler season for the four years since the introduction of the new Norwegian regulations (1989-1992) compared with the previous four years (1985-1988).

4.3 By-Catch and Mortalities of Salmon in Non-Salmon Directed Fisheries

Landing of salmon caught in fisheries targeting other species is illegal in most of the Study Group member countries except France, where it is authorized, and Sweden, where landing is allowed during the regular salmon fishing season (March - September). In the countries where the by-catch cannot be landed legally, these catches are included in the estimates of unreported catches.

The shore-based gillnet fishery for species such as mullet/bass (England and Wales), lumpsuckers (Iceland) and mackerel (Norway) may represent a potential danger of taking salmon by-catches, especially in cases where mesh sizes, fishing areas or fishing seasons are not regulated to reduce the impact on salmonid stocks. However, the information available to the Study Group suggests that only small catches of salmon are taken in these fisheries. In Iceland, where there are known to be some illegal catches of salmon in the fishery for male (small) lumpsuckers, the authorities are currently negotiating a closure of this fishery in June and July in order to protect salmon. In Norway, fishing experiments with mackerel gillnets showed a relatively high catch efficiency of those nets also for small salmon. Mackerel nets, therefore, would be of greatest risk to salmonids if used in fjords into which grilse rivers flow. However, the Norwegian authorities are currently discussing regulations on mesh sizes, and a closed season in June and July for the mackerel fishery.

There are only occasional instances of salmon being taken in near- or off-shore fisheries with purse-seines, pelagic trawls and drift nets for commercial pelagic species, e.g. mackerel, sprat and herring. The by-catch of salmon from these fisheries is, therefore, considered to be negligible.

4.4 Predictive Indicators for Abundance of Salmon in the Northeast Atlantic

Several biological and physical indicators can possibly be used to predict the abundance of salmon stocks in subsequent years. Most common are population estimates conducted at various points in the salmon's lifecycle, both in fresh and salt water.

4.4.1 Freshwater assessments

Biological indices used in freshwater include catches, run or escapement counts (spawning targets), estimates of egg, fry or parr abundance and smolt counts. These methods tend to be less costly than marine assessments and have thus been used to some extent in all countries bordering the North Atlantic. These methods give good estimates of the utilization of the rearing capacity in individual rivers and smolt counts can in some cases be a good indicator of grilse and salmon abundance in subsequent years.

In general, one can say that the precision of these methods to predict future salmon abundance decreases as one goes forward in the life cycle due to the additive mortalities encountered in freshwater from egg to smolt as well as those in the marine environment.

Counts of runs and escapement are undertaken in many countries. These methods give very accurate information about the status of the stock in question and, in some cases, can be used to calculate egg deposition. The method has been used successfully to estimate spawning targets in Canada. Counters and their operation, however, are expensive and are usually only applied to a limited number of rivers.

Estimation of egg deposition by sampling river beds or counting redds does not seem to be a practical method to predict future abundance of Atlantic salmon, although it is extensively used in Pacific salmon.

Electrofishing surveys of fry and parr give good indications of the utilization of the rearing capacity of individual rivers. In some cases they can be useful as predictors for future abundance of salmon. These methods are, however, mostly usable for relatively small rivers, which can be easily electrofished.

In the River Bush (UK, Northern Ireland), fry estimates (0+) have been found to be fairly representative of 1- and 2-year smolt production as observed in the downstream smolt traps. A method to estimate smolt production from habitat assessments and juvenile surveys has also been developed and successfully tested in France. In Iceland, where juveniles spend 2-5 years in freshwater, electrofishing surveys have only given moderate success in predicting future salmon abundance. It seems likely, therefore, that the longer the stocks stay in freshwater as juveniles, the less applicable this technique will be, considering the variable mortality in fresh and salt water depending on climatic and oceanographic factors. It was also noted that variable precocious maturity in parr would reduce the applicability of these methods.

Smolt counts are by far the best method to predict future abundance of salmon. Traps are used on index rivers in several countries, but these are expensive to construct and operate. Information from these has, however, sometimes been used as an index for larger areas, especially with respect to marine survival.

4.4.2 Marine assessments

Methods used to predict salmon abundance through assessments during the marine phase include test fishing at various stages, acoustic surveys and prediction of non-maturing 1SW salmon abundance from returning 1SW salmon in home waters. In some cases, oceanographic and meteorological factors, as well as the abundance of prey and possibly predatory species could be used to improve the predictive ability of the model. It has been noted that good salmon years in certain parts of Iceland seem to coincide with high catches in the capelin fishery.

It seems likely that a large fraction of the marine mortality of salmon takes place fairly soon after migration into seawater. Early feeding in the sea might be an important factor in survival as well as the impact of various predators. Sampling of post-smolts and their predators during this early marine period might, in time, give some useful indices for a predictive model. Sampling of post-smolts, however, has been found to be a very difficult task all around the Atlantic.

Sampling the abundance of prey species might also be a useful index to use in a predictive model. Such survival indices have been developed in the Pacific and zooplankton indices are used to determine proper release time for pink and chum salmon in Alaskan ranching operations.

Test fishing on the feeding grounds might in theory provide a meaningful indicator of abundance of fish. If some of the fish are carrying tags, it might give an indication of relative stock abundance. The benefits of these approaches, however, are dependent on the value of the information in relation to the cost of running such a project; test fisheries tend to be very costly.

When considering test fisheries, it is important to consider that salmon from Europe are distributed over the entire North Atlantic from West Greenland to the Norwegian Sea with variable contribution, from the countries of origin. Oceanic conditions might be highly variable from one area to another making sampling in one area a poor indicator of overall marine survival and subsequent homewater catches. Test fishing at key locations during the spawning migration might in some countries yield useful advance information on the run size. However, in many cases this technique would not be very cost-effective.

4.4.3 Acoustic assessments

Acoustic methods have been used to estimate the abundance of pelagic fish for decades. Some difficulties have been encountered in estimating salmon abundance with these methods as the salmon feed close to the surface and do not aggregate in dense schools. Improved technology might, however, provide a solution to this problem in future years. A new 95 KHz sector-scanning sonar modified for fisheries research will be tested as an aid in assessing abundance and distribution of pelagic species (including salmon) within the framework of the "Ecology of the Nordic Seas" programme that will be implemented in Norway in 1994.

4.4.4 Forecasts of salmon abundance from 1SW returns

The abundance of 1SW fish can possibly be used as a rough predictor of the abundance of 2SW salmon in the following year. The method was first used in the Pacific to predict sockeye salmon abundance from the returns of jacks (1SW males) the previous year. Run reconstruction models have in the past indicated that age of maturity is one of the more stable biological parameters in individual salmon stocks.

The method has been tried in Iceland, Canada and Scotland. In northern Iceland the catches of 2SW salmon in freshwater were highly correlated with the catches of grilse in the previous year (Scarnecchia *et al.*, 1989). In the study, a strong relationship ($p<0.01$) was found between grilse abundance and subsequent 2SW returns in 18 out of 22 rivers in northern Iceland, whereas a similar relationship only existed for 12 out of 21 rivers in western Iceland. On the north coast, environmental conditions favour late maturation and there is also greatest fluctuation in salmon abundance due to changing environmental conditions. Forecasting of MSW returns from 1SW returns in the previous year has not proved successful in Scottish studies. In Canada, a number of parametric models (linear + multiple linear regressions) were developed (Anon. 1992c) but few have withstood the test of time.

4.4.5 Future prediction models

It seems likely that future predictive models will have to combine data from various sources. It can be concluded that the most efficient methods are based on the counting of smolts followed by counting of upstream migrating salmon, which could be used to estimate egg deposition. In the absence of such information electrofishing surveys might yield useful information on juvenile abundance. Knowledge of various biological and physical parameters related to sea conditions, both in the inshore and oceanic areas, would probably increase the predictive value of such models.

Marine assessments of salmon are costly and seem unlikely to be viable for prediction of salmon abundance in various distant water fisheries or homewaters.

Assessment of 2SW salmon from the abundance of 1SW fish in homewaters seems to be a promising method in some areas with relatively high proportions of 2SW fish.

Development of predictive models is not only important for salmon managers around the North Atlantic but is also considered a top priority research project for the salmon ranching industry, which needs to know in advance with some certainty about the tonnage to be marketed during a particular salmon season. In this case, however, the numbers of smolts released are usually known and the success of the operation is more dependent on smolt quality, release techniques and conditions in the sea.

4.5 Effects of the NASCO Tag Return Incentive Scheme

Most of the North-East Atlantic countries provided data to NASCO for the Tag Return Incentive Scheme (UK (England and Wales), Scotland, Ireland, Norway, Sweden, Russia and Finland)). However, Northern Ireland do not use any external tags and in UK (England and Wales) and Ireland they are only used on kelts and as external indicators of the presence of transmitter tags. Iceland does not participate in the scheme and Norway only provide data on Norwegian tags caught outside their homewaters. No information was available for France.

At the moment there is no good evidence for positive effects of the scheme on the rates of tag returns. The main reasons are the small numbers of external tags used and insufficient awareness of fishermen about the NASCO lottery in most participating countries. The only positive effect of the scheme was reported from Finland, where tag reporting rates (estimated by observers) are thought to have increased, but there are no quantitative estimates. Iceland has no interest in this programme as its stocks are not exploited by other countries. Norway, on the other hand, conducts a lot of tagging experiments, but does not participate in the incentive scheme in order not to interfere with ongoing assessments of recent homewater measures. In Scotland it was thought that the scheme had no effect on catch return rates; in the principal fisheries taking tagged fish, reporting rates are thought to be close to 100% already. In other fisheries the numbers of tag recoveries are too small to detect a change.

The Study Group felt that more intensive advertising of the objectives of tagging programmes might be more successful than the lottery at improving tag returns rates.

4.6 Effects of the Cessation of Fishing Activities at Faroes

The mean catch in the Faroes fishery in the 3 fishing seasons 1988/1989 to 1990/1991 was 87,454 salmon (292 t) per season. The catch in the 1991/1992 research fishery, after the buy-out of the quota, was 8,464 fish (31 t). Thus, the catch at Faroes was reduced by 78,990 fish (261 t) compared to the previous 3 seasons.
Data presented to the Study Group (Jacobsen *et al.*, 1992) suggests that about 37% of the fish taken at Faroes in the 1991/1992 seasons may have been of farmed origin, and the proportion may have been similar in preceding years. Thus, the extra number of wild fish not caught as a result of the cessation of fishing may be about 50,000 fish (164 t), the remaining ~29,000 fish (97 t) being fish farm escapees.

The Working Group has previously provided a model to assess the effects of the catch at Faroes on stocks returning to homewaters (Anon., 1984b). It was estimated at that time that 78% of fish in the Faroes area will mature in the same year and 97% of these will survive to reach home waters if they are not caught. Using these data, the estimated increase in wild fish returning to home waters is about 37,800 salmon. Some additional fish saved from the fishery in 1991/1992 will be expected to return to home waters in 1993.

The Study Group was unable to model reliably the fate of the farmed salmon from the Faroes fishery, but it is believed that these will also return to homewaters. Assuming that the farmed fish behave in the same way as the wild fish, the predicted increase in the numbers of fish returning to homewaters in 1992 would be approximately:

Wild 1SW	3,400
Wild 2SW	34,400
Farmed	22,000

[NB. Ageing of the farmed component is thought to be unreliable and all age groups are, therefore, grouped].

These fish will probably have contributed to homewater fisheries in most salmon producing countries in the north-east Atlantic. However, it is unlikely that it will be possible to demonstrate a significant change in catches after a single year. The majority (perhaps 60-80%) of the wild fish caught at Faroes are thought to originate from Scandinavian, Finnish and Russian stocks (Anon., 1991b, 1992b, and Section 4.1.5) and thus, the greatest impact should be seen in the fisheries of these countries. The total homewater catch in these countries in 1992 was 326,603 of which 17% (56,000) were estimated to be farm escapees (Table 4.2.2) and of the wild fish, 173,000 were estimated to be 1SW and 147,000 MSW salmon. Assuming that the mean exploitation rate in homewater fisheries is 40-70%, the additional catch should have been 800-1,900 1SW wild fish, 8,200-19,000 MSW wild fish and 5,300-12,300 farm escapees.

These increased catches would, therefore, have represented the following proportions of the recorded catches:

Wild 1SW	~ 1%
Wild 2SW	6 - 13%
Farmed	10 - 22%

Such small increases will have been within the annual variation of catches in these countries and will not represent a statistically significant increase. (It is not possible to provide reliable standard deviations on catches in these countries in recent years because of changes in fishery regulations, the contribution of farmed fish and the lack of appropriate catch data.)

Exploitation rates on stocks from UK and Ireland have been very low at Faroes in most years. The buy-out of the quota must be expected to have resulted in additional fish returning to these countries, but the predicted improvements in catches will be very small. In view of the variability of homewater catches it is not expected that they will be statistically significant even after many years.

If we assume that monitored stocks have been relatively stable over the past 4 years, the cessation of fishing should have reduced exploitation at Faroes to about 10% of levels in the previous 3 seasons. For stocks in UK and Ireland the numbers of tag recoveries in the last 4 seasons have been too low for such a reduction to be statistically significant. However, exploitation rates on Imsa and Drammen stocks in 1991/1992 were 0-4% and 2% respectively in comparison with rates between 1988/1989 to 1990/1991 seasons of 0-37% and 13-45% respectively.

5 PRODUCTION OF FARMED SALMON

The reported production of farmed salmon in countries in the North-East Atlantic Commission area is given in Table 5.1. The total production of 204,632 t in 1992 was 18,224 t less than in 1991. Production increased in Northern Ireland and Faroe Islands. Production of farmed salmon in 1992 was 63 times higher than the reported catch of salmon in the North-East Atlantic Commission area.

6 NATIONAL SALMON RUN-RECONSTRUCTION MODEL

6.1 Sensitivity Analysis of the National Run-Reconstruction Model

In their 1991 report (Anon., 1991c), the ICES Study Group on the Norwegian Sea and Faroes Salmon Fishery presented the preliminary results from a model which used the results of the run-reconstruction model (Potter and Dunkley, in press) to estimate the numbers of fish from each country caught in fisheries outside home waters. (This model was called the national run-reconstruction model.) The Study Group recognised that some of the data used in the national models were very limited and that the model might be very sensitive to certain parameters. The Study Group has, therefore, been asked to make a sensitivity analysis of the national run-reconstruction model.

The model provides a means for scaling-up tag recoveries from a 'monitored' stock (Anon., 1987) to national stock numbers. It assumes that fish of each sea-age class in the monitored stock are exploited at the same rate in the West Greenland and Faroes fisheries as all fish of the same ages from the national stocks. However, it applies different scaling factors to the different sea-age classes to account for the fact that the age composition of the national stock may differ from the monitored stock. It also allows for 'correction factors' to be included to adjust for differences in the levels of exploitation on the monitored stock and national stocks in the home-water fisheries (both the country of origin and other interceptory homewater fisheries).

The model thus estimates catches of salmon, C, of each age-class from one nation or region in each fishery using the estimates of exploitation rates, U, derived from the normal run-reconstruction model. The generalised form of the model is as follows:

Fishery	Exp. rate	Catch of national stock	
Homewater	U_{hi}	C_{hi} = input data	
Other homewater interception	U_{ji}	$C_{ji} = (C_{hi}/U_{hi}*y_i)*e^{Mt*}U_{ji}*x_i/(1-U_{ji}*x_i)$	Eq.1
W. Greenland	U_{gi}	$C_{gi} = (C_{fi+1}/U_{fi+1})*e^{Mt*}U_{gi}/(1-U_{gi})$	Eq.2
Faroes	U_{fi}	$C_{fi}=[C_{gi}/U_{gi})*e^{Mt}+(C_{ji}/U_{ji}*x_i)*e^{Mt}]*U_{fi}/(1-U_{fi})$	Eq.3

[Eq.3 must be solved first for maximum 'i' when C_{gi}/U_{gi} will be zero.]

where:-

suffixes 'h', 'j', 'g' and 'f' refer to homewater, other homewater interception, West Greenland and Faroes fisheries, respectively;

suffix 'i' refers to the sea age group;

't' in each case is the time in months between the fishery and the previous fishery affecting the year class (as used in the run-reconstruction model);

'M' is the instantaneous rate of natural mortality for salmon after the first sea year;

'y_i' is the correction factor for the exploitation rates on 'i' sea-winter fish in the homewater fisheries;

'x_i' is the correction factor for the exploitation rates on 'i' sea-winter fish in the other homewater interception fisheries.

6.1.1 Sensitivity analysis

Although the original model (Anon., 1991c) included homewater rod fisheries in the scaling estimates, it was always recognised that these were likely to be very unreliable because of the difficulties of obtaining good tag recovery and catch data from these fisheries and the very considerable differences between the fisheries in different rivers. Rod fisheries are not, therefore, included in the sensitivity analysis.

The main input and output parameters for the run-reconstruction model are listed in Table 6.1. Although the run-reconstruction model also provides estimates of levels of exploitation on the monitored stock, the proportions of 1SW and 2SW fish in the sea maturing and the post-smolt survival, these are not important outputs of the national run-reconstruction model; they are, therefore, ignored in this sensitivity analysis.

Altering some of the parameters has effects on more than one of the outputs. In addition, the effects may vary depending upon the relative values of the input parameters. The following description gives an indication of the likely magnitude of the changes described on typical data-sets.

For simplicity the following analysis considers only 1SW and 2SW fish. It should be noted, however, that errors in the estimates for MSW fish are likely to be greater than for 1SW fish because they are usually based on fewer tags (see below).

Mortality rate: The mortality value is used to estimate the proportion of extant stocks that would survive between different fisheries. The largest variations in natural mortality during the marine phase are thought to occur in the first few months in the sea. Natural mortality after about the first 9 months in the sea is thought to be fairly low and stable. The Working Group on North Atlantic salmon has used a value of M=0.01 per month in their assessments. Altering this by a large amount (e.g. halving or doubling) usually has only a very small effect on the outputs. For some combinations of inputs outputs may change by as much as shown below:

If M is decreased to 0.005	Rf1 increases by up to 7.5% Rf2 increases by up to 5% Rg1 increases by up to 5%
If M is increased to 0.02	Rf1 decreases by up to 7.5% Rf2 decreases by up to 5% Rg1 decreases by up to 5%

However, under most circumstances the errors are much less than 5%.

Time: The time values affect the model in the same way as 'M' by altering the proportion of the extant stock estimated to have survived between consecutive fisheries. However, each value of 't' affects only a very small part of the model. In addition, increasing one value of 't' will often decrease the value of 't' between the next two fisheries. There may, therefore, be an element of compensation.

Even large changes in individual values of 't' have negligible (<1%) effect on the output.

Spawning escapement: The confidence limits on estimates of the number of tagged fish recaptured (R_1) in a fishery or the home river are mainly related to the number of tags recovered (R).

If 70 tags are recovered, the confidence limits on the recapture rate will be about 25%. With larger numbers of recaptures the relative size of the confidence limits decreases only slowly. With smaller numbers of tag recoveries, however, the confidence limits increase quite rapidly.

In most tagging experiments, the number of tagged fish in the spawning escapement (or the spawning escapement plus the homewater catch) will be large enough to reduce the confidence limits on the estimate of the number of tagged fish returning to homewaters to less than 30%.

A 30% change in the number of spawners or homewater recaptures also has only a very small effect on the output. The effect on the 1SW catch at Faroes is greatest and will usually be less than 3%.

Tag recoveries in fisheries: The number of recaptures in some fisheries may be very small and this will have a greater effect on the precision of those data.

Changes in the following tag recapture estimates will have an equal effect on the estimate of the national catch of the same year class in the same fishery:

1SW recaptures at Faroes	R_{f1}
2SW recaptures at Faroes	R_{f2}
1SW recaptures at West Greenland	R_{g1}
1SW recaptures in homewater fisheries of neighbouring country	R_{j1}
2SW recaptures in homewater fisheries of neighbouring country	R_{j2}

Under normal circumstances, there is a minimal knock-on effect on other outputs from the model.

Alterations to the tag recapture data R_{h1} and R_{h2} have greater effects on the estimates. The relationship between the error in the estimated number of tags recaptured (R_{hi}) and the effect on the estimated catch (N_{zi}) in the fishery 'z' are:

If R_{h1} is increased by P%	N_{ji} changes by Q%
	N_{f1} changes by less than Q%
If R_{h2} is increased by P%	N_{j2} changes by Q%
	N_{g1} changes by Q%
	N_{f2} changes by Q%
	N_{f1} changes by less than Q%

where the relationship between P% and Q% is expressed by:

$$Q = (10{,}0001(100 + P)) - 100$$

and is shown in Figure 6.1.

Exploitation correction factors: Because the factors x and y effectively scale the principal inputs to the model they can have a fairly large effect on certain outputs.

If x_1 is altered, N_{j1} and N_{f1} will be affected. The size of the changes will be related mainly to the exploitation rate in fishery 'j'. If this exploitation rate is high (>50%) the effect on N_{j1} may be very large; the effect on N_{f1} will be smaller but may still be important (>20%). If the exploitation rate in the fisheries is small (<20%) the change in N_{j1} will be slightly greater than the alteration in x_1; the effect on N_{f1} will be small.

If x_2 is altered , N_{j2}, N_{g1}, N_{f2} and N_{f1} will all be affected. As for x_1, if the exploitation rate in fishery 'j' is high then the effect on N_{j2} may be very large and on the other values also significant. However, at low exploitation rates in fishery 'j', N_{j2} will change by about the same amount as the alteration in x_2, and the change in the other outputs will be small.

If y_1 is altered by P%, N_{j1} will change by Q% (see above) and N_{f1} by a smaller amount.

If y_2 is altered by P%, N_{j2}, N_{g1} and N_{f2} will change by Q% and N_{f1} will be affected by a smaller amount.

If both y_1 and y_2 are altered by P% then N_{f1} N_{f2}, N_{g1}, N_{j1} and N_{j2} will all change by Q%.

Homewater catch data: The homewater catch data should be equivalent to the population from which the homewater tag recoveries were sampled. In the case of microtag studies this is likley to be the case because tags are normally recovered by scanning part of the catch. Biases may be more common with external tags, however, because fishermen may report tagged fish more readily than they report their catch (or vice versa).

Errors in the homewater catches of one sea-age will affect all the estimates of catches of fish of that age by the same amount.

6.1.2 Conclusions from Sensitivity Analysis

The analysis confirms that the national run-reconstruction model is very insensitive to variations in 'M' and 't'.

The model is dependent upon reliable tag recovery data. If tag recoveries in any fishery are small (<10), then the reliability of the recapture estimates and consequent estimates of exploitation rates will have large confidence limits (≥ = ± 60%). Similar errors will be introduced into the estimates of catches of national stocks.

If the reason for the number of tag recoveries being small is that the catch scanning rate is low, then the errors may be significantly reduced by increasing the proportion of the catch examined for tags. Where external tags are used, efforts should be made to maximise reporting rates. If the number of tag recoveries is small because the exploitation rate is low, it may not matter that the resulting estimate of exploitation rate is imprecise. Where the exploitation rate is higher the number of tags recovered may be greater and this will give a more a precise estimate of exploitation rate.

Parts of the model can be sensitive to the correction factors 'x' + 'y' used to adjust levels of exploitation in homewater fisheries on the monitored and national stocks. However, this is only a critical problem (for factor 'x' only) when the exploitation rate on the monitored stock in the homewater interception fishery is very high (>50%). This can present a major problem because these values may have to be based on limited data or educated guesses.

6.2 Model Runs for 1989 and 1990 Smolt Year Classes

6.2.1 Input data

The Study Group was asked to provide runs of the model for the smolt year classes of 1989 and 1990. Data were available for these years for smolt tagging carried out on the Rivers Burrishoole (Ireland), Imsa and Drammen (Norway), Lagen (Sweden), Bush (UK, Northern Ireland) and N.Esk (Scotland). No new data were available for smolt tagging carried out in Faroes, France, Finland, UK (England & Wales) or Russia, and it was considered unreliable to extrapolate data from neighbouring countries for individual years. The available input data to the model are given in Tables 6.2.1 and 6.2.2.

For all countries except Ireland, the tag recapture data are those from the monitored stock. The Irish data also include tag returns from the national smolt tagging programme; the spawning escapement for these stocks are based upon the exploitation rate on the monitored stock in the homewater fisheries. Thus:

Recovery of national tags in homewaters	No. national tagged spawners
Recovery of Burrishoole tags in homewaters	No. Burrishoole tagged spawners

Spawning escapements for the tagged fish from the Rivers Lagen and Wear were based upon estimated exploitation rates in homewaters (see tables). For some rivers, data from rod fisheries are combined with homewater net catches or the spawning escapement.

6.2.2 Results of the runs

The results of the runs are shown in Tables 6.2.3 and 6.2.4. The model uses separate data sets for each country and each country's results are, therefore, independent. If, however, data are available for all countries, the total estimated catches in each fishery by age class can be compared with the observed catches to provide an additional check on the validity of the results (Anon., 1991). In the absence of data from several countries for the runs shown in the tables, it was not possible to make this additional check.

The small numbers of tag returns from some countries in some fisheries will mean that the confidence limits on the relevant exploitation rate estimates will be very large, in some cases >100%. This accounts for much of the variation in the estimated harvests of national stocks at Faroes and West Greenland between the two years.

For Sweden, the exploitation rate in homewater interception fisheries is estimated to be very high. This may be erroneous and reflects problems of estimating the population returning to the river.

The Study Group noted that unless the run-reconstruction model could be based on larger numbers of tag recoveries, it would not be possible to make meaningful comparisons between annual runs. With current levels of tagging it was felt that the national run-reconstruction model was best used on combined data for a number of years, although it was recognised that this presented additional problems, for example where exploitation rates had changed significantly. The Study Group recommended that more work should be undertaken to develop indicator stocks that could be used to represent stocks on a regional or national basis.

7 RECOMMENDATIONS

1. The Study Group noted that although it was desirable to prepare data from the North-East Atlantic prior to the Working Group meeting, there was no advantage in holding a separate meeting unless it could be organised at least a full week earlier. Unfortunately many members of the Study Group would be unable to attend both meetings in such circumstances. The Study Group, therefore, recommends that they should not meet in 1994 unless specific questions were asked of it. Instead, an extra 3 days should be added to the Working Group meeting to permit it to collate the data from the NASCO Commission areas in split sessions.

2. The Study Group recommends that a workshop be held, to consider available evidence that might be used to set targets and to identify what further data are necessary to implement assessment of stock status with respect to targets. Attempts to set spawning targets should be made wherever possible before the next meeting.

3. The Study Group recommends that countries should attempt to estimate the numbers and stages of fish farm escapees each year.

4. The Study Group recommends that samples of scales from the available time series be examined to investigate the development of the occurrence of farmed fish in the Faroese waters.

5. The Study Group recommends that an attempt be made to estimate the contributions (in tonnes) of non-national origin stocks to national catches.

6. The Study Group recommends that more work should be carried out to develop indicator stocks that could be used to represent stocks on a regional or national basis. Although the 'monitored' stocks may be used for this purpose, in most cases more research needs to be carried out to provide more reliable estimates of the exploitation correction factors.

7. The Study Group recommends that current studies of the stock/recruitment relationship in salmon should continue.

Table 2.1.1 Nominal homewater catch of salmon by country (in tonnes round fresh weight) 1981-1992.

Year	UK (E&W)	Finland	France	Iceland	Ireland[2,3]	UK[2,4] (NI)	Norway	UK (Scotland)	Sweden (W.Coast)	Russia	Total NE Atlantic
1981	493	44	20	163	685	101	1,656	1,233	26	463	4,884
1982	286	54	20	147	993	132	1,348	1,092	25	364	4,461
1983	429	57	16	198	1,656	187	1,550	1,221	28	507	5,849
1984	345	44	25	159	829	78	1,623	1,013	40	593	4,749
1985	361	49	22	217	1,595	98	1,561	913	45	659	5,520
1986	430	38	28	310	1,730	109	1,598	1,271	54	608	6,176
1987	302	49	27	222	1,239	56	1,385	922	47	564	4,813
1988	395	34	32	396	1,874	114	1,076	882	40	419	5,262
1989	296	52	14	278	975	142	905	895	29	359	3,945
1990	338	59	15	426	586	94	930	624	33	315	3,420
1991	200	69	13	505	404	55	876	462	38	215	2,836
1992[1]	195	78	20	590	630	151	850	525	49	161	3,249
5-year average 1987-1991	306.2	52.6	20.2	365.4	1,036.4	92.2	1,034.4	757.0	37.4	374.4	4,055.2
(+ S.D.)	(63.7)	(11.6)	(7.8)	(102.3)	(519.1)	(33.6)	(188.4)	(182.5)	(6.2)	(115.9)	(886.9)
10-year average 1982-1991	338.2	50.5	21.2	285.8	1,198.5	106.5	1,285.2	929.5	37.9	459.3	4,703.1
(+ S.D.)	(67.4)	(9.7)	(6.3)	(115.0)	(480.2)	(38.3)	(292.2)	(234.7)	(8.8)	(140.1)	(1,012.0)

[1]Provisional figures.
[2]Catch on River Foyle allocated 50% Ireland and 50% Northern Ireland.
[3]Includes only catches sold through dealers.
[4]Not including angling catch (mainly grilse).

Table 2.2.1 Reported catch of SALMON in numbers and weight in tonnes (round fresh weight). Catches reported for 1992 are provisional. Some countries divide 1SW from MSW salmon based on weight.

Country	Year	1SW		2SW		3SW		4SW		5SW		MSW!		PS		Total	
		No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt
Faroe Islands	1982/1983	9,086	-	101,227	-	21,663	-	448	-	29	-	-	-	-	-	132,453	625
	1983/1984	4,791	-	107,199	-	12,469	-	49	-	-	-	-	-	-	-	124,453	651
	1984/1985	324	-	123,510	-	9,690	-	-	-	-	-	-	-	1,653	-	135,776	598
	1985/1986	1,672	-	141,740	-	4,779	-	76	-	-	-	-	-	6,287	-	154,554	545
	1986/1987	76	-	133,078	-	7,070	-	80	-	-	-	-	-	-	-	140,304	539
	1987/1988	5,833	-	55,728	-	3,450	-	0	-	-	-	-	-	-	-	65,011	208
	1988/1989	1,351	-	86,417	-	5,728	-	0	-	-	-	-	-	-	-	93,496	309
	1989/1990	1,560	-	103,407	-	6,463	-	6	-	-	-	-	-	-	-	111,430	364
	1990/1991	631	-	52,420	-	4,390	-	8	-	-	-	-	-	-	-	57,442	202
	1991/1992	16	-	7,611	-	837										8,464	31
Finland	1990	13,460	24	-	-	-	-	-	-	-	-	5,420	35	-	-	18,700	59
	1991																69
	1992																78
France	1985	1,074	-	-	-	-	-	-	-	-	-	3,278	-	-	-	4,352	22
	1986	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6,801	28
	1987	6,013	18	-	-	-	-	-	-	-	-	1,806	9	-	-	7,819	27
	1988	2,063	7	-	-	-	-	-	-	-	-	4,964	25	-	-	7,027	32
	1989	1,124	3	1,971	9	311	2	-	-	-	-	-	-	-	-	3,406	14
	1990	1,886	5	2,186	9	146	1	-	-	-	-	-	-	-	-	4,218	15
	1991	1,362	3	1,935	9	190	1	-	-	-	-	-	-	-	-	3,487	13
	1992	2,490	7	2,450	12	221	2	-	-	-	-	-	-	-	-	5,161	20
Iceland	1982	23,026	58	-	-	-	-	-	-	-	-	18,119	89	-	-	41,145	147
	1983	33,769	85	-	-	-	-	-	-	-	-	24,454	113	-	-	58,223	198
	1984	18,901	47	-	-	-	-	-	-	-	-	22,188	112	-	-	41,089	159
	1985	50,000	125	-	-	-	-	-	-	-	-	16,300	94	-	-	66,300	217
	1986	67,300	174	-	-	-	-	-	-	-	-	22,300	136	-	-	89,600	310
	1987	42,550	114	-	-	-	-	-	-	-	-	18,840	108	-	-	61,390	222
	1988	112,000	288	-	-	-	-	-	-	-	-	19,000	108	-	-	133,500	396
	1989	70,817	158	-	-	-	-	-	-	-	-	20,037	115	-	-	90,854	278
	1990	98,241	-	-	-	-	-	-	-	-	-	34,267	-	-	-	132,508	426
	1991	144,639	-	-	-	-	-	-	-	-	-	30,510	-	-	-	175,149	505
	1992	149,783	-	-	-	-	-	-	-	-	-	34,683	-	-	-	184,466	590
Ireland	1980	248,333	745	-	-	-	-	-	-	-	-	39,608	202	-	-	287,941	947
	1981	173,667	521	-	-	-	-	-	-	-	-	32,159	164	-	-	205,826	685
	1982	310,000	930	-	-	-	-	-	-	-	-	12,353	63	-	-	322,353	993
	1983	502,000	1,506	-	-	-	-	-	-	-	-	29,411	150	-	-	531,411	1,656
	1984	242,666	728	-	-	-	-	-	-	-	-	19,804	101	-	-	262,470	829
	1985	498,333	1,495	-	-	-	-	-	-	-	-	19,608	100	-	-	517,941	1,595
	1986	498,125	1,594	-	-	-	-	-	-	-	-	28,335	136	-	-	526,450	1,730
	1987	358,842	1,112	-	-	-	-	-	-	-	-	27,609	127	-	-	386,451	1,239
	1988	559,297	1,733	-	-	-	-	-	-	-	-	30,599	141	-	-	589,896	1,874
	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	330,558	975
	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	194,785	586
	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	135,600	404
	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	235,153	630

cont'd.

Table 2.2.1 cont'd.

Country	Year	1SW		2SW		3SW		4SW		5SW		MSW1		PS		Total	
		No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt	No.	Wt
Norway	1981	221,566	467	-	-	-	-	-	-	-	-	213,943	1,189	-	-	435,509	1,656
	1982	163,120	363	-	-	-	-	-	-	-	-	174,229	985	-	-	337,349	1,348
	1983	278,061	593	-	-	-	-	-	-	-	-	171,361	957	-	-	449,442	1,550
	1984	294,365	628	-	-	-	-	-	-	-	-	176,716	995	-	-	471,081	1,623
	1985	299,037	638	-	-	-	-	-	-	-	-	162,403	923	-	-	461,440	1,561
	1986	264,849	556	-	-	-	-	-	-	-	-	191,524	1,042	-	-	456,373	1,598
	1987	235,703	491	-	-	-	-	-	-	-	-	153,554	894	-	-	389,257	1,385
	1988	217,617	420	-	-	-	-	-	-	-	-	120,367	656	-	-	337,984	1,076
	1989	220,170	436	-	-	-	-	-	-	-	-	80,880	469	-	-	301,050	905
	1990	192,500	385	-	-	-	-	-	-	-	-	91,437	545	-	-	286,466	930
	1991	171,041	342	-	-	-	-	-	-	-	-	92,214	535	-	-	263,255	877
	1992	150,580	301	-	-	-	-	-	-	-	-	94,624	549	-	-	245,204	850
				-	-	-	-	-	-	-	-			-	-		
Russia	1987	97,242	-	27,135	-	9,539	-	556	-	18	-	-	-	2,521	-	139,011	564
	1988	53,158	-	33,395	-	10,256	-	294	-	25	-	-	-	2,937	-	100,066	419
	1989	78,023	-	23,123	-	4,118	-	26	-	-	-	-	-	2,187	-	107,477	359
	1990	70,595	-	20,633	-	2,919	-	101	-	-	-	-	-	2,010	-	96,258	315
	1991	40,603	-	12,458	-	3,060	-	650	-	-	-	-	-	1,375	-	58,146	215
	1992	34,015	-	8,370	-	3,517	-	169	-	-	-	-	-	821	-	46,892	161
Sweden	1989	3,181	7	-	-	-	-	-	-	-	-	4,610	22	-	-	7,791	29
	1990	7,428	18	-	-	-	-	-	-	-	-	3,133	15	-	-	10,561	33
	1991	8,987	20	-	-	-	-	-	-	-	-	3,620	18	-	-	12,607	38
	1992	9,850	23	-	-	-	-	-	-	-	-	4,656	26	-	-	14,507	49
UK (England & Wales)	1985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	95,531	361
	1986	-	-	-	-	-	-	-	-	-	-	-	-	-	-	110,794	430
	1987	66,371	-	-	-	-	-	-	-	-	-	17,063	-	-	-	83,434	302
	1988	76,521	-	-	-	-	-	-	-	-	-	33,642	-	-	-	110,163	395
	1989	65,450	-	-	-	-	-	-	-	-	-	19,550	-	-	-	85,000	296
	1990	53,143	-	-	-	-	-	-	-	-	-	33,533	-	-	-	86,676	338
	1991	34,596	-	-	-	-	-	-	-	-	-	17,053	-	-	-	51,649	199
	1992		-	-	-	-	-	-	-	-	-		-	-	-		
UK (Scotland)	1982	208,061	416	-	-	-	-	-	-	-	-	128,242	596	-	-	336,303	1,092
	1983	209,617	549	-	-	-	-	-	-	-	-	145,961	672	-	-	320,578	1,221
	1984	213,079	509	-	-	-	-	-	-	-	-	107,213	504	-	-	230,292	1,013
	1985	158,012	399	-	-	-	-	-	-	-	-	114,648	514	-	-	272,660	913
	1986	202,861	526	-	-	-	-	-	-	-	-	148,398	745	-	-	351,259	1,271
	1987	164,785	419	-	-	-	-	-	-	-	-	103,994	503	-	-	268,779	922
	1988	149,098	381	-	-	-	-	-	-	-	-	112,162	501	-	-	261,260	882
	1989	174,941	431	-	-	-	-	-	-	-	-	103,886	464	-	-	278,827	895
	1990	68,135	169	-	-	-	-	-	-	-	-	76,650	374	-	-	144,785	543
	1991	73,608	177	-	-	-	-	-	-	-	-	65,193	285	-	-	138,801	462
	1992	92,028	214	-	-	-	-	-	-	-	-	70,205	311	-	-	162,233	525

1MSW includes all sea ages >1, when this cannot be broken down.

Table 2.3.1 Guess-estimates of unreported catches within national EEZs in the North-East Atlantic Commission Area of NASCO, 1987-1992.

Year	Unreported catch (t)
1987	2,554
1988	3,087
1989	2,103
1990	1,779
1991	1,555
1992	1,825

Table 3.2.1 Wild Smolt Counts and Estimates on various Index Streams in the NE Atlantic Area including juvenile index counts in the River Bush and River Nivelle catchments.

Year of count	France			Iceland		Ireland	Norway		Sweden	UK (N. Ireland)	UK (Scotland)		UK (N. Ireland)
	R. Nivelle	R. Oir	Bresle	R. Ellidaar	R. Vesturdalsa	R. Burrishoole	R. Imsa	R. Orkla	R. Högvadsån	R. Bush	R. N.Esk	Girnock Burn	R. Bush
	Juv.survey[4]	Estimate	Estimate	Estimate	Estimate	Total trap	Total count	Estimate	Partial count[1]	Total trap	Estimate	Total trap	Juvenile surveys[2]
1959									4,057				
1960									1,962				
1961									7,899				
1962									2,795				
1963									5,700				
1964									9,771		275,000		
1965									2,610		183,000		
1966									367		172,000		
1967									627		98,000	2,057	
1968									1,564		227,000	1,440	
1969									4,742		-	2,610	
1970									242		-	2,412	
1971									-		167,000	2,461	
1972									-		260,000	2,830	
1973									1,184		165,000	1,812	
1974									184	43,958	106,000	2,842	
1975									363	33,365	173,000	2,444	
1976									247	21,021	93,000	2,762	
1977									-	19,693		3,679	
1978									38	27,104		3,149	
1979									103	24,733		2,724	
1980						11,208			1,064	20,139	132,000	3,074	
1981						9,434	3,214		500	14,509	195,000	1,640	-
1982			1,860			10,381	736		1,566	10,694	160,000	1,626	-
1983			1,880			9,383	1,287	121,000	2,982	26,804	-	1,747	32.6
1984			1,250			7,270	936	183,000	4,961	30,009[3]	220,000	3,247	19.5
1985	850		2,550	29,000		6,268	892	173,000	4,989	30,518[3]	130,000	2,716	7.6
1986	6,500[5]	1,325	1,245	-		5,376	477	227,000	2,076	18,442	-	2,091	11.3
1987	11,800[5]	379	-	-		3,817	480	238,000	3,173	21,994	199,000	1,132	10.3
1988	9,950[5]	454	-	23,000		6,554	1,700	152,000	2,571	22,783	-	2,595	8.9
1989	6,658[5]	858	-	22,500	14,642	6,563	1,194	-	882	17,644	141,000	1,360	16.2
1990	2,505[5]	817	-	24,000	11,115	5,968	1,822	323,000	1,042	17,133	175,000	2,042	5.6
1991	5,287	210	-	22,000	9,300	3,804	1,995	243,000	1,235	18,281	236,000	1,503	12.5
1992	3,452	678	690	-	-	6,926	1,500	262,534	1,247	10,006	-	2,572	13.0
Mean	5,875	674	1,579	26,167	12,879	7,169	1,339	213,645	2,383	23,264	175,600	2,320	13.8

[1]The smolt trap catch a part of the smolt run.
[2]Juvenile surveys represent index of fry (o+) abundance (number per 5 minutes electrofishing) at 137 sites, based on natural spawning in the previous year.
[3]These smolt counts show effects of enhancement.
[4]Estimate of the 0+ parr population size in autumn.
[5]Influenced by enhancement (fry releases).

Table 3.2.2 Wild adult counts to various rivers in the NE Atlantic area

	Scandinavia and Russia									
	Iceland	Norway	Sweden	Russia	Russia	Russia	Russia	Russia	Russia	Russia
Year	River Ellidaar	River Imsa	River Högvadsån	River Tuloma	River Varzuga	River Keret	River Ponoy	River Kola	River Yokanga	R. Zap. Litca
	Estimate	Total trap	Total trap	Total trap	Total trap	Total trap	Total trap	Total trap	Total trap	Total trap
1952				4800						
1953				2950						
1954			364	4010						
1955			210	4600				4855		
1956			144	4800				2176		
1957			126	4300				2949		
1958			632	6228				1771		1051
1959			197	6125				2790		1642
1960			209	10360				5030		2915
1961			229	11050				5121		2091
1962			385	10920				5776		2196
1963			217	7880				3656		1983
1964			390	4400			23666	3268		1664
1965			442	5600			12998	3676		1506
1966			375	3648			10333	3218		787
1967			90	9011			11527	7170		1486
1968			172	6277			18352	5008		1971
1969			321	4538			9267	6525		2341
1970			610	6175			9822	5416		2048
1971			173	3284			8523	4784		1502
1972			281	6554			10975	8695		1316
1973			100	9726			20553	9780		1319
1974			270	12784			24652	15419		2605
1975			138	11074			41666	12793		2456
1976			65	8060			44283	9360		1325
1977			49	2878			37159	7180		1595
1978			23	3742			24045	5525		766
1979			15	2887			17920	6281		700
1980			260	4087			15069	7265		548
1981			512	3467			11670	7131		477
1982		66	572	4252			9585	5898		889
1983		14	447	9102			15594	10643		1254
1984		32	629	10971			26330	10970		1859
1985		31	768	8067			38787	6163		1563
1986	2726	22	1632	7275	71562	2798	32266	6508	3212	1815
1987		9	1475	5470	137419	1986	21212	6300	3468	1498
1988		44	1283	8069	72528	2898	20620	5203	2270	575
1989	2921	83	480	8413	65524	2986	19214	10929	2850	2613
1990	1822	67	879	11594	56000	2520	37712	13383	3376	1194
1991	1881	43	534	7174	63000	690	21000	8500	1704	2081
1992	2917	70	345	5476	61300	-	26600	14670	5531	2755
Mean	2338	41	405	6665	77672	2313	21467	8471	2813	1629

Table 3.2.3 Wild adult counts to various rivers in the NE Atlantic area.

	Ireland, UK and France									
	Ireland	UK (E&W)	UK (E&W)	UK (E&W)	UK (NI)	UK (Scotl.)	UK (Scotl.)	France	France	France
Year	R.Burrishoole	R. Severn	R. Dee	R. Usk	R. Bush	R.N. Esk	Girnock (Dee)	R. Nivelle	R. Oir	R. Bresle
	Total trap	Counter	Counter	Counter	Total trap	Counter	Total trap	Trap estimate	Trap estimate	Trap estimate
1966							269			
1967							214			
1968							196			
1969							49			
1970							90			
1971							125			
1972							137			
1973					2614		225			
1974					3483		184			
1975					3366		121			
1976			1585		3124		164			
1977			4945		1775		115			
1978			4448		1621		38			
1979			2056		1820		82			
1980	832	3416	1802		2863		203			
1981	348	3884	4417		1539	9025	67			
1982	510	1875	848		1571	8121	73			
1983	602	1232	2942		1030	8972	63			
1984	319	1711	2960		672[1]	7007	106	180	274	98
1985	567	3257	5719		2443	9912	67	115	295	148
1986	495	2129	23[1]		2930	6987	156	329	193	211
1987	468	1206	4391		2530	7014	293	218	131	183
1988	458	1958	6243	7446	2832	11243	187	161	230	89
1989	662	5207	3488	1719	1029	11026	108	264	235	204
1990	231	1006	3952	2532	1850	4762	58	291	84	126
1991	547	1006	190[1]	1911	2341	9127	97	184	46	211
1992	360	1388	-	3084	2546	10795	73	233	52	243
Mean	503	2324	3126	3402	2181	8472	134	219	171	168

[1]Minimum count.

In both the UK(E&W) Severn and UK(E&W) Dee, the counters are some distance upstream so that the counts do not represent total counts for these systems. In the UK(Scotl.)Girnock, the trap is located in the Girnock Burn, a tributary in the upper reaches of the River Dee (Aberdeenshire). In the UK(Scotl.) N. Esk, counts are recorded upstream of the in-river commercial fishery and most important angling fishery. Thus, the counts do not necssarily reflect the numbers of fish entering the river.

Table 3.4.1 Estimated survival of wild smolts (%) to return to homewaters (prior to coastal fisheries) for various monitored rivers in the NE Atlantic area.

Smolt	Iceland[1]			UK (N.Ireland)[1]	Norway[2]		UK (Scotland)[2]			France
migration	Ellidar	R.Vesturdalsa[4]		R. Bush	R. Imsa		North Esk			Bresle
year	1SW	1SW	2SW	1SW[3]	1SW	2SW	1SW	2SW	3SW	All ages
1975	20.0									
....										
1981					17.3	4.0	13.7	6.9	0.3	
1982					5.3	1.2	12.6	4.5	0.2	
1983		2.0			13.5	1.3	-	-	-	8.5
1984					12.1	1.8	23.0	5.4	0.1	16.3
1985	9.4				10.2	2.1	26.1	6.4	0.2	12.2
1986				31.3	3.8	4.2	-	-	-	19.4
1987				35.1	17.3	5.6	13.9	3.4	0.1	-
1988	12.7			36.2	13.3	1.1	-	-	-	-
1989	8.1	1.1	2.0	25.0	8.7	2.2	7.8	4.9	0.1	-
1990	5.4	1.0	1.0	34.7	3.0	1.3	7.3	4.2	-	-
1991	8.8	4.2	-	27.4	8.5	-	11.1	-	-	-

[1]Microtags.
[2]Carlin tags, not corrected for tagging mortality.
[3]Microtags, corrected for tagging mortality.
[4]Assumes 50% exploitation in rod fishery.

Table 3.4.2 Estimated survival of wild smolts (%) into freshwater for various monitored rivers in the NE Atlantic area.

Smolt	Iceland[1]			Ireland[1]	UK (N.Ireland)[1]		Norway[2]		UK (Scotland)[1]			France		
migration	R.Ellidar	R.Vesturdalsa[5]		R.Burrishoole	R. Bush		R. Imsa		North Esk[4]			Oir[3]	Nivelle[6]	Bresle
year	1SW	1SW	2SW	1SW	1SW	2SW	1SW	2SW	1SW	2SW	3SW	All ages	All ages	All ages
1975	20.8													
1979	-			7.3										
1980	-			3.1										
1981	-			5.4	9.5	0.9	2.1	0.3	4.2	2.0	0.2			
1982	-			5.8	7.8	0.8	0.7	0.1	4.9	2.2	0.2			
1983	-	2.0		3.4	1.9[3]	1.7	2.4	0.1	-	-	-	3.7		5.5
1984	-	-		7.8	6.4	1.4	3.2	0.3	3.9	2.1	0.1	6.4		11.7
1985	9.4	-		7.9	7.9	1.9	2.1	0.1	5.9	2.9	0.2	7.4		9.6
1986	-	-		8.7	9.7	1.9	1.7	0.8	-	-	-	3.4	15.7	14.4
1987	-	-		12.0	12.0	0.4	8.3	1.5	6.7	2.1	0.1	7.6	2.7	-
1988	12.7	-		10.1	3.9	0.8	4.5	0.6	-	-	-	2.3	2.2	-
1989	8.1	1.1	2.0	3.5	9.3	1.4	4.9	0.6	3.5	2.7	0.1	2.0	3.5	-
1990	5.4	1.0	1.0	9.2	11.8	1.7	1.7	0.3	4.2	2.1	-	3.9[7]	1.7[7]	-
1991	8.8	4.2	-	9.5	12.0	-	3.4	-	5.2	-	-	10.6[7]	5.6[7]	-

[1]Microtags.
[2]Carlin tags, not corrected for tagging mortality.
[3]Minimum estimate.
[4]Before in-river netting.
[5]Assumes 50% exploitation in rod fishery.
[6]Survival of 0+ parr to adults.
[7]Incomplete returns.

Table 3.4.3 Estimated survival (%) of hatchery smolts to adult return to homewaters, (prior to coastal fisheries) for various monitored rivers and experimental facilities in the NE Atlantic area.

Smolt migration year	Iceland[1] Kollafjordur 1SW	Iceland[1] Kollafjordur 2SW	Ireland[1] R.Burrishoole[3] 1SW	N. Ireland[1] R. Bush 1SW 1+ smolts	N. Ireland[1] R. Bush 1SW 2+ smolts	Norway[2] R Imsa 1SW	Norway[2] R Imsa 2SW	Norway[2] R Drammen 1SW	Norway[2] R Drammen 2SW	Sweden[2] R. Lagan 1SW	Sweden[2] R. Lagan 2SW
1981	5.6	3.1	7.6	-	-	10.1	1.3	-	-	-	-
1982	8.7	1.6	8.7	-	-	4.2	0.6	-	-	-	-
1983	1.2	0.9	3.4	1.9	8.1	1.6	0.1	-	-	-	-
1984	4.5	0.5	20.3	13.3	-	3.8	0.4	3.5	3.0	11.8	1.1
1985	7.3	0.7	18.7	15.4	17.5	5.8	1.3	3.4	1.9	11.8	0.9
1986	no release		9.1	2.0	9.7	4.7	0.8	6.1	2.2	7.9	2.5
1987	8.9	0.7	12.6	6.5	19.4	9.8	1.0	1.7	0.7	8.4	2.4
1988	1.0	0.7	17.9	4.9	6.0	9.5	0.7	0.5	0.3	4.3	0.6
1989	1.0	0.5	5.3	8.1	23.2	3.0	0.9	1.9	1.3	5.0	1.3
1990	2.7	0.4	10.5	5.6	5.6	2.8	1.5	0.3	0.4	5.2	3.1
1991	3.2	-	7.6	5.4	8.7	3.2	-	0.1	-	3.4	-

[1]Microtagged.
[2]Carlin tagged, not corrected for tagging mortality.
[3]Return rates to rod fishery with constant effort.

Table 3.4.4 Estimated survival (%) of hatchery smolts to adult return to freshwater, for various monitored rivers and experimental facilities in the NE Atlantic area.

Smolt migration year	Iceland[1] Kollafjordur 1SW	Iceland[1] Kollafjordur 2SW	Ireland[1] R.Burrishoole[3] 1SW	N. Ireland[1] R. Bush 1SW 1+ smolts	N. Ireland[1] R. Bush 1SW 2+ smolts	Norway[2] R Imsa 1SW	Norway[2] R Imsa 2SW	Norway[2] R Drammen 1SW	Norway[2] R Drammen 2SW
1981	5.6	3.1	1.3	-	-	2.0	0.1		
1982	8.7	1.6	1.6	-	-	0.2	0.03		
1983	1.2	0.9	0.5	0.1	0.4	0.1	0.0		
1984	4.5	0.5	3.0	0.9	.	0.6	0.03	2.5	1.2
1985	7.3	0.7	3.7	2.8	4.3	1.3	0.13	0.6	0.9
1986	no release		1.7	0.1	2.1	1.1	0.07	2.2	1.1
1987	8.9	0.7	3.5	1.8	8.2	2.1	0.3	0.5	0.3
1988	1.0	0.7	3.3	0.4	1.0	4.8	0.2	0.3	0.2
1989	1.0	0.5	2.5	2.9	6.8	1.5	0.3	1.4	0.6
1990	2.7	0.4	3.7	2.4	3.0	1.3	0.1	0.1	0.2
1991	3.2	-	2.5	1.4	2.2	0.8	-	0.1	

[1]Microtagged.
[2]Carlin tagged, not corrected for tagging mortality.
[3]Return rates to rod fishery with constant effort.

Table 4.1.1 Nominal landings of Atlantic salmon by Faroes vessels 1968-1992 from the Faroes area and northern Norwegian Sea, north of latitude 67°N. Catches by vessels of other countries fishing in the northern Norwegian Sea are also given.

Year	Faroes catch (t)		Other catches from Northern Norwegian Sea (>67°N)					Total catch
	Faroes	>67°N	Denmark[1]	Finland	Fed.Rep.of Germany	Norway[2]	Sweden	
1968	5[3]	0	177	0	0	100	126	408
1969	7	0	419	0	24	450	24	924
1970	12[3]	0	481	0	21	420	24	958
1971	0	0	162	0	9	300	17	488
1972	9	0	182	0	4	300	20	515
1973	28	0	233	0	0	250	50	561
1974	20	0	148	0	0	200	25	393
1975	28	0	245	0	0	200	30	503
1976	40	0	264	0	0	0	25	329
1977	40	0	192	0	0	0	0	232
1978	37	0	138	0	0	0	0	175
1979	119	0	193	0	0	0	0	312
1980	508	28	277	0	0	0	0	873
1981	1,025	0	313	0	0	0	0	1,338
1982	606	259	408	29	0	0	0	1,302
1983	678	0	445	21	0	0	0	1,144
1984	628[3]	0	72	29	0	0	0	729
1985	566[3]	0	0	0	0	0	0	566
1986	530	0	0	0	0	0	0	530
1987	576[3]	0	0	0	0	0	0	576
1988	243[3]	0	0	0	0	0	0	243
1989	364	0	0	0	0	0	0	364
1990	315	0	0	0	0	0	0	315
1991[4]	95	0	0	0	0	0	0	95
1992[5]	23	0	0	0	0	0	0	23

[1] Including some catch taken in Faroes area.
[2] Estimated catch.
[3] A small part of the catch taken outside the Faroes EEZ.
[4] Partly from research fishery.
[5] Research fishery, Preliminary figures.

Table 4.1.2 Nominal landings of Atlantic salmon by Faroes vessels in years 1982-1991 and the seasons 1981/1982 - 1991/1992.

Year	Catch (t)	Season	Catch (t)
1982	606	1981/1982	796
1983	678	1982/1983	625
1984	628	1983/1984	651
1985	566	1984/1985	598
1986	530	1985/1986	545
1987	576	1986/1987	539
1988	243	1987/1988	208
1989	364	1988/1989	309
1990	315	1989/1990	364
1991[1]	95	1990/1991[1]	202
1992[2]	23	1991/1992[3]	31

[1] Partly from research fishery.
[2] Research fishery, preliminary figures.
[3] Research fishery.

Table 4.1.3 Catch in number of salmon by month in the Faroes fishery for the seasons 1983/1984 to 1991/1992.

Season	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
				Commercial fishery					
1983/1984	8,680	24,882	12,504	26,396	32,712	12,486	6,849	-	124,508
1984/1985	5,884	20,419	14,493	24,380	26,035	25,471	19,095	-	135,776
1985/1986	1,571	27,611	13,992	50,146	25,968	21,209	14,057	-	154,554
1986/1987	1,881	19,693	5,905	15,113	35,241	21,953	39,153	1,365	140,304
1987/1988	4,259	27,125	5,803	9,387	9,592	4,203	4,642	-	65,011
1988/1989	17,019	24,743	2,916	4,663	12,457	31,698	-	-	93,496
1989/1990	13,079	40,168	5,533	11,282	11,379	29,504	570	-	111,425
1990/1991	6,921	28,972	3,720	7,996	6,275	3,557	-	-	57,442
				Research fishery					
1991/1992[1]	-	3,842	-	931	3,039	652	-	-	8,464

Table 4.1.4 Sampling of undersized salmon in the 1991/1992 season by M/S Polarlaks (total catch, wild and reared fish combined).

Date	Total no.	No>60 total	No<60 total	Scales	Meas.	Fincl.	Micro tags	Ext. tags	Disc (%)
09.12.91	2,254	2,028	226	552	2,254	19	11	7	10.0
18.12.91	1,823	1,536	287	205	1,823	24	12	4	15.7
14.02.92	991	840	151	0	991	13	1	4	15.2
09.03.92	927	900	27	256	927	6	1	4	2.9
31.03.92	2,232	2,177	55	302	2,232	9	1	6	2.5
11.04.92	700	664	36	252	700	4	0	5	5.1
Total 1991/1992	8,927	8,145	782	1,567	8,927	75	26	34	8.8

Table 4.1.5 Estimation of discard rates in the Faroes fishery 1982/1983 to 1991/1992 (total catch, wild and reared fish combined).

Season	No. of samples	Number sampled	No<60 total	Discard rate %	Range %		
Commercial fishery							
1982/1983	7	6,820	472	6.9	0	-	10.4
1983/1984	5	4,467	176	3.9		-	
1984/1985	12	9,546	1,289	13.5	3	-	32
1985/1986	7	14,654	286	1.8	0.6	-	13.8
1986/1987	13	39,758	2,849	7.2	0	-	71.3
1987/1988	2	1,499	235	15.6		-	
1988/1989	9	17,235	1,804	10.7	0.4	-	31.9
1989/1990	5	16,375	1,533	9.4	3.6	-	18.5
1990/1991	3	4,615	681	14.8	9.9	-	17.5
Research fishery							
1991/1992[1]	6	8,927	782	8.8	2.5	-	5.7

[1]Total catch sampled.

Table 4.1.6a Catch of salmon in number per unit effort (1,000 hooks) by month in the Faroes longline fishery south of 65°30'N in the seasons 1981/1982 - 1991/1992.

Season	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Season
Commercial fishery									
1981/1982	-	38	41	49	58	51	34	-	46
1982/1983	19	120	-	61	50	39	36	40	48
1983/1984	85	80	86	58	45	28	26	-	51
1984/1985	38	38	32	32	37	39	40	-	36
1985/1986	64	52	68	54	48	78	61	-	56
1986/1987	31	43	34	44	70	111	102	-	64
1987/1988	56	51	-	47	34	25	22	-	43
1988/1989	63	80	48	68	61	76	-	-	71
1989/1990	81	86	38	56	87	77	-	-	76
1990/1991	81	97	-	35	39	51	-	-	67
Research fishery									
1991/1992[1]	-	93	-	72	77	50	-	-	79

Table 4.1.6b Catch of salmon in number per unit effort (1,000 hooks) by month in the Faroes longline fishery north of 65°30'N in the seasons 1981/1982 - 1991/1992.

Season	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Season
Commercial fishery									
1981/1982	-		72	69	73	64	65	-	69
1982/1983	-	-	-	-	68	41	-	54[1]	60
1983/1984	102[1]	-	-	-	34[1]	-	-	-	70
1984/1985	-	-	-	46	31	37	43	-	37
1985/1986	-	-	-	-	38[1]	82	84	-	80
1986/1987	-	-	67[1]	64	77	-	94	-	77
1987/1988	48	68	73	71[1]	31[1]	32[1]	-	-	65
1988/1989	-	-	-	-	71[1]	-	-	-	71
1989/1990	-	-	-	-	-	103	-	-	103
1990/1991	-	-	-	-	-	-	-	-	-
Research fishery									
1991/1992	-	-	-	-	-	-	-	-	-

[1]Data from less than 6 sets.

Table 4.1.7 Proportion of reared fish in samples from the Faroese salmon fisheries.

Season	Time	Number sampled	Estimated number reared	Estimated % reared
1989/1990	February 1990	73	32	44
1990/1991	December 1990	99	42	42
1991/1992	December 1991	119	43	36
	February 1992	158	76	48
	March 1992	79	20	25
	April 1992	98	27	28

Table 4.1.8 Length distribution from scale samples 1991/1992 season, 5 cm groups, excluding fish that cannot be classified as wild or reared.

Length	Dec 1991		Feb 1992		Mar 1992		Apr 1992		Season 1991/1992		
	Wild	Reared	Wild	Reared	Wild	Reared	Wild	Reared	Wild	Reared	Both
40	0	0	0	0	0	0	0	0	0	0	0
45	4	0	0	0	0	0	0	0	4	0	4
50	3	2	2	0	0	0	1	0	6	2	8
55	0	1	0	2	0	1	1	1	1	5	6
60	2	3	0	5	0	3	0	0	2	11	13
65	8	5	2	11	1	2	2	2	13	20	33
70	27	15	16	23	10	1	7	11	60	50	110
75	20	11	29	18	22	8	25	6	96	43	139
80	4	3	10	10	13	4	17	6	44	23	67
85	1	2	8	2	2	0	4	0	15	4	19
90	1	1	5	4	3	1	4	1	13	7	20
95	0	0	3	2	5	0	4	0	12	2	14
100	1	0	1	0	1	0	0	0	3	0	3
105	0	0	1	0	1	0	1	0	3	0	3
Sum	71	43	77	77	58	20	66	27	272	167	439

Table 4.1.9 Sea age distribution (%) (estimated by scale reading) of wild and reared salmon in samples from the Faroes salmon fisheries. N=number of fish examined, indet.=number of fish not possible to classify.

Sea age	Wild							Reared						
	Feb. 1990	Dec. 1990	Dec. 1991	Feb. 1992	Mar. 1992	April 1992	Total	Feb. 1990	Dec. 1990	Dec. 1991	Feb. 1992	Mar. 1992	Apr. 1992	Total
1	0	0	9.9	1.3	0	0	2.3	31.3	21.4	9.3	35.5	20.0	22.2	25.0
2	86.1	100	85.9	78.7	79.0	86.4	85.3	59.4	78.6	79.1	59.2	75.0	77.8	69.6
3	13.9	0	4.2	18.7	17.5	13.6	11.6	9.4	0	11.6	5.3	5.0	0	5.4
4	0	0	0	1.3	3.5	0	0.9	0	0	0	0	0	0	0
Total	36	49	71	75	57	66	354	32	42	43	76	20	27	240
indet.	0	0	0	2	0	0	2	0	0	0	0	0	0	0

Table 4.1.10 Catch in number by sea-age class by month in the Faroes salmon fishery in 1991/1992 (wild fish only).

Month	Sea age						Total
	1	%	2	%	3+	%	
Nov	-	0	-	0	-	0	-
Dec	242	9.9	2,100	85.9	103	4.2	2,445
Jan	-	0	-	0	-	0	-
Feb	6	1.3	381	78.7	97	20	484
Mar	0	0	1,800	79.0	479	21	2,279
Apr	0	0	405	86.4	64	13.6	469
Total	248	4.4	4,686	82.6	743	13.1	5,675

Table 4.1.11 Catch in number by sea-age class by fishing seasons in the Faroes salmon fishery since 1983/1984.

Season	Sea age								Total
	1	%	2	%	3	%	4	%	
				Commercial fishery					
1983/1984	5,142	3	136,418	86	16,401	10	59	+	157,961
1984/1985	381	+	138,375	92	11,358	8	0	0	150,114
1985/1986	2,021	1	169,462	96	5,671	3	87	+	177,241
1986/1987	71	+	124,628	95	6,621	5	75	+	131,395
1987/1988	5,833	9	55,728	86	3,450	5	0	0	65,011
1988/1989	1,351	1	86,417	92	5,728	6	0	0	93,496
1989/1990	1,560	1	103,407	93	6,463	6	0	0	111,430
1990/1991	631	1	52,420	91	4,390	8	0	0	57,442
				Research fishery					
1991/1992[1]	248	4	4,686	83	743	13	+	+	5,675
Total	17,238	2	874,604	92	60,881	6	221	+	952,454

[1]Wild fish only.

Table 4.1.12 Percentage distribution by weight category (kg) of salmon landed at Faroes in the 1991/1992 season.

Fishing season	Weight category (kg)						
	<2.5	2.5-3	3-4	4-5	5-7	7-9	>9
			Commercial fishery				
1983/1984	9.7	20.1	41.5	14.2	4.7	6.2	3.6
1984/1985	13.3	21.4	42.3	11.7	3.6	4.9	2.8
1985/1986	9.6	18.3	46.4	16.4	5.3	2.8	1.2
1986/1987	24.4	26.5	30.9	9.1	4.1	3.5	1.5
1987/1988	35.8	26.6	24.3	5.6	4.6	2.3	0.8
1988/1989	26.4	26.2	33.9	7.9	3.2	2	0.4
1989/1990	24.4	23.8	37.8	8.9	3.2	1.5	0.4
1990/1991	13.2	20.1	38.8	13.0	7.6	4.8	3.0
			Research fishery				
1991/1992	13.0	14.1	31.1	11.0	10.0	13.1	7.7

Table 4.1.13 Smolt age composition in samples taken in the Faroes fishery from 1984/1985 to 1991/1992.

Season	1	2	3	4	5	6	Unknown	Total
			Commercial fishery					
1984/1985	1.5	37.9	46.9	12.3	1.5	0.1	0	2,194
1985/1986	0.8	20.4	52.7	24.4	1.7	0	0	951
1986/1987	0.2	16.2	48.5	31.8	3.1	0.2	0	575
1987/1988	1.2	35.9	49.5	13.2	0.4	0	0	680
1988/1989	3.5	47.0	40.5	7.0	0.3	0	1.8	798
1989/1990	3.9	52.2	35.5	6.7	1.1	0	0.6	358
1990/1991	-	-	No scale samples			-	-	-
			Research fishery					
1991/1992[1]	2.6	38.7	43.5	5.2	0.4	0	9.5	271

[1]Wild fish only.

Table 4.1.14 Number of microtags recovered at Faroes from European countries.

Season	Country of origin	Discards Recovery	1SW1	2SW	Total
1981/1982	Ireland	1	-	2	3
	UK (Scotland)	-	-	2	2
1982/1983	Ireland	4	2	2	8
	UK (Scotland)	-	-	1	1
1983/1984	UK (Scotland)	-	-	1	1
1984/1985	Iceland	2	-	-	2
	Ireland	15	-	3	18
	UK (Scotland)	3	-	-	3
	Raising Factors	16.4	3.55	3.55	
1985/1986	Ireland	8	-	5	13
	Faroe Islands	-	-	3	3
	UK (England and Wales)	-	-	1	1
	Raising Factors	10.7	3	3	
1986/1987	Faroe Islands	-	-	29	29
	Ireland	8	-	1	9
	UK (England and Wales	1	-	5	6
	UK (N. Ireland)	4	-		4
	UK (Scotland)	2	-	1	3
	Raising Factors	3.8	3	3	
1987/1988	Faroe Islands	-	-	20	20
	Iceland	-	1	-	1
	Ireland	3	1	4	8
	UK (England and Wales)	1	-	3	4
	Raising Factors	51.4	2.7	2.7	
1988/1989	Canada	1	-	-	1
	Faroe Islands	2	-	-	2
	Iceland	-	-	15	15
	Ireland	17	-	2	19
	UK (England and Wales)	2	1	13	16
	UK (N. Ireland)	-	-	1	1
	UK (Scotland)	2	-	2	4
	USA	-	-	1	1
	Raising Factors	6.1	1.8	1.8	
1989/1990	Faroe Islands	-	-	30	30
	Ireland	14	-	3	17
	UK (England and Wales)	3	1	5	9
	Raising Factors	7.5	2.3	2.3	
1990/1991	Faroe Islands	-	-	2	2
	Iceland	-	-	1	1
	Ireland	3	-	-	3
	UK (England and Wales)	1	-	4	5
	UK (N. Ireland)	1	-	-	1
	UK (Scotland)	1	-	1	2
	Raising Factors	14.6	3.8	3.8	
1991/1992	Faroe Islands	1	-	3	4
	Ireland	19	-	1	20
	UK (England and Wales)	3	-	-	3
	UK (Scotland)	-	-	2	2
	France	1	-	-	1
	Raising Factors	1	1	1	

Table 4.1.15 Calculation of the raising factors for the microtag data from the Faroes fishery 1984/1985 to 1991/1992.

		A	B	C	D	E	F	G	H
Year of fishery	No. Trips	Total Sample	No. of Discard	Discard Rate % B/A*100	Total Landed	Total Discard C*D/(100-C)	Discard Raising Factor E/B	Total observed	1SW and 2SW Raising Factor D/G
Commercial fishery									
1984/1985	12	9,546	1,289	13.5	135,776	21,196	16.4	38,276	3.55
1985/1986	7	14,654	268	1.8	154,554	2,879	10.7	52,186	2.96
1986/1987	13	39,758	2,849	7.2	140,304	10,830	3.8	47,347	2.96
1987/1988	2	1,499	235	15.7	65,011	12,087	51.4	24,160	2.69
1988/1989	9	17,235	1,804	10.5	93,496	10,930	6.1	51,562	1.81
1989/1990	5	16,375	1,533	9.4	111,425	11,509	7.5	48,352	2.30
1990/1991	3	4,615	681	14.8	57,442	9,944	14.6	14,902	3.85
Research fishery									
1991/1992[1]	6	8,927	782	8.8	8,145	782	1.0	8,145	1.0

[1]Total catch sampled.

Table 4.1.16 Estimated numbers of discards, 1SW and 2SW microtagged salmon caught in the Faroese fishery from smolt releases between 1984 and 1991 (year of fishery for 2SW is n+1).

					Number in catch			
Year of migration yr(n)	Country of origin	Number released	Discards yr(n)	1SW yr(n)	All 1SW yr(n)	2SW Yr(n+1)	Total	Rec./rel x 1000
1984	Faroe Islands	19,620	-	-	-	9	9	0.46
	Ireland	260,816	246	-	246	15	261	1.00
	N. Iceland	72,352	33	-	33	-	33	0.45
	UK (Engl. + Wales)	39,780	-	-	-	3	3	0.08
	UK (Scotland)	30,040	49	-	49	-	49	1.64
1985	Faroe Islands	30,079	-	-	-	87	87	2.89
	Ireland	220,000	86	-	86	3	89	0.40
	UK (Engl. + Wales)	53,347	-	-	-	15	15	0.28
	UK (Scotland)	13,497	-	-	-	3	3	0.22
1986	Faroe Islands	43,000	-	-	-	54	54	1.26
	Ireland	143,866	30	-	30	41	41	0.29
	UK (Engl. + Wales)	177,071	4	-	4	12	12	0.07
	UK (N. Ireland)	26,320	15	-	15	15	15	0.58
	UK (Scotland)	16,217	8	-	8	8	8	0.47
1987	Ireland	162,189	154	3	157	161	161	0.99
	N. Iceland	27,978	-	3	3	30	30	1.06
	UK (Engl. + Wales)	195,373	51	-	51	75	75	0.38
	UK (N. Ireland)	20,145	-	-	-	2	2	0.09
	UK (Scotland)	20,876	-	-	-	4	4	0.17
	USA	640,400	-	-	-	2	2	0.00
1988	Canada	13,322	6	-	-	-	6	0.45
	Faroe Islands	43,481	12	-	12	69	81	1.87
	Ireland	165,841	104	-	104	7	111	0.67
	UK (Engl. + Wales)	189,913	12	2	14	12	26	0.13
	UK (Scotland)	31,331	12	-	12	-	12	0.39
1989	Faroe Islands	26,943	-	-	-	8	8	0.28
	Ireland	185,439	105	-	105	-	105	0.57
	N. Iceland	85,452	-	-	-	4	45	0.04
	UK (Engl. + Wales)	256,342	23	2	25	15	40	0.16
	UK (Scotland)	30,288	-	-	-	4	4	0.13
1990	Faroe Islands	11,820	-	-	-	3	3	0.25
	Ireland	153,821	44	-	44	1	45	0.29
	UK (Engl. + Wales)	250,024	15	-	15	-	15	0.06
	UK (N. Ireland)	29,875	15	-	15	-	15	0.49
	UK (Scotland)	41,390	15	-	15	2	17	0.40
1991	Faroe Islands	NA	1	-	1	NA	1	-
	Ireland	471,152	19	-	19	NA	19	0.04
	UK (Engl. + Wales)	231,205	3	-	3	NA	3	0.01
	France	21,376	1	-	1	NA	1	0.05

NA = not available.

Table 4.1.17 Provisional numbers of external tags recovered in the Faroes fishery in the 1991/1992 season.

Country	Number of tags
Norway	22
Sweden	3
Scotland	3
Total	28

Table 4.1.18 Numbers of external tags recovered in the Faroes fishery from salmon tagged as smolts on the North Esk, UK (Scotland) (1980-1991), and total estimated tag return rates, using reporting rate of 0.75.

Smolt year	No. tag recoveries				Total recoveries	Total estimated recaptures	Recaptures per 1000 smolts
	No. tagged	1SW	2SW	3SW			
1980	11,475	1	8	1	10	13.3	1.16
1981	10,371	0	19	3	22	29.3	2.83
1982	11,848	7	22	1	30	40.0	3.38
1983	1,456	0	1	0	1	1.3	0.92
1984	6,527	0	3	0	3	4.0	0.61
1985	6,210	1	3	0	4	5.3	0.86
1986	1,124	0	0	0	0	0	0.00
1987	4,976	0	0	0	0	0	0.00
1988	3,874	2	0	0	2	2.7	0.69
1989	4,967	2	1	0	3	4.0	0.81
1990	17,445	1	0	-	1	1.3	0.08
1991	8,721	1	-	-	1	1.3	0.15

Table 4.1.19 Numbers of external tags recovered in the Faroes fishery from salmon tagged as smolts in Sweden (1975-1991), and total estimated tag return rates using reporting rate of 0.75

Smolt year	No. released tagged	1SW	No. rec. 2SW	No. rec. 3SW	Total recoveries	Total estimated recaptures	Recaptures per 1000 released
1975	5,907	0	1	0	1	1.3	0.23
1976	4,974	0	1	1	2	2.7	0.54
1977	4,571	5	3	1	9	12.0	2.62
1978	9,968	4	38	3	45	60.0	6.02
1979	5,219	3	8	3	14	18.7	3.58
1980	996	1	5	0	6	8.0	8.03
1981	6,546	3	64	12	79	105.3	16.10
1982	8,894	13	71	4	88	117.3	13.19
1983	10,713	15	64	3	82	109.3	10.21
1984	5,724	12	7	0	19	25.3	4.26
1985	5,981	2	16	1	19	25.3	10.68
1986	2,373	5	6	2	13	17.3	7.30
1987	5,864	3	36	3	42	56.0	9.55
1988	8,279	0	7	2	9	12.0	1.45
1989	9,749	4	26	0	30	40.0	4.10
1990	8,841	2	1	0	3	4.0	0.45
1991[1]	5,969	2	3[1]	-	5	6.7	1.12

[1]Preliminary data only.

Table 4.1.20 Numbers of external tags recovered in the Faroes fishery from salmon tagged as smolts in Norway (1980-1991), and estimated total tag return rates using reporting rate of 0.75

Smolt year	No. tagged	1SW	2SW	3SW	Total recoveries	Total estimated recaptures	Recaptures per 1000 released
1980	36,984	1	53	32	86	114.7	3.10
1981	59,478	27	305	87	419	559.7	9.39
1982	53,484	56	255	25	336	448.0	8.38
1983	55,400	5	148	15	168	224.0	4.04
1984	65,706	53	195	16	264	352.0	5.36
1985	60,159	63	107	9	179	238.7	3.97
1986	104,137	4	77	7	88	117.3	1.13
1987	122,447	1	166	31	198	264.0	2.16
1988	107,894	6	173	4	183	244.0	2.26
1989	103,236	3	189	1	193	257.3	2.49
1990	105,824	5	22[1]	-	27	36.0	0.34[1]
1991[1]	122,404	-	-	-	-	-	-

[1]Preliminary data only.

Table 4.1.21 Comparison of the estimated number of tag recaptures (CWT and External tags) in the Faroes fishery per 1,000 released for all ages, (external tag reporting rate = 0.75).

	Country of Origin								
Year	Faroes[1]	N. Iceland[1]	Ireland[1]	UK (Engl.+Wales)[1,4]	UK (Scot.)[1]	UK (Scot.) N. Esk[2]	UK (N.Ireland)[1]	Sweden[2]	Norway[2]
1975								0.23	
1976								0.54	
1977								2.62	
1978								6.02	
1979								3.58	
1980						1.16		8.03	3.10
1981						2.83		16.10	9.39
1982						3.38		13.19	8.38
1983						0.92		10.21	4.04
1984	0.46	0.45	1.00	0.08	1.64	0.61		4.26	5.36
1985	2.89		0.40	0.28	0.22	0.86		10.68	3.97
1986	1.26		0.29	0.07	0.47	0	0.58	7.30	1.13
1987		1.06	0.99	0.38	0.17	0	0.09	9.55	2.16
1988	1.87		0.67	0.13	0.39	0.69		1.45	2.26
1989	0.28	0.04	0.57	0.16	0.13	0.81		4.10	2.49
1990	0.25		0.29	0.06	0.40	0.08	0.49	0.45	0.34[3]
1991			0.04	0.01		0.15		1.12	

[1]microtags.
[2]external tags.
[3]preliminary data only.
[4]Releases in UK (Engl. & Wales) are mainly of parr.

Table 4.1.22 Estimated number of 1SW and 2SW salmon of the River Imsa stock available to the Norwegian Sea fishery and Norwegian homewater fishery, and estimated exploitation rates. The number of salmon caught in the trap in River Imsa is considered to be the total river escapement. The estimates are based on 75% and 50% tag reporting rate in Norwegian Sea and Norwegian homewaters respectively. Exploitation rates for 1992 are provisional.

Released	Smolt type	No. tagged	1SW					2SW				
			Norwegian Sea		Norwegian homewaters			Norwegian Sea		Norwegian homewaters		
			No. of fish available	Expl. rate	No. of fish available	Expl. rate	No. in trap	No. of fish available	Expl. rate	No. of fish available	Expl. rate	No. in trap
1981	Wild	3,214	776	0.00	555	0.88	66	177	0.25	127	0.93	9
	2+	5,819	757	0.01	586	0.80	114	125	0.38	74	0.92	6
1982	Wild	736	61	0.00	39	0.87	5	18	0.50	9	0.89	1
	1+	5,581	130	0.00	73	0.99	1	48	0.33	31	0.97	1
	2+	8,501	712	0.03	524	0.95	25	129	0.57	54	0.93	4
1983	Wild	1,287	211	0.00	174	0.82	31	27	0.33	17	0.94	1
	1+	5,861	27	0.00	23	0.96	1	3	0.31	2	1.00	0
	2+	6,052	205	0.02	172	0.93	12	19	0.47	10	1.00	0
1984	Wild	936	150	0.00	113	0.73	30	29	0.38	17	0.82	3
	1+	1,863	40	0.00	21	0.76	5	16	0.19	12	0.83	2
	2+	7,445	413	0.04	335	0.86	48	43	0.40	25	0.96	1
1985	Wild	892	121	0.00	91	0.79	19	23	0.13	19	0.95	1
	1+	9,160	782	0.00	561	0.77	128	177	0.16	142	0.90	14
	2+	1,950	97	0.00	82	0.78	18	10	0.40	6	1.00	0
1986	Wild	477	42	0.00	18	0.56	8	21	0.05	20	0.80	4
	1+	10,048	603	0.00	469	0.73	123	103	0.17	83	0.92	7
	2+	1,976	110	0.01	93	0.92	7	12	0.25	9	0.89	1

(cont'd.)

Table 4.1.22 (cont'd.)

Released	Smolt type	No. tagged	1SW					2SW				
			Norwegian Sea		Norwegian homewaters			Norwegian Sea		Norwegian homewaters		
			No. of fish available	Expl. rate	No. of fish available	Expl. rate	No. in trap	No. of fish available	Expl. rate	No. of fish available	Expl. rate	No. in trap
1987	Wild	480	119	0.00	83	0.51	40	29	0.03	27	0.74	7
	1+	3,980	527	0.00	447	0.80	87	55	0.07	49	0.86	7
	2+	3,902	373	0.01	322	0.75	80	32	0.13	27	0.44	15
1988	Wild	1,700	259	0.00	226	0.65	76	21	0.05	19	0.42	11
	1+	9,896	1,085	0.00	928	0.53	435	107	0.30	72	0.69	22
	2+	1,991	220	0.00	205	0.35	130	6	0.00	6	0.67	2
1989	Wild	1,214	142	0.00	104	0.42	59	30	0.13	25	0.72	7
	1+	4,903	225	0.00	142	0.47	75	69	0.36	42	0.66	14
1990	Wild	1,977	82	0.00	54	0.37	34	23	0.04	21	0.76	5
	1+	12,285	532	0.00	311	0.50	155	185	0.01	177	0.91	15
1991	Wild	1,886	164	0.00	152	0.57	65					
	1+	15.783	471	0.00	452	0.72	125					
	2+	6,942	197	0.01	189	0.62	70					

Table 4.1.23 Estimated number of 1SW and 2SW salmon of the River Imsa stock available to the Norwegian Sea fishery and Norwegian homewater fishery, and estimated exploitation rates. The number of salmon caught in the trap in River Imsa is considered to be the total river escapement. The estimates are based on 75% and 70% tag reporting rate in Norwegian Sea and Norwegian homewaters respectively. Exploitation rates for 1992 are provisional.

Released	Smolt type	No. tagged	1SW					2SW				
			Norwegian Sea		Norwegian homewaters			Norwegian Sea		Norwegian homewaters		
			No. of fish available	Expl. rate	No. of fish available	Expl. rate	No. in trap	No. of fish available	Expl. rate	No. of fish available	Expl. rate	No. in trap
1981	Wild	3,214	592	0.00	416	0.84	66	142	0.32	93	0.90	9
	2+	5,819	596	0.01	452	0.74	114	105	0.46	55	0.89	6
1982	Wild	736	48	0.00	29	0.83	5	16	0.56	7	0.86	1
	1+	5,581	98	0.00	52	0.98	1	39	0.41	22	0.95	1
	2+	8,501	549	0.04	382	0.93	25	115	0.63	40	0.90	4
1983	Wild	1,287	163	0.00	133	0.76	31	22	0.41	12	0.92	1
	1+	5,861	20	0.00	17	0.94	1	2	0.50	1	1.00	0
	2+	6,052	154	0.03	126	0.90	12	16	0.56	7	1.00	0
1984	Wild	936	122	0.00	90	0.66	30	25	0.44	13	0.77	3
	1+	1,863	30	0.00	16	0.69	5	12	0.25	9	0.78	2
	2+	7,445	322	0.05	255	0.81	48	36	0.47	18	0.94	1
1985	Wild	892	93	0.00	70	0.73	19	18	0.17	14	0.93	1
	1+	9,160	645	0.00	438	0.70	128	138	0.21	105	0.87	14
	2+	1,950	77	0.00	64	0.72	18	8	0.50	4	1.00	0
1986	Wild	477	35	0.00	15	0.47	8	17	0.06	15	0.73	4
	1+	10,048	478	0.00	371	0.66	123	82	0.23	61	0.89	7
	2+	1,976	80	0.02	68	0.90	7	10	0.30	7	0.86	1

(cont'd)

Table 4.1.23 (cont'd)

Released	Smolt type	No. tagged	1SW					2SW				
			Norwegian Sea		Norwegian homewaters			Norwegian Sea		Norwegian homewaters		
			No. of fish available	Expl. rate	No. of fish available	Expl. rate	No. in trap	No. of fish available	Expl. rate	No. of fish available	Expl. rate	No. in trap
1987	Wild	480	100	0.00	71	0.42	40	23	0.04	21	0.67	7
	1+	3,980	407	0.00	345	0.74	87	43	0.09	37	0.81	7
	2+	3,902	296	0.01	253	0.68	80	29	0.14	24	0.38	15
1988	Wild	1,700	211	0.00	184	0.58	76	18	0.06	17	0.35	11
	1+	9,896	930	0.00	795	0.44	435	93	0.34	58	0.62	22
	2+	1,991	197	0.00	184	0.28	130	5	0.00	5	0.60	2
1989	Wild	1,214	122	0.00	91	0.34	59	25	0.16	20	0.65	7
	1+	4,903	196	0.00	123	0.38	75	61	0.41	34	0.59	14
1990	Wild	1,977	70	0.00	48	0.29	34	18	0.06	16	0.69	5
	1+	12,285	432	0.00	267	0.41	155	138	0.01	131	0.88	15
1991	Wild	1,886	138	0.00	127	0.48	65					
	1+	15.783	374	0.00	359	0.65	125					
	2+	6,942	162	0.01	155	0.54	70					

Table 4.1.24 Estimated exploitation rates of hatchery-reared Atlantic salmon of the River Drammen in the different sea fisheries. Tag reporting rate in Norwegian homewaters = 0.50. Exploitation rates for 1992 are provisional.

Released	Smolt age	No. tagged	1SW							2SW				
			Faroes		Norwegian homewaters		No. in Drammen river	Greenland		Faroes		Norwegian homewaters		No. in Drammen river
			No. of fish available	Expl. rate	No. of fish available	Expl. rate		No. of fish available	Expl. rate	No. of fish available	Expl. rate	No. of fish available	Expl. rate	
1984	2+ 1+	984 1,472	87 121	0.10 0.01	44 41	0.45 0.68	24 13	39 73	0.03 0.00	36 68	0.42 0.18	20 54	0.30 0.70	14 16
1985	1+	1,437	90	0.00	49	0.81	9	31	0.19	29	0.03	27	0.52	13
1986	1+	2,972	269	0.00	182	0.64	65	76	0.04	71	0.06	64	0.47	34
1987	2+ 1+	2,289 1,498	103 23	0.00 0.00	55 9	0.73 0.67	15 3	33 13	0.03 0.00	30 12	0.30 0.42	20 7	0.60 0.57	8 3
1988	1+	7,531	37	0.00	35	0.40	21	40	0.00	38	0.45	20	0.40	12
1989	2+	5,199	202	0.00	97	0.23	74	96	0.00	90	0.13	44	0.59	18
1990	2+	8,796	75	0.01	26	0.54	12	44	0.00	42	0.02	39	0.51	19

Table 4.1.25 Estimated exploitation rates of hatchery-reared Atlantic salmon of the River Drammen stock in the different sea fisheries. Tag reporting rate in Norwegian homewaters = 0.70. Exploitation rates for 1992 are provisional.

Released	Smolt age	No. tagged	1SW								2SW				
			Faroes		Norwegian homewaters		No. in Drammen river	Greenland			Faroes		Norwegian homewaters		No. in Drammen river
			No. of fish available	Expl. rate	No. of fish available	Expl. rate		No. of fish available	Expl. rate		No. of fish available	Expl. rate	No. of fish available	Expl. rate	
1984	2+	984	88	0.10	38	0.37	24	37	0.03		34	0.44	18	0.22	14
	1+	1,472	99	0.01	33	0.61	13	61	0.00		57	0.21	43	0.63	16
1985	1+	1,437	74	0.00	38	0.76	9	33	0.18		25	0.04	23	0.43	13
1986	1+	2,972	227	0.00	149	0.56	65	69	0.04		62	0.06	55	0.38	34
1987	2+	2,289	76	0.00	44	0.66	15	28	0.04		27	0.33	17	0.53	8
	1+	1,498	20	0.00	7	0.57	3	12	0.00		11	0.44	6	0.50	3
1988	1+	7,531	33	0.00	31	0.32	21	38	0.00		36	0.47	18	0.33	12
1989	2+	5,199	183	0.00	91	0.18	74	83	0.00		78	0.15	37	0.51	18
1990	2+	8,796	64	0.02	22	0.45	12	38	0.00		36	0.03	33	0.42	19

Table 4.1.26 Estimated number of 1SW and 2SW salmon of the North Esk stock available to the Faroes, West Greenland and homewater fisheries and estimated exploitation rates.

Smolt Year	No tagged	1SW							2SW						
		Faroes		Homewaters		Greenland		No. in North Esk	Greenland		Faroes		Homewaters		No. in North Esk
		No. available	Expl. rate	No. available	Expl. rate	No. available	Expl. rate		No. available	Expl. rate	No. available	Expl. rate	No. available	Expl. rate	
1981	10,371	779	0.00[1]	447	0.74	276	0.00[1]	118	24	0.00[1]	259	0.10	181	0.80	37
1982	11,848	1,207	0.01[1]	783	0.70	311	0.00[1]	237	11	0.00[1]	293	0.10	227	0.80	46
1983	1,456	61	0.00[1]	44	0.75	12	0.00[1]	11	1	0.00[1]	12	0.09[1]	9	0.56[1]	4
1984	6,527	285	0.00[1]	182	0.76	84	0.00[1]	43	4	0.73[1]	79	0.05[1]	64	0.70	19
1985	6,210	346	0.00[1]	245	0.88	77	0.08[1]	30	2	0.00[1]	67	0.06[1]	58	0.86	8
1986	1,124	65	0.00[1]	36	0.89	26	0.27[1]	4	1	0.00[1]	18	0.00[1]	16	0.88	2
1987	4,976	119	0.00[1]	89	0.76	23	0.04[1]	21	2	0.48[1]	21	0.00[1]	18	0.67	6
1988	3,874	79	0.04[1]	56	0.79	14	0.00[1]	12	2	0.00[1]	16	0.00[1]	13	0.92	1
1989	4,967	182	0.02[1]	94	0.72	71	0.00[1]	26	13	0.08[1]	67	0.02[1]	46	0.61	18
1990	1,445	295	0.00[1]	283	0.54	114	0.08[1]	129	-	-	99	0.00[1]	91	0.62	35

Reporting rates:

Faroes	0.75
W.Greenland	0.75
N. Esk	1.00
Montrose Bay	1.00
Sweden	0.65
Elsewhere	0.50

[1]Estimates based on less than 10 recaptures.

Table 4.1.27 Estimated exploitation rates of 1SW and 2SW salmon in the Faroes fishery. All estimates are based on recoveries of external tags.

Season	Exploitation Rates %										
	Norway						Scotland			Sweden	
	R. Drammen		River Imsa				North Esk			R. Lagan	
	Hatchery		Wild		Hatchery		Wild			Hatchery	
	1SW	2SW	1SW	2SW	1SW	2SW	1SW	2SW	3SW	1SW	2SW
1981/1982			0[1]	-	1[1]	-	0[1]	6	0[1]		
1982/1983			0[1]	25	2	38	1[1]	10	6[1]		
1983/1984			0[1]	50[1]	1[1]	45	0[1]	10	18[1]		
1984/1985	5	-	0[1]	33[1]	2	39	0[1]	9[1]	16[1]	0[1]	
1985/1986	0[1]	30	0[1]	38	0[1]	30	<1	5[1]	0[1]	3[1]	22[1]
1986/1987	0[1]	3[1]	0[1]	13[1]	1[1]	28	0[1]	6[1]	0[1]	2[1]	0[1]
1987/1988	0[1]	6[1]	0[1]	5[1]	1[1]	21	0[1]	0[1]	0[1]	0[1]	9[1]
1988/1989	0[1]	36	0[1]	3[1]	0[1]	10[1]	4[1]	0[1]	0[1]	0[1]	13[1]
1989/1990	0[1]	45	0[1]	5[1]	0[1]	15	2[1]	0[1]	0[1]	1[1]	21[1]
1990/1991	1[1]	13	0[1]	13[1]	0[1]	36	<1[1]	2[1]	0[1]	1[1]	18
1991/1992[2]	-	2[1]	0[1]	4[1]	0[1]	1[1]	-	0[1]	0[1]	1[1]	3[1]
Mean for 1986/87 to 1990/91	0	21	0	8	0	23	1	2	0	1	12

[1]Estimate based on less tthan 10 tag returns.
[2]Provisional exploitation rate estimates.

Reporting rates for external tags as for Table 4.1.26 + Norway home waters = 0.50.

Table 4.2.1a Numbers of gear units licensed or authorised by country and gear type.

Year	UK (England and Wales)				UK (Scotland)		UK (N. Ireland)				Norway			
	Gillnet licences	Sweepnet	Hand-held net	Fixed engine	Fixed engine[1]	Net and cable	Driftnet	Draftnet	Bagnets and boxes	Rod licences	Bagnet	Bendnet	Liftnet	Driftnet (No. Nets)
1966											7,101		55	
1967											7,106	2,827	48	11,498
1968											6,588	2,613	36	9,149
1969											6,012	2,756	32	8,956
1970											5,476	2,548	32	7,932
1971											4,608	2,421	26	8,976
1972											4,215	2,367	24	13,448
1973											4,047	2,996	32	18,616
1974											3,382	3,342	29	14,078
1975											3,150	3,549	25	15,968
1976											2,569	3,890	22	17,794
1977											2,680	4,047	26	30,201
1978											1,980	3,976	12	23,301
1979											1,835	5,001	17	23,989
1980											2,118	4,922	20	25,652
1981											2,060	5,546	19	24,081
1982					8,389	647	123	221	18	14,784	1,843	5,217	27	22,520
1983	232	209	333	149	10,610	668	120	207	17	14,145	1,735	5,428	21	21,813
1984	226	223	354	149	7,716	638	121	192	19	13,529	1,697	5,386	35	21,210
1985	223	230	375	144	5,779	529	122	168	19	14,962	1,726	5,848	34	20,329
1986	220	221	368	139	4,789	597	121	148	18	15,332	1,630	5,979	14	17,945
1987	213	206	352	143	6,297	579	120	119	18	-	1,422	6,060	13	17,234
1988	210	212	284	145	2,118	395	115	113	18	-	1,322	5,702	11	15,532
1989	201	199	282	150	1,843	356	117	108	19	-	1,888	4,100	16	0

Table 4.2.1a Numbers of gear units licensed or authorised by country and gear type.

Year	UK (England and Wales)				UK (Scotland)		UK (N. Ireland)				Norway			
	Gillnet licences	Sweepnet	Hand-held net	Fixed engine	Fixed engine[1]	Net and cable	Driftnet	Draftnet	Bagnets and boxes	Rod licences	Bagnet	Bendnet	Liftnet	Driftnet (No. Nets)
1990	200	204	292	144	2,234	340	114	106	17	-	2,375	3,890	7	0
1991	199	187	264	142	1,836	295	-	-	18	-	2,343	3,628	8	0
1992	-	-	-	-	-	-	121	91	19	-	-	-	-	0

[1]Annually (number of fixed engine counted together from February to September).

Table 4.2.1b Numbers of gear units licensed or authorised by country and gear type.

Year	Ireland				Finland				France		
					The Teno River			The Näätanu River			
	Driftnets No.	Draftnets	Other commercial nets	Rod and line	Recreational fishery		Commercial fishery	Recreational fishery	Rod and line licences	Commercial nets in freshwater[3]	Licences in estuary [3,4]
					Fishing days	Fishermen	Fishermen	Fishermen			
1966	510	742	214	11,621							
1967	531	732	223	10,457							
1968	505	681	219	9,615							
1969	669	665	220	10,450							
1970	817	667	241	11,181							
1971	916	697	213	10,566							
1972	1,156	678	197	9,612							
1973	1,112	713	224	11,660							
1974	1,048	681	211	12,845							
1975	1,046	672	212	13,142							
1976	1,047	677	225	14,139							
1977	997	650	211	11,721							
1978	1,007	608	209	13,327							
1979	924	587	240	12,726							
1980	959	601	195	15,864							
1981	878	601	195	15,519	16,859	5,742	677	467			
1982	830	560	1972	15,697	19,690	7,002	693	484	4,145	55	82
1983	801	526	190	16,737	20,363	7,053	740	587	3,856	49	82
1984	819	515	194	14,878	21,149	7,665	737	677	3,911	42	82
1985	827	526	190	15,929	21,742	7,575	740	866	4,443	40	82
1986	768	507	183	17,977	21,482	7,404	702	691	5,919[1]	58[1]	86
1987[1]	-	-	-	-	22,487	7,759	754	689	5,804[2]	87[2]	80
1988	836	-	-	-	21,708	7,755	741	538	4,413	101	76
1989	801	-	-	-	24,118	8,681	742	696	3,826	83	78
1990	756	-	-	-	19,596	7,677	728	614	2,977	71	76
1991	707	496	-	-	22,922	8,286	734	718	2,760	78	71
1992	694	-	-	-	26,748	9,058	749	875	2,155		56

[1]Common licence for salmon and seatrout.
[2]Introduction of quotas/fisherman, obligation to declare the catches.
[3]The number of licences indicates only the number of fishermen (or boats allowed to fish for salmon. It overestimates the actual number of fishermen fishing for salmon up to 2 or 3 times.
[4]Adour estuary only (southwest of France).

Table 4.2.2 CPUE data for net and fixed engine salmon fisheries by National River Authority Region in UK (England and Wales), 1988-1992.

Data expressed as catch per licence-day.

NRA Region	1988	1989	1990	1991	1992
Northumbria	6.85	5.38	6.64	3.98	3.51
Yorkshire	2.24	2.16	2.94	1.28	0.80
Southern	10.15	16.8	8.56	6.40	NA
Welsh	-	0.90	0.78	0.62	NA
North West	-	0.82	0.63	0.51	0.35

Table 4.2.3 CPUE for rod fisheries on the Tana River,Finland (1983-1992).

Year	Catch (kg) per angler season		Catch (kg) per angler day	
1983 1984	3.4 2.2		1.2 0.8	
1985 1986 1987 1988	2.7 2.1 2.3 1.9	$\bar{x}$ = 2.43	0.9 0.7 0.8 0.7	$\bar{x}$ = 0.85
1989 1990 1991 1992	2.2 2.8 3.4 4.5	$\bar{x}$ = 3.23	0.8 1.1 1.2 1.5	$\bar{x}$ = 1.15

Table 4.2.4 Origin of catches of salmon in homewater fisheries based on tag recoveries.

++ = Principal component of catch
\+ = Consistent recoveries
\- = Rare tag recovery

Origin of stock	Catch by Country									
	Rus	Fin	Nor	Swe	Fr	UK E & W	UK Scot	UK N.Ire	Ire	Ice
Russia	++	-	+							
Finland	-	++	+							
Norway		+	++	+		-	-		-	
Sweden			+	++						
France					++	-	-	-	-	
UK (E & W)			-	-		++	+	+	+	
UK (Scot)						+	++	+	+	
UK (N.Ire)						-	+	++	+	
Ireland			-	-		-	+	+	++	
Iceland			-				-			++

Table 4.2.5 Estimated catches (in tonnes round fresh weight) of wild, farmed and ranched salmon in national catches in the North East Atlantic.

Country	Catches of Salmon						
	Wild		Farmed		Total Farmed	Ranched	Total
Norway	1989	710	FW	29			
			SEA	166	195		905
	1990	716	FW	29			
			SEA	185	214		930
	1991	688	FW	20			
			SEA	169	189		877
	1992[2]	651	FW	26			
			SEA	173	199		850
Faroes	1990/1991	117.2			84.8	0	202
	1991/1992	20.4			10.6	0	31
Finland	1991	68			<1	0	69
	1992	77			<1	0	78
France	1991	13			0	0	13
	1992	20			0	0	20
Iceland	1991	130			3	375	505
	1992	175.5			<1	412	590
Ireland	1991	<402.6			<1	1.4	404
	1992	<628			<1	2	630
Russia	1991	215			0	0	215
	1992	161			0	0	161
Sweden	1991	23			1	14[1]	38
	1992	24			1	24[1]	49
UK (E & W)	1991	200			0	0	200
	1992	195			0	0	195
UK (N.Ire)	1991	54			<1	0	55
	1992	147.3			1.1	2.6	151
UK (Scot)	1991	448			14	0	462
	1992	502			23	0	525

[1]Fish released for mitigation purposes and not expected to contribute to spawning.
[2]Provisional figures.

Table 4.2.6 Proportion (unweighted mean) of reared salmon in marine and freshwater fisheries in Norway between 1989 and 1992. N= number of salmon examined. The data from freshwater for 1992 are provisional.

Group	Period		N	No. of sites	Mean (%)	Range
Marine Outer Coast	Summer	1989	1217	7	45	7-66
		1990	2481	9	48	16-64
		1991	1245	6	49	29-63
		1992	1162	7	44	4-72
Marine Fjords	Summer	1989	803	4	14	8-29
		1990	940	5	15	6-36
		1991	336	3	10	6-16
		1992	307	1	21	-
Freshwater	Summer	1989	5744	39	7	0-26
		1990	5380	39	7	0-55
		1991	3707	27	5	0-23
		1992	2262	20	6	0-24
Freshwater	Autumn	1989	1791	16	38	2-77
		1990	2004	21	33	2-82
		1991	1677	23	24	0-82
		1992	788	14	23	0-57

Table 4.2.7 Total marine exploitation (% of extant stock) in Irish coastal waters of R. Bush hatchery-reared and wild salmon released as microtagged smolts.

1SW exploitation of hatchery-reared and wild smolts released in 1985-1991.

Release year	HR (1+)	Release group HR(2+)	Wild
1983	93.7	94.6	-
1984	93.3	-	-
1985	81.9	75.4	-
1986	93.9	77.5	68.5
1987	72.3	57.1	65.3
1988	92.3	83.4	89.0
1989	63.5	69.8	61.4
1990	57.2	46.1	65.3
1991[1]	74.0	74.6	55.8

2SW exploitation of hatchery-reared and wild smolts released in 1985-1990.

Release year	Group	Exploitation (%)
1985	HR(1+/2+)	46.3
1986	HR/Wild	36.5
1987	HR(1+/2+)	60.0
1988	HR/Wild	37.9
1989	HR/Wild	42.8
1990[1]	HR/Wild	32.0

[1] Provisional.
HR = Hatchery reared.

Table 4.2.8 Estimated exploitation rates (in %) of salmon in homewater fisheries in Ireland and UK.

Year	Ireland[1]	UK (England + Wales)[2]			UK (N. Ireland)[1]				UK (Scotland)[2]	
	Burrishoole	Itchen		Test	River Bush				North Esk	
	HR	W		W	W	W/HR	HR1+	HR2+	W	W
	Total	net	rod	rod	Net	Net	Net	Net	In-river netting	
	1SW	(all ages)			1SW	2SW	1SW	1SW	1SW	2SW
1985	82						93	-	23	35
1986	85						82	75	40	29
1987	75				69	46	94	77	29	37
1988	76			39	65	36	72	57	35	37
1989	82	9	45	29	89	60	92	83	25	26
1990	54	20	51	36	61	38	63	70	37	37
1991	65	30	45	26	65	43	57	46	10	15
1992[3]	68	9	27	25	56	32	74	75	28	27
Average	73	17	42	31	68	43	78	69	28	30

[1]Estimate based on microtag recoveries raised to total catch and including estimate of non-catch fishing mortality.
[2]Estimate based on counter and catch figures.
[3]Provisional figures.
HR = Hatchery reared.
W = Wild.

Table 4.2.9 Estimated total exploitation rates (in %) of salmon in homewater fisheries in Iceland, Norway and Sweden and Russia.

Year	Iceland[1]	Norway[2]						Sweden[3]		Russia[1]		
	R. Elli-daar	R. Drammen		R. Imsa				R. Lagan[3]		R. Ponoy	R. Kola	R. Tuloma
	W	HR[4]		W		HR[4]		HR2+		W	W+HR	W
	1SW	1SW	2SW	1SW	2SW	1SW	2SW	1SW	2SW	all sea ages		
1985		57	-	73	94	81	100	81		47	90	47
1986	34	81	50	79	82	78	90	93	82	50	77	50
1987		64	52	56	95	83	95	78	55	48	91	49
1988		70	47	51	80	78	91	73	91	77	87	51
1989	41	40	59	65	74	44	65	76	86	78	84	50
1990	44	23	40	42	42	47	68	80	82	50	80	50
1991	37	54	59	37	72	50	66	91	92	20	58	48
1992[5]	48	-	51	57	76	67	91	73	100	11	77	45
Average	41	56	51	58	77	66	83	81	84	48	81	49

[1]Estimate based on counter and catch figures.
[2]Estimates based on external tag recoveries and counter figures.
[3]Estimate based on external tag recoveries and on assumed 50% exploitation in the river brood stock fishery.
[4]HR in R. Drammen and R. Ims are pooled groups of 1+ and 2+ smolts.
[5]Provisional figures.
W = Wild.
HR = Hatchery reared.

Reporting rates for external tags as for Table 4.1.26.; Norway = 0.50.

Table 4.2.10 Nominal catches in Norwegian homewaters 1982-1991 (t round weight) broken down to drift net fishery, marine fishery excluding drift nets (other nets) and freshwater fishery and the proportion of the total catch taken in freshwater.

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992[1]
Drift nets	590	826	866	667	795	552	527	0	0	0	0
Other nets	469	418	458	572	497	461	314	488	514	470	427
Freshwater	289	306	299	322	306	372	235	417	416	407	423
Proportion in freshwater	0.21	0.20	0.18	0.21	0.19	0.27	0.22	0.46	0.45	0.46	0.50
Total	1,348	1,550	1,623	1,561	1,598	1,385	1,076	905	930	877	850

[1]Provisional data

Table 4.2.11 Frequency of net marks on Atlantic salmon in 12 Norwegian rivers sampled during 1978-1988 and in 1990-1992 (unweighted mean).

River %	1978-1988				1990-1992			
	Number of sampling years	Total number of fish examined	Net marks %	Range %	Number of sampling years	Number of fish examined	Net marks %	Range
R. Repparfjord	7	4,812	29	18-45	2	281	35	29-40
R. Malselv	9	2,590	44	12-75	3	822	27	19-32
R. Vefsna	8	2,220	33	16-58	1	102	12	-
R. Namsen	9	4,036	25	12-36	3	609	8	4-14
R. Stjordal	4	889	43	32-63	3	411	17	6-25
R. Orkla	2	132	71	66-76	1	73	19	-
R. Orsta	7	2,094	73	48-90	2	138	20	17-23
R. Gaular	5	1,522	37	23-56	3	367	20	16-27
R. Etne	7	3,883	36	27-52	1	61	8	-
R. Suldal	7	1,025	18	8-43	3	886	2	1-4
R. Imsa	11	2,886	16	6-47	3	1,598	5	4-6
R. Figgjo	4	950	24	12-38	3	529	11	7-17

Table 4.2.12 Exploitation (% of extant stock) in Norwegian fisheries of 1SW salmon from the River Lagan (Sweden). Reporting rates as in Table 4.1.26.

Year of fishery	1SW
1985	5
1986	6
1987	5
1988	11
1989	0
1990	3
1991	1
1992	0

Table 4.2.13 Numbers of external tags recovered in Norway from salmon tagged as smolts in Sweden (1977-1992).

Catch Year N	No. released in year N-1	Number of recaptures				No. rec. per 1000 released in year N-1	
		1SW	2SW	3SW	Total		
1977	4,974	54	5	.	59	11.9	
1978	4,571	57	10	.	67	14.6	
1979	9,968	209	18	.	227	22.8	
1980	5,219	48	14	1	63	12.1	$\bar{x}$ = 10.9
1981	996	16	3	3	22	22.1	
1982	6,546	56	1	1	58	8.9	
1983	8,894	125	10	.	135	15.2	
1984	10,713	26	4	1	31	2.9	
1985	5,724	16	7	2	25	4.4	
1986	5,981	16	4	2	22	3.7	
1987	2,373	16	3	.	19	8.0	
1988	5,864	23	.	2	25	4.3	
1989	8,279	3	1	.	4	0.5	
1990	9,749	4	1	.	5	0.5	$\bar{x}$ = 0.5
1991	8,841	2	.	.	2	0.2	
1992	5,959	3	.	1	4	0.7	

Table 5.1 Production of farmed salmon in the North East Atlantic Commission area (in tonnes round fresh weight), 1980-1992.

Year	Scotland	Norway	Iceland	N. Ireland	Faroe Islands	USSR	Ireland	Total
1980	598	4,153	-	-	-	-	21	4,772
1981	1,133	8,422	-	-	-	-	35	9,590
1982	2,152	10,266	-	-	70	-	100	12,588
1983	2,536	17,000	-	-	110	-	257	19,903
1984	3,912	22,300	-	-	120	-	385	26,717
1985	6,921	28,655	91	-	470	-	700	36,837
1986	10,338	45,675	123	-	1,370	-	1,215	58,721
1987	12,721	47,417	490	-	3,530	-	2,232	66,390
1988	17,951	80,371	1,053	-	3,300	-	4,700	107,375
1989	28,553	124,000	1,480	-	8,000	-	5,068	167,101
1990	32,350	165,000	2,800	< 100	13,000	5	5,983	219,238
1991	40,593	155,000	2,680	100	15,000	0	9,483	222,856
1992	36,101	140,000	2,100	200	17,000	0	9,231	204,632

Table 6.1 Input and output data for the national run reconstruction model.

INPUT DATA FOR THE MODEL:	
Natural mortality after first sea winter:	M
Tag recapture data for:	
1SW recaptures at Faroes	R_{f1}
2SW recaptures at Faroes	R_{f2}
1SW recaptures at West Greenland	R_{g1}
1SW recaptures in homewater fisheries of neighbouring country	R_{j1}
2SW recaptures in homewater fisheries of neighbouring country	R_{j2}
1SW recaptures in homewaters	R_{h1}
2SW recaptures in homewaters	R_{h2}
1SW spawning escapement	S_1
2SW spawning escapement	S_2
Correction factors for:	
1SW exploitation level in fisheries of neighbouring country	X_1
2SW exploitation lebel in fisheries of neighbouring country	X_2
1SW exploitation in homewaters	Y_1
2SW exploitation in homewaters	Y_2
Total homewater catches of:	
1SW salmon	N_1
2SW salmon	N_2
OUTPUT FROM THE MODEL:	
Estimates of total catches of salmon from a nation as:	
1SW salmon at Faroes	N_{f1}
2SW salmon at Faroes	N_{f2}
1SW salmon at West Greenland	N_{g1}
1SW salmon in homewater fisheries of neighbouring country	N_{j1}
2SW salmon in homewater fisheries of neighbouring country	N_{j2}

Table 6.2.1 Input data for national run-reconstruction model for 1989 smolt migration.

Area	Eng&Wal	Finland	France	Iceland	Ireland	N.Ireland	Norway	Scotland	Sweden	Russia	Totals
No tagged	-	-	-	-	185439	9812	6403	4967	3970	-	210591
NEA catch 1sw	-	-	-	-	105	0	0	3	4	-	112
NEA catch 2sw	-	-	-	-	0	0	13	1	13	-	27
NEA catch 3sw	-	-	-	-	0	0	0	0	0	-	0
WG catch 1sw	-	-	-	-	45	0	1	0	0	-	46
WG catch 2sw	-	-	-	-	0	0	0	1	0	-	1
Intercept'n 1sw	-	-	-	-	135	46	0	6	6	-	193
Intercept'n 2sw	-	-	-	-	0	6	1	4	2	-	13
Intercept'n 3sw	-	-	-	-	0	0	0	0	0	-	0
H-W net 1sw	-	-	-	-	7840	573	33	67	108	-	8621
H-W net 2sw	-	-	-	-	176	6	29	24	42	-	277
H-W net 3sw	-	-	-	-	0	0	0	1	0	-	1
Rod catch 1sw	-	-	-	-	1055	0	0	1	51	-	1107
Rod catch 2sw	-	-	-	-	0	0	0	4	8	-	12
Rod catch 3sw	-	-	-	-	0	0	0	1	0	-	1
Spawners 1sw	-	-	-	-	5567	339	135	26	38	-	6105
Spawners 2sw	-	-	-	-	0	16	39	18	4	-	77
Spawners 3sw	-	-	-	-	0	0	0	9	0	-	9

Scaling data - HW net catch:

1sw	-	-	-	-	181101	26133	192500	61728	7428	-
2sw	-	-	-	-	14684	2878	92214	18051	3620	-
3sw	-	-	-	-	0	0	0	1805	0	-

Exploitation correction factors:

y1	-	-	-	-	1.00	1.00	1.00	1.00	1.00	-
y2	-	-	-	-	1.00	1.00	1.00	1.00	1.00	-
y3	-	-	-	-	1.00	1.00	1.00	1.00	1.00	-
x1	-	-	-	-	1.00	1.00	1.00	1.00	0.80	-
x2	-	-	-	-	1.00	1.00	1.00	1.00	0.90	-
x3	-	-	-	-	1.00	1.00	1.00	1.00	1.00	-

Table 6.2.2 Input data for national run-reconstruction model for 1990 smolt migration

Area	Eng&Wal	Finland	France	Iceland	Ireland	N.Ireland	Norway	Scotland	Sweden	Russia	Totals
No tagged	-	-	-	-	153821	24522	10773	17445	2994	-	209555
NEA catch 1sw	-	-	-	-	44	0	0	1	3	-	48
NEA catch 2sw	-	-	-	-	1	0	3	0	3	-	7
NEA catch 3sw	-	-	-	-	0	0	0	0	0	-	0
WG catch 1sw	-	-	-	-	47	8	0	9	1	-	65
WG catch 2sw	-	-	-	-	0	0	0	0	0	-	0
Intercept'n 1sw	-	-	-	-	229	223	0	0	2	-	454
Intercept'n 2sw	-	-	-	-	0	9	0	4	0	-	13
Intercept'n 3sw	-	-	-	-	0	0	0	0	0	-	0
H-W net 1sw	-	-	-	-	5942	638	17	137	129	-	6863
H-W net 2sw	-	-	-	-	80	22	18	48	91	-	259
H-W net 3sw	-	-	-	-	0	0	0	0	0	-	0
Rod catch 1sw	-	-	-	-	281	0	0	17	14	-	312
Rod catch 2sw	-	-	-	-	0	0	0	8	1	-	9
Rod catch 3sw	-	-	-	-	0	0	0	0	0	-	0
Spawners 1sw	-	-	-	-	3185	702	54	129	14	-	4084
Spawners 2sw	-	-	-	-	667	65	28	35	0	-	795
Spawners 3sw	-	-	-	-	0	0	0	0	0	-	0

Scaling data - HW net catch:

1sw	-	-	-	-	125430	16306	171041	56294	8987	-
2sw	-	-	-	-	10170	4677	94624	22616	4656	-
3sw	-	-	-	-	0	0	0	0	0	-

Exploitation correction factors:

y1	-	-	-	-	1.00	1.00	1.00	1.00	1.00	-
y2	-	-	-	-	1.00	1.00	1.00	1.00	1.00	-
y3	-	-	-	-	1.00	1.00	1.00	1.00	1.00	-
x1	-	-	-	-	1.00	1.00	1.00	1.00	0.80	-
x2	-	-	-	-	1.00	1.00	1.00	1.00	0.90	-
x3	-	-	-	-	1.00	1.00	1.00	1.00	1.00	-

Table 6.2.3 Estimates of national stock contributions to fisheries outside homewaters using the national run-reconstruction model for the 1989 smolt migration.

Area	Eng&Wal	Finland	France	Iceland	Ireland	N.Ireland	Norway	Scotland	Sweden	Russia	Totals
NEA catch 1sw	-	-	-	-	2529	0	0	2827	355	-	5711
NEA catch 2sw	-	-	-	-	0	0	41337	971	1245	-	43553
NEA catch 3sw	-	-	-	-	0	0	0	0	0	-	0
WG catch 1sw	-	-	-	-	3754	0	3180	0	0	-	6934
WG catch 2sw	-	-	-	-	0	0	0	1805	0	-	1805
H-W intercep'n 1sw	-	-	-	-	3118	2098	0	5528	516	-	11260
H-W intercep'n 2sw	-	-	-	-	0	2878	3180	3009	192	-	9258
H-W intercep'n 3sw	-	-	-	-	0	0	0	0	0	-	0
H-W net 1sw	-	-	-	-	181101	26133	192500	61728	7428	-	468890
H-W net 2sw	-	-	-	-	14684	2878	92214	18051	3620	-	131447
H-W net 3sw	-	-	-	-	0	0	0	1805	0	-	1805

Totals:

Area	Eng&Wal	Finland	France	Iceland	Ireland	N.Ireland	Norway	Scotland	Sweden	Russia	Totals
NEA catch	-	-	-	-	2529	0	41337	3798	1600	-	49264
WG'land catch	-	-	-	-	3754	0	3180	1805	0	-	8739
H-W Interc'n	-	-	-	-	3118	4976	3180	8536	707	-	20518
H-W net catch	-	-	-	-	195785	29011	284714	81584	11048	-	602142

Table 6.2.4 Estimates of national stock contributions to fisheries outside homewaters using the national run-reconstruction model for the 1990 smolt migration.

Area	Eng&Wal	Finland	France	Iceland	Ireland	N.Ireland	Norway	Scotland	Sweden	Russia	Totals
NEA catch 1sw	-	-	-	-	1326	0	0	428	225	-	1979
NEA catch 2sw	-	-	-	-	127	0	15771	0	171	-	16068
NEA catch 3sw	-	-	-	-	0	0	0	0	0	-	0
WG catch 1sw	-	-	-	-	5975	1701	0	4241	57	-	11973
WG catch 2sw	-	-	-	-	0	0	0	0	0	-	0
H-W intercep'n 1sw	-	-	-	-	4834	5699	0	0	174	-	10708
H-W intercep'n 2sw	-	-	-	-	0	1913	0	1885	0	-	3798
H-W intercep'n 3sw	-	-	-	-	0	0	0	0	0	-	0
H-W net 1sw	-	-	-	-	125430	16306	171041	56294	8987	-	378058
H-W net 2sw	-	-	-	-	10170	4677	94624	22616	4656	-	136743
H-W net 3sw	-	-	-	-	0	0	0	0	0	-	0

Totals:

Area	Eng&Wal	Finland	France	Iceland	Ireland	N.Ireland	Norway	Scotland	Sweden	Russia	Totals
NEA catch	-	-	-	-	1453	0	15771	428	395	-	18047
WG'land catch	-	-	-	-	5975	1701	0	4241	57	-	11973
H-W Interc'n	-	-	-	-	4834	7613	0	1885	174	-	14506
H-W net catch	-	-	-	-	135600	20983	265665	78910	13643	-	514801

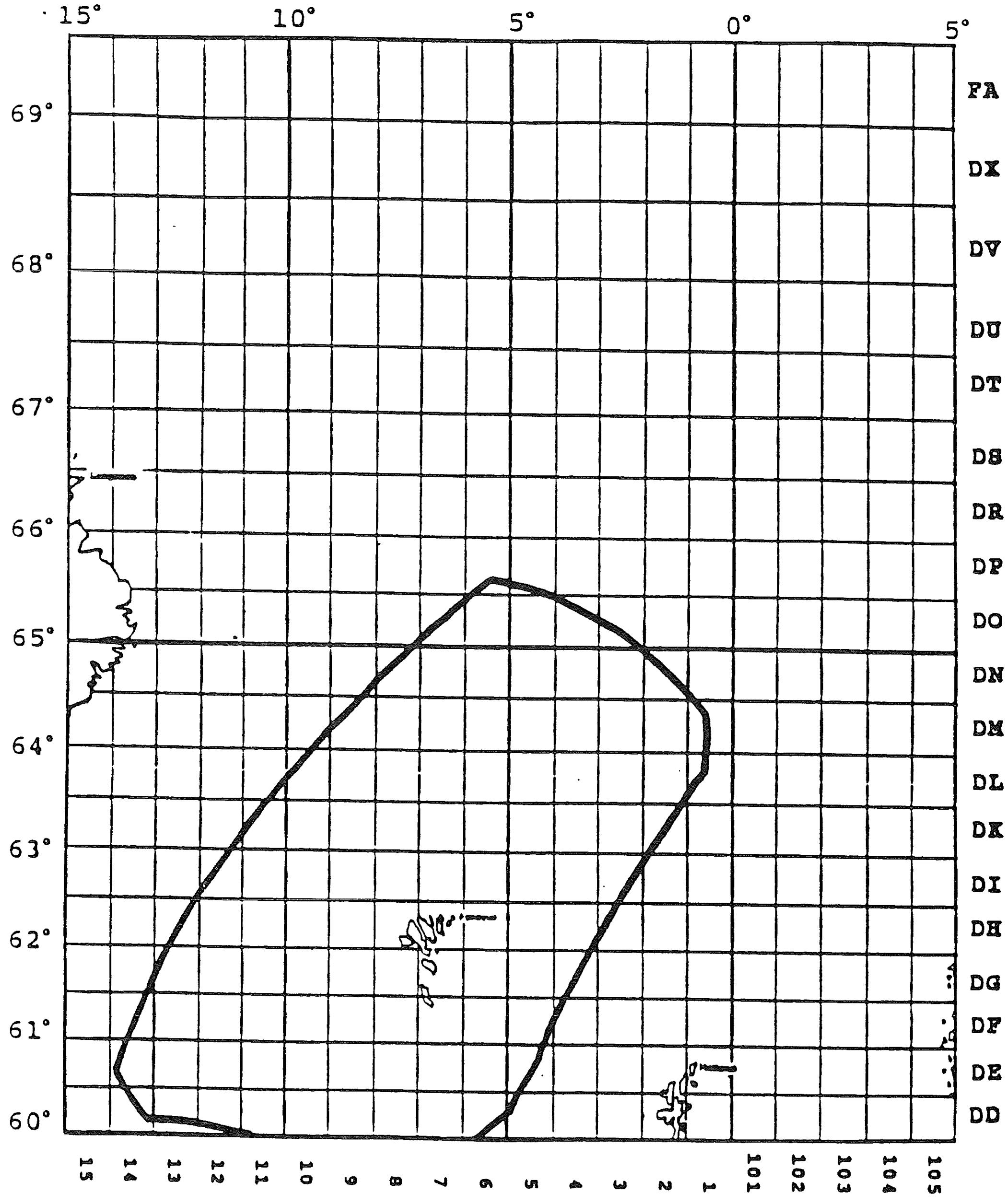


Figure 4.1.1 The Faroe Exclusive Economic zone (EEZ).

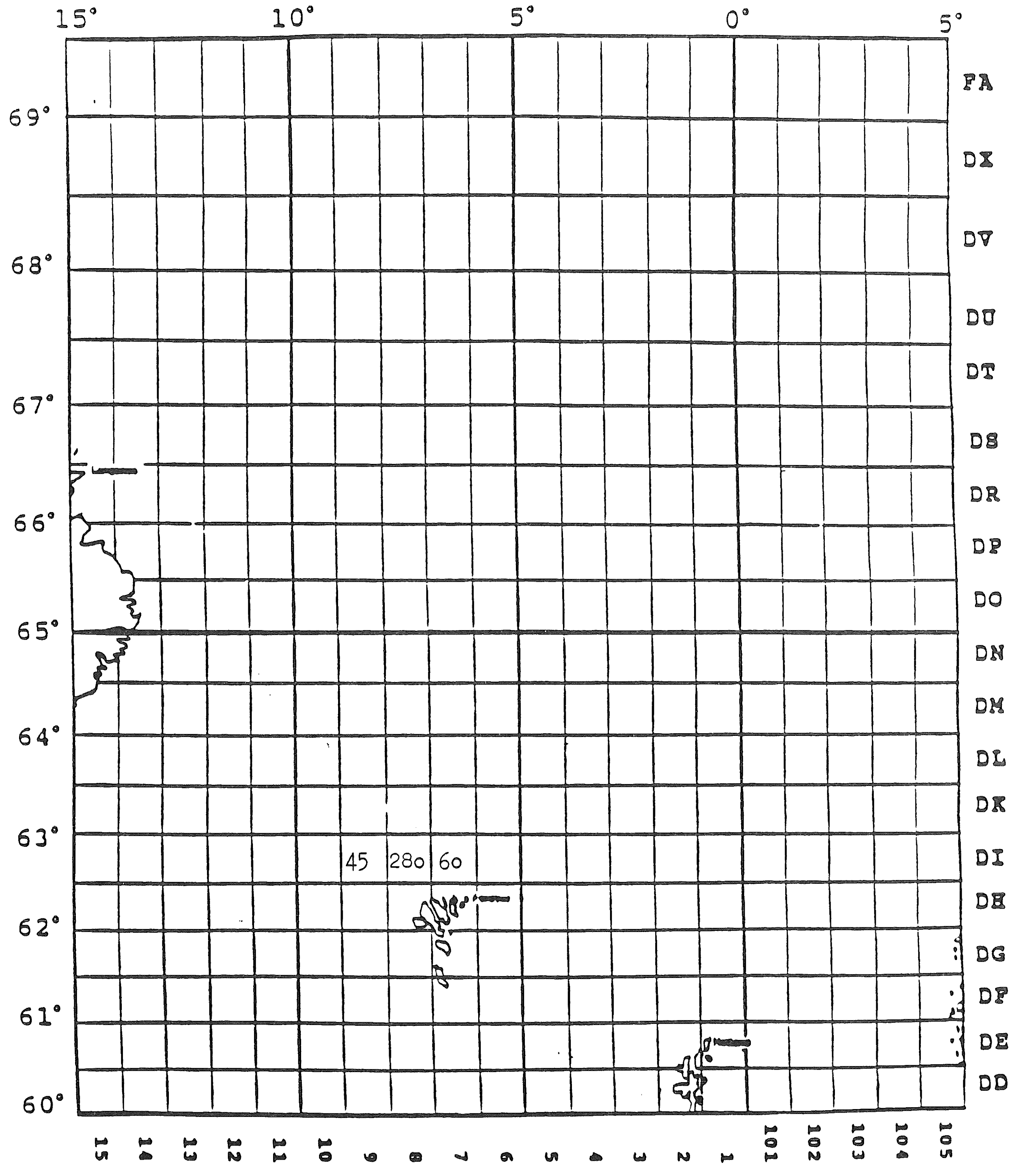


Figure 4.1.2 Catch/10 December 1991.

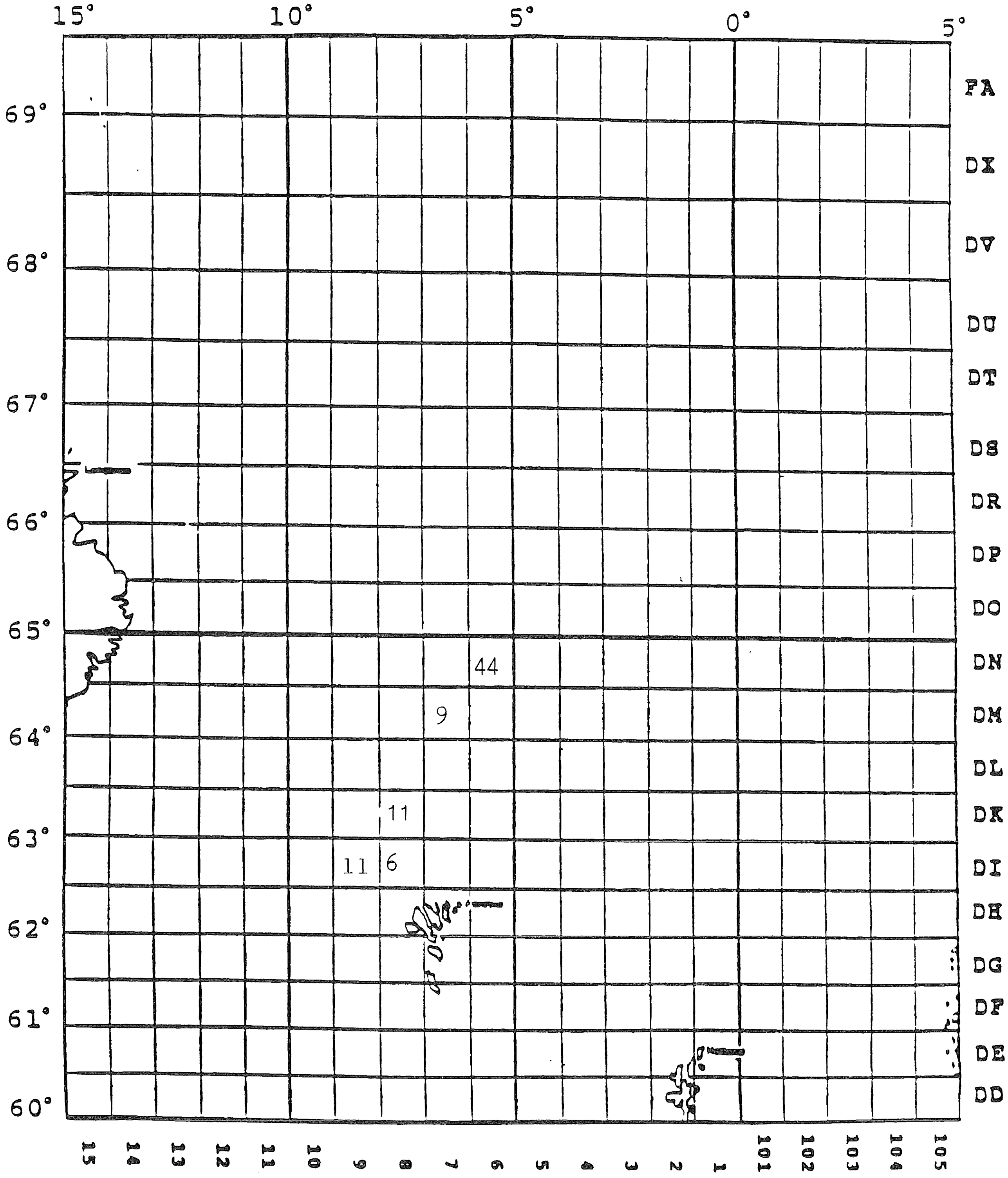


Figure 4.1.3 Catch/10 February 1992.

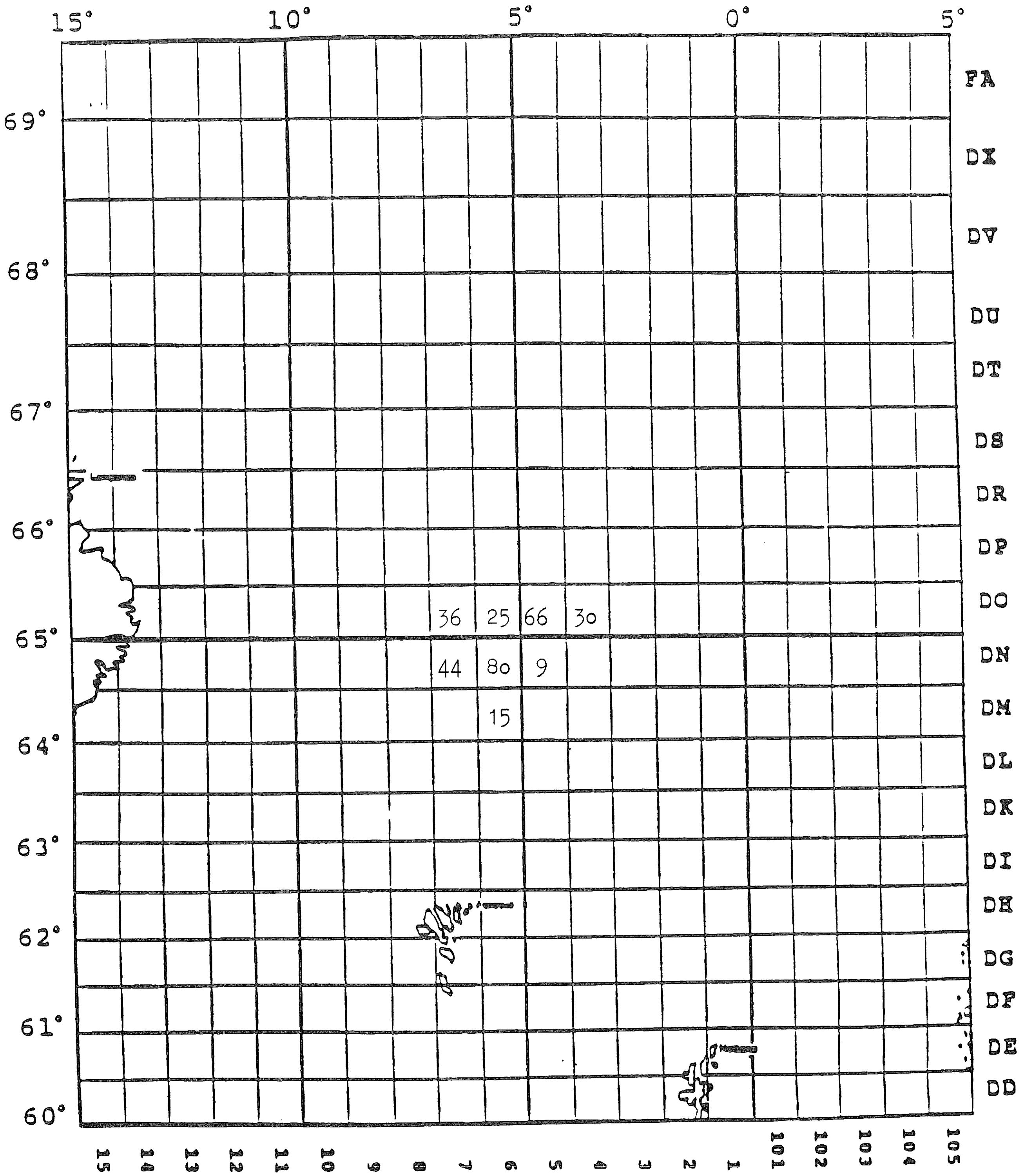


Figure 4.1.4 Catch/10 March 1992.

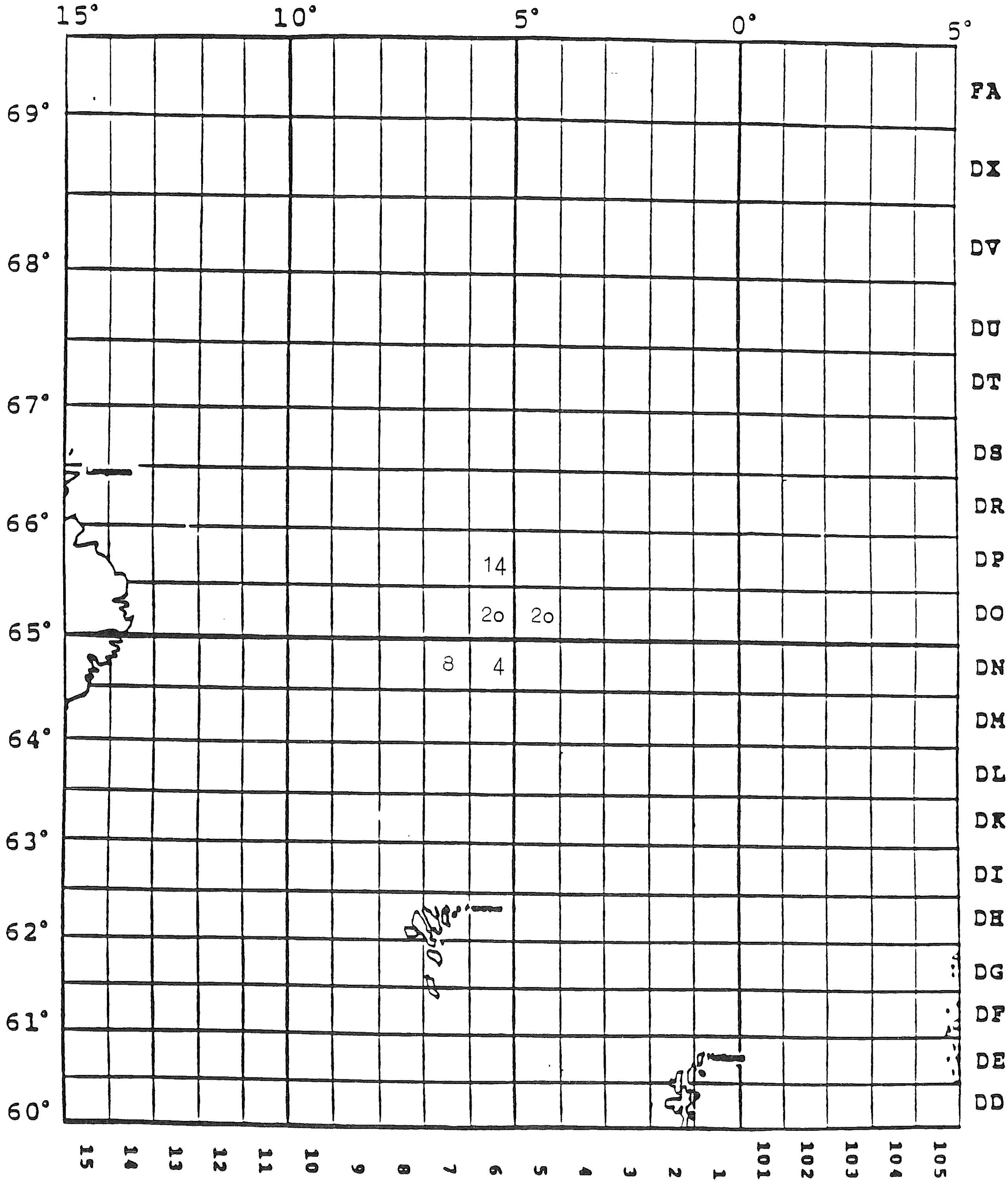


Figure 4.1.5 Catch/10 April 1992.

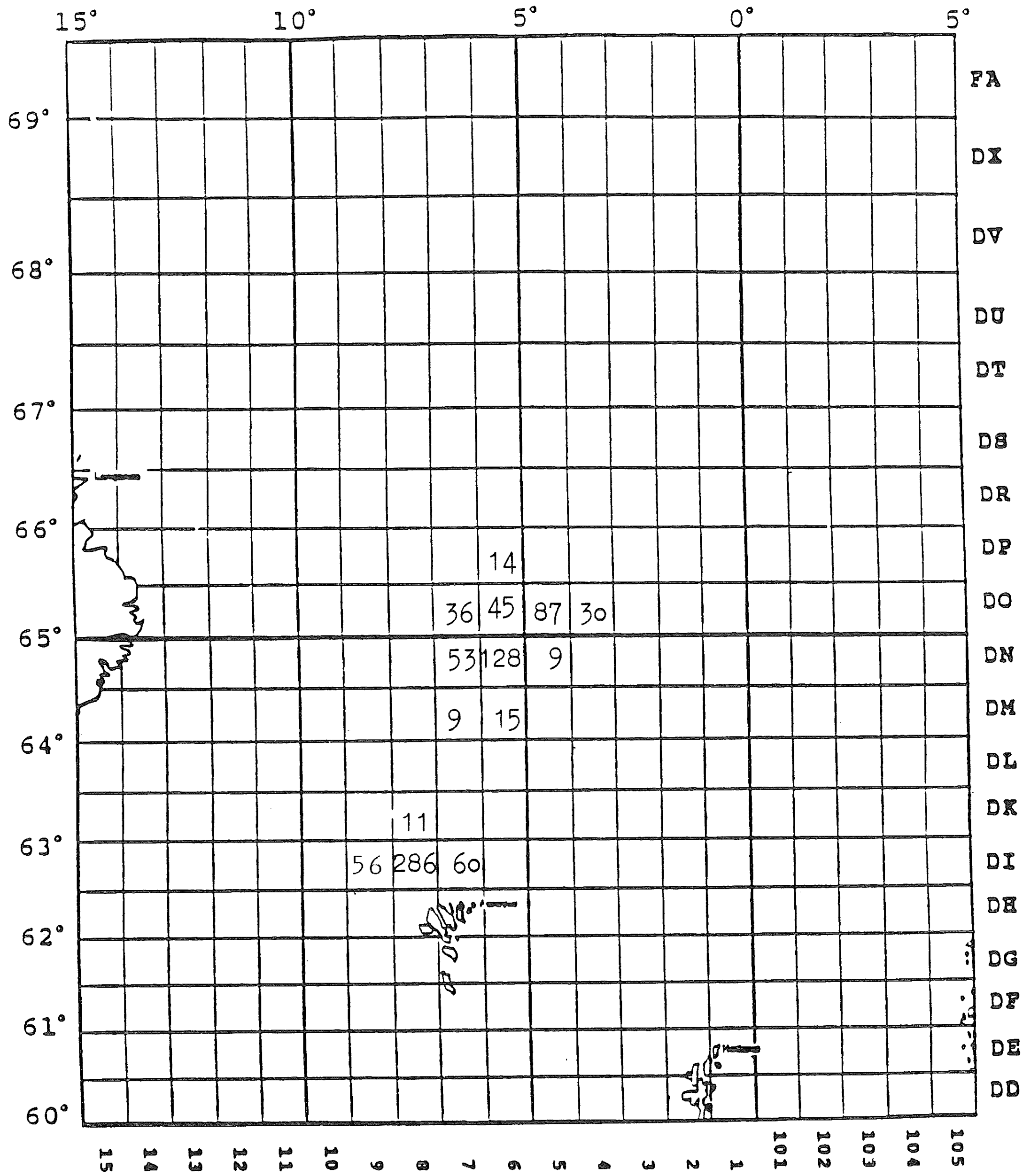


Figure 4.1.6 Catch/10. Total 1991/1992 season.

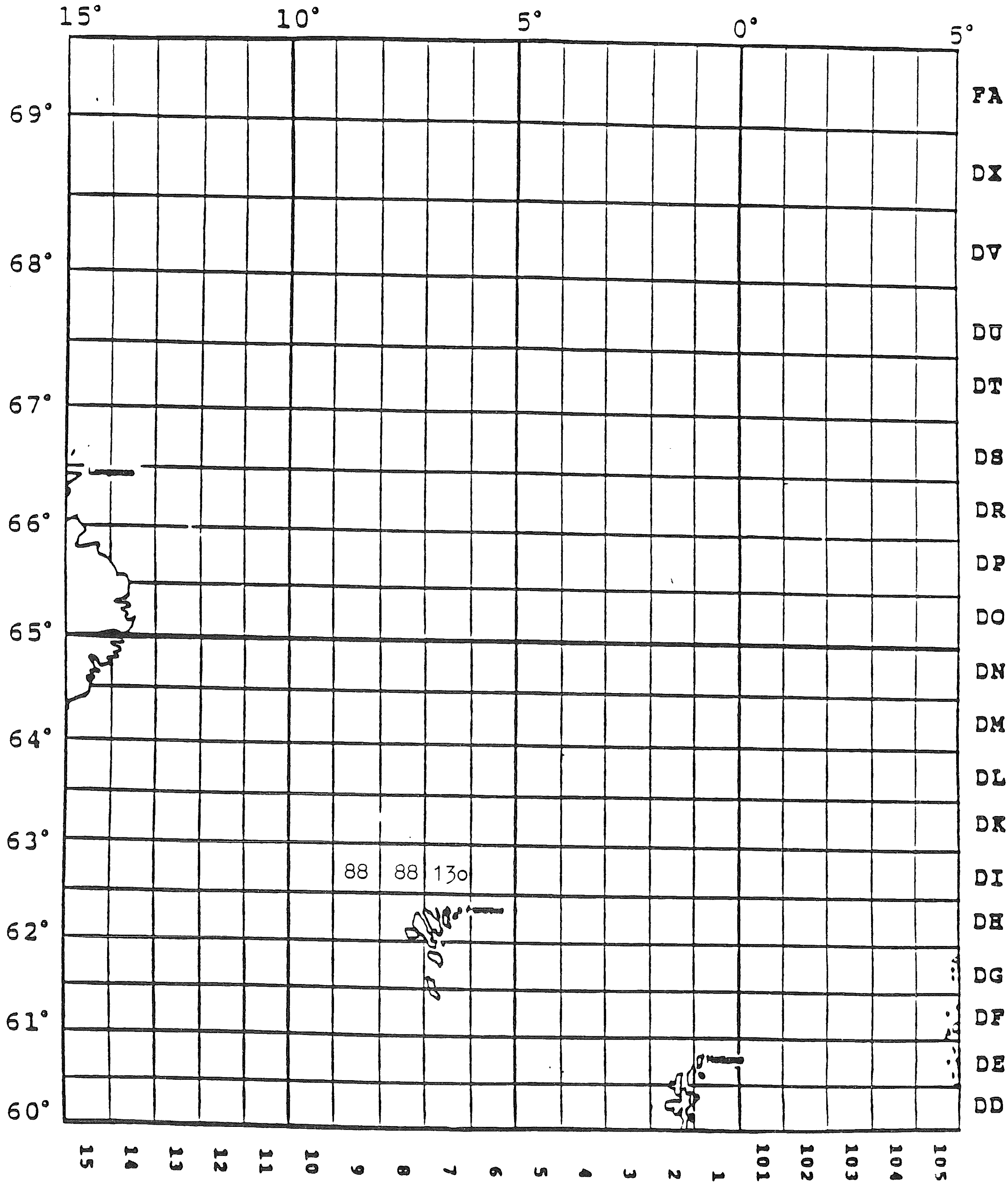


Figure 4.1.7 CPUE (1000 hooks) December 1991.

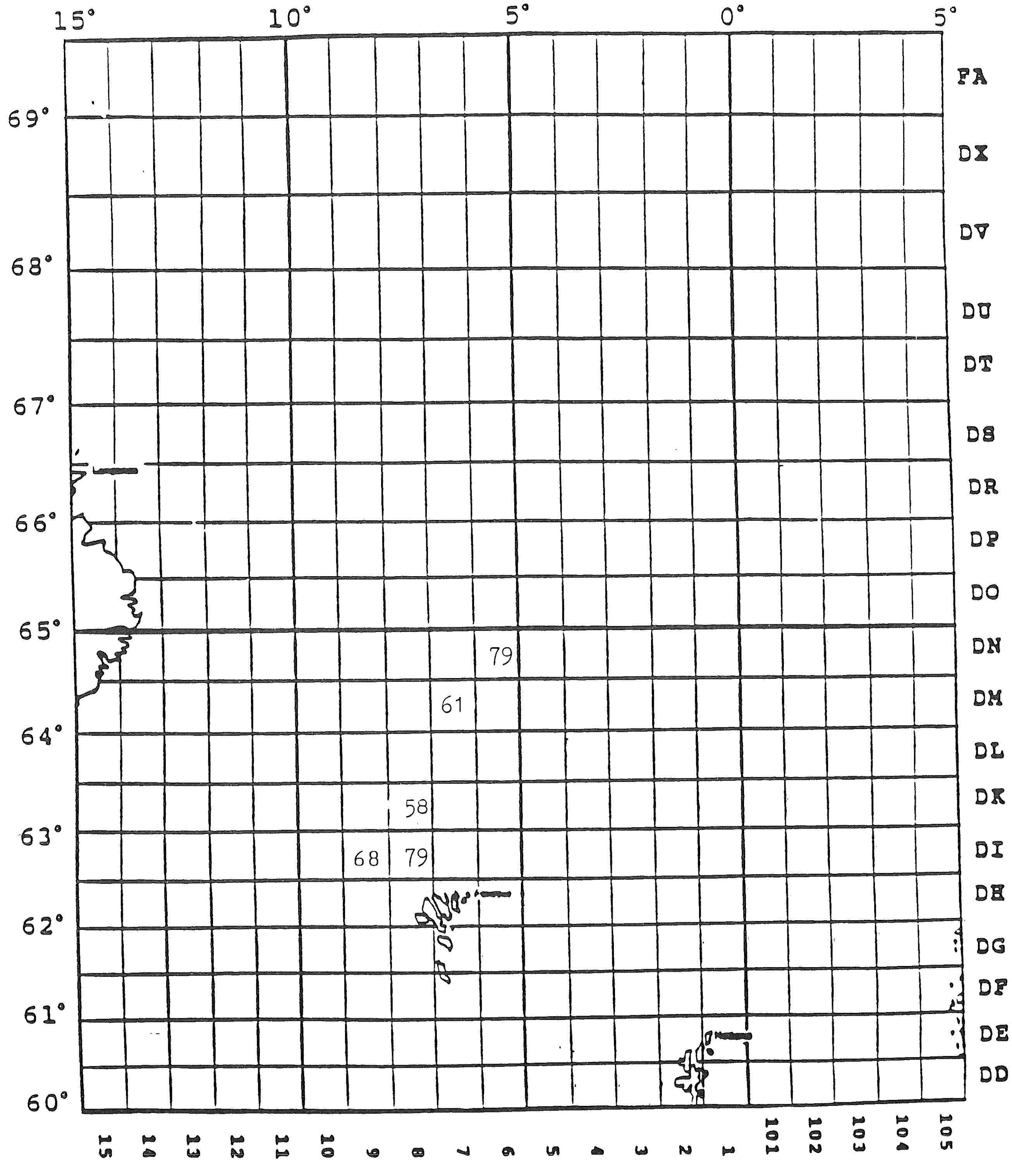


Figure 4.1.8 CPUE February 1992.

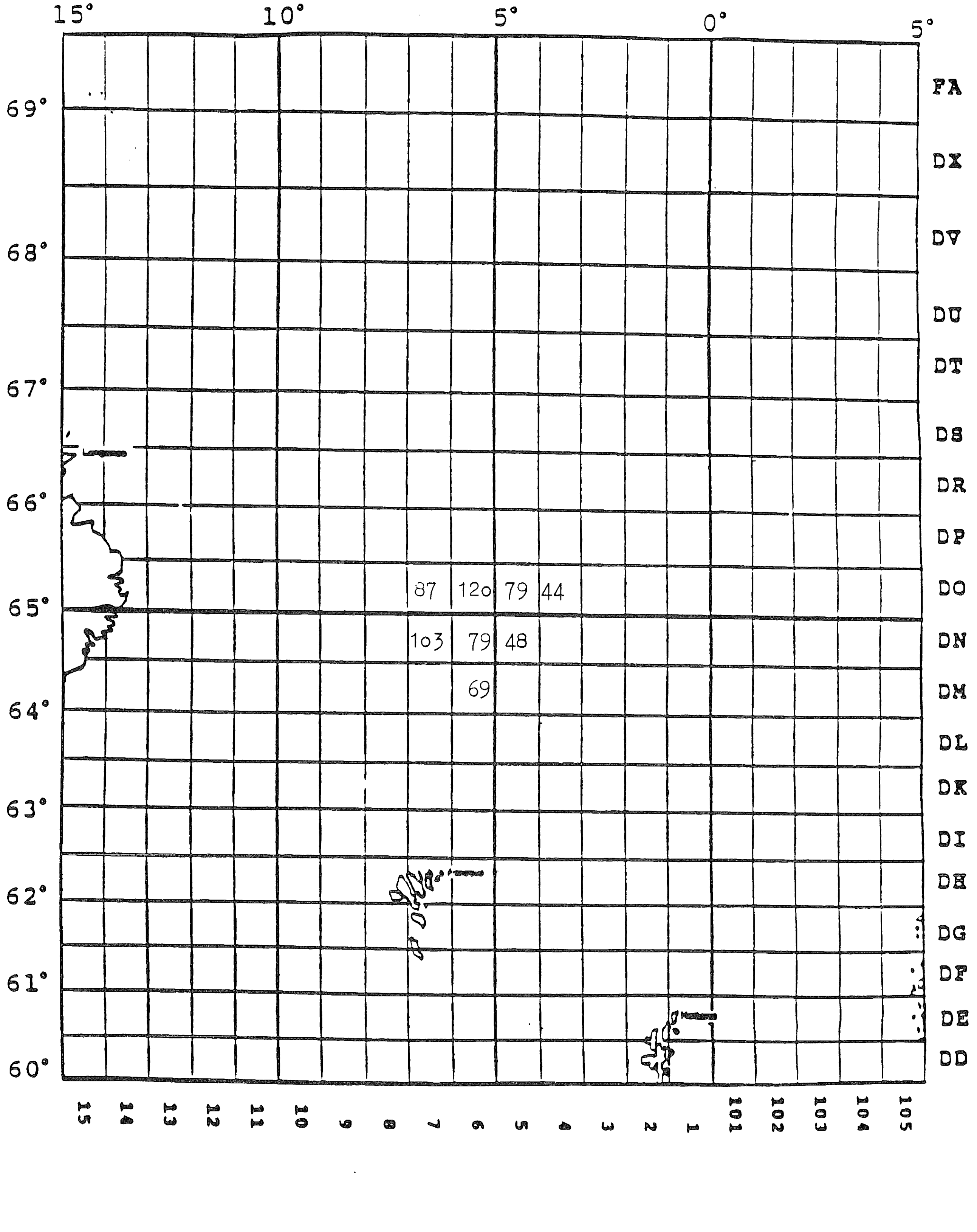


Figure 4.1.9 CPUE March 1992.

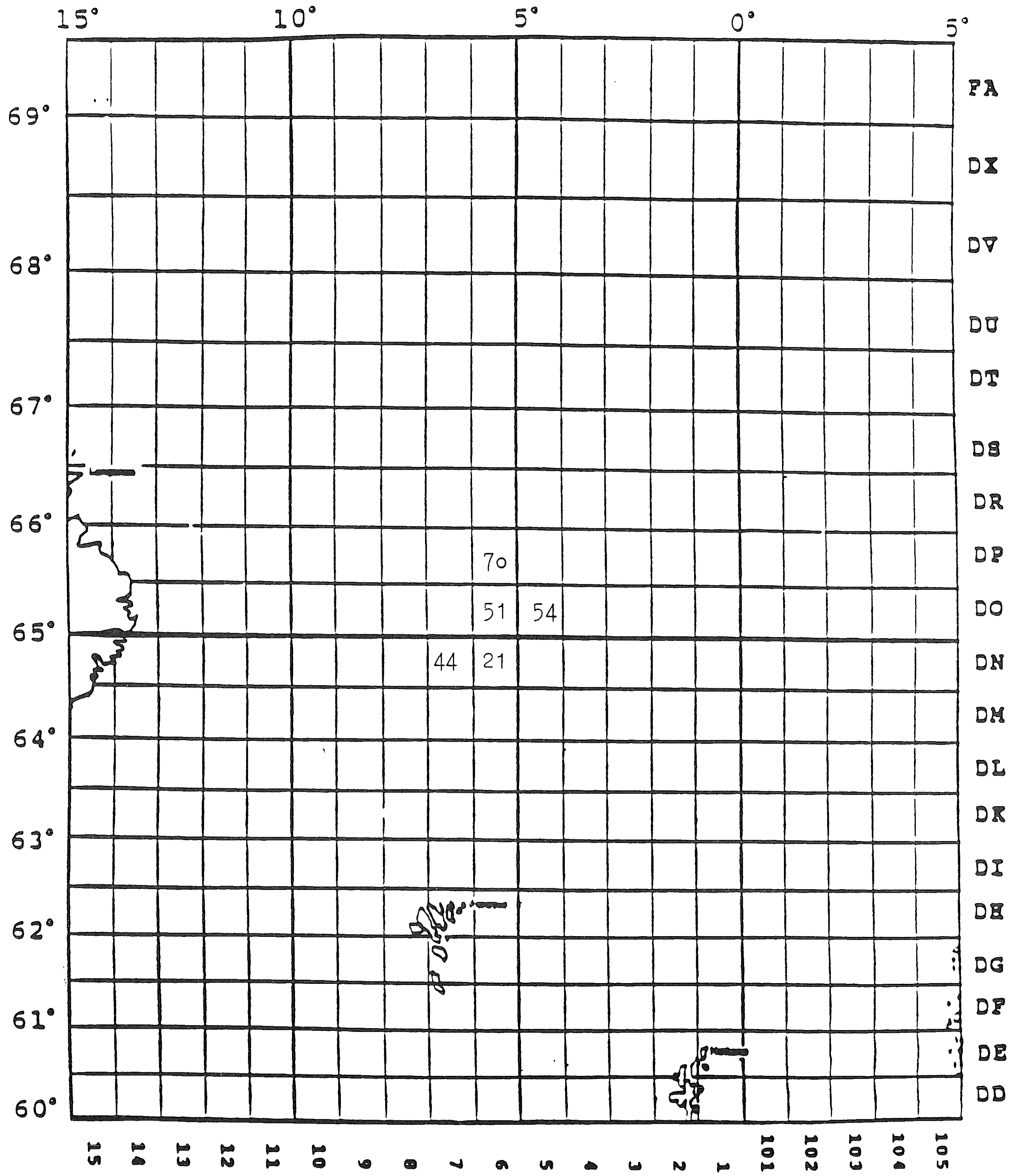


Figure 4.1.10 CPUE April 1992.

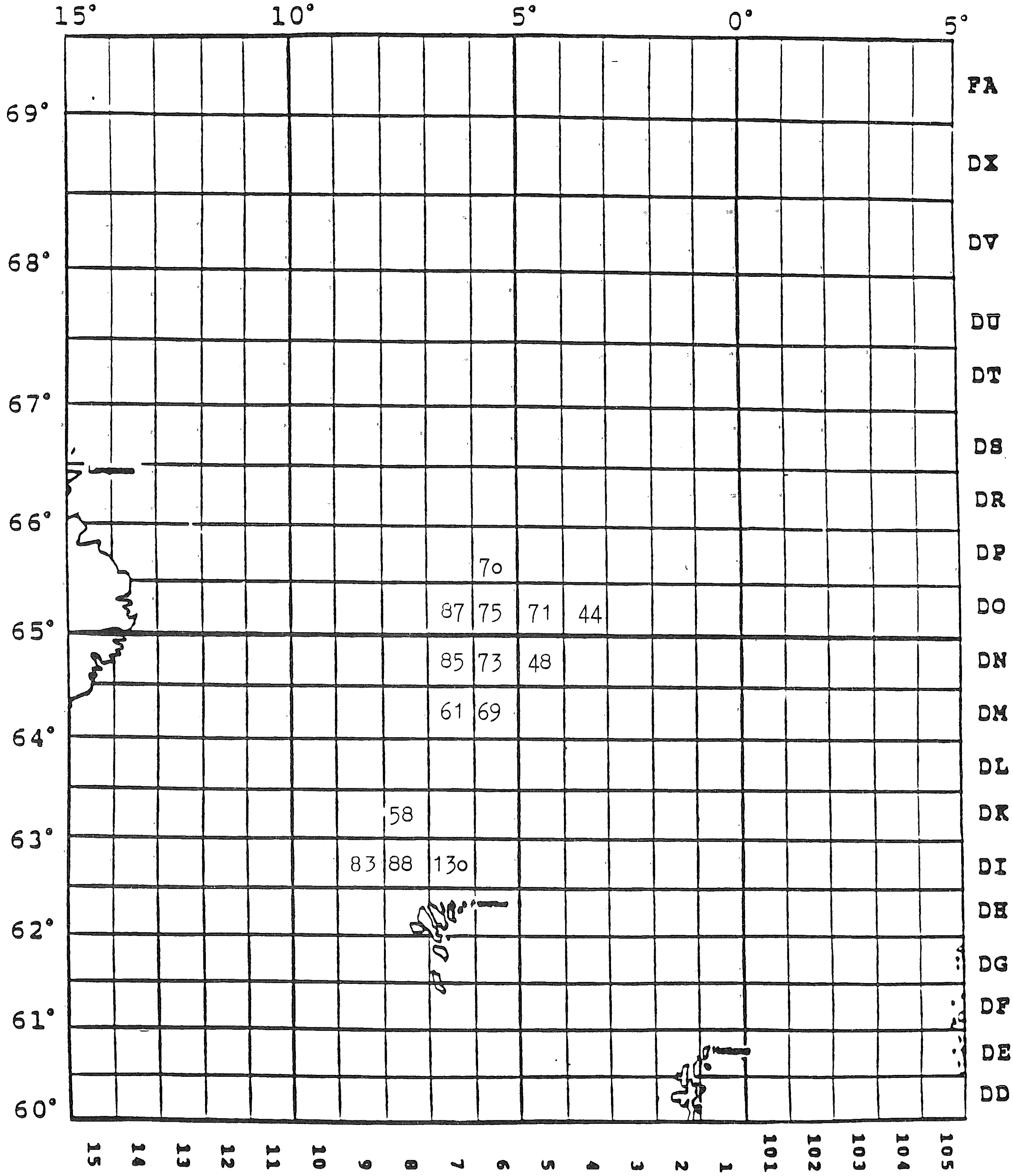


Figure 4.1.11 CPUE (per 1000 hooks). Total 1991/1992 season.

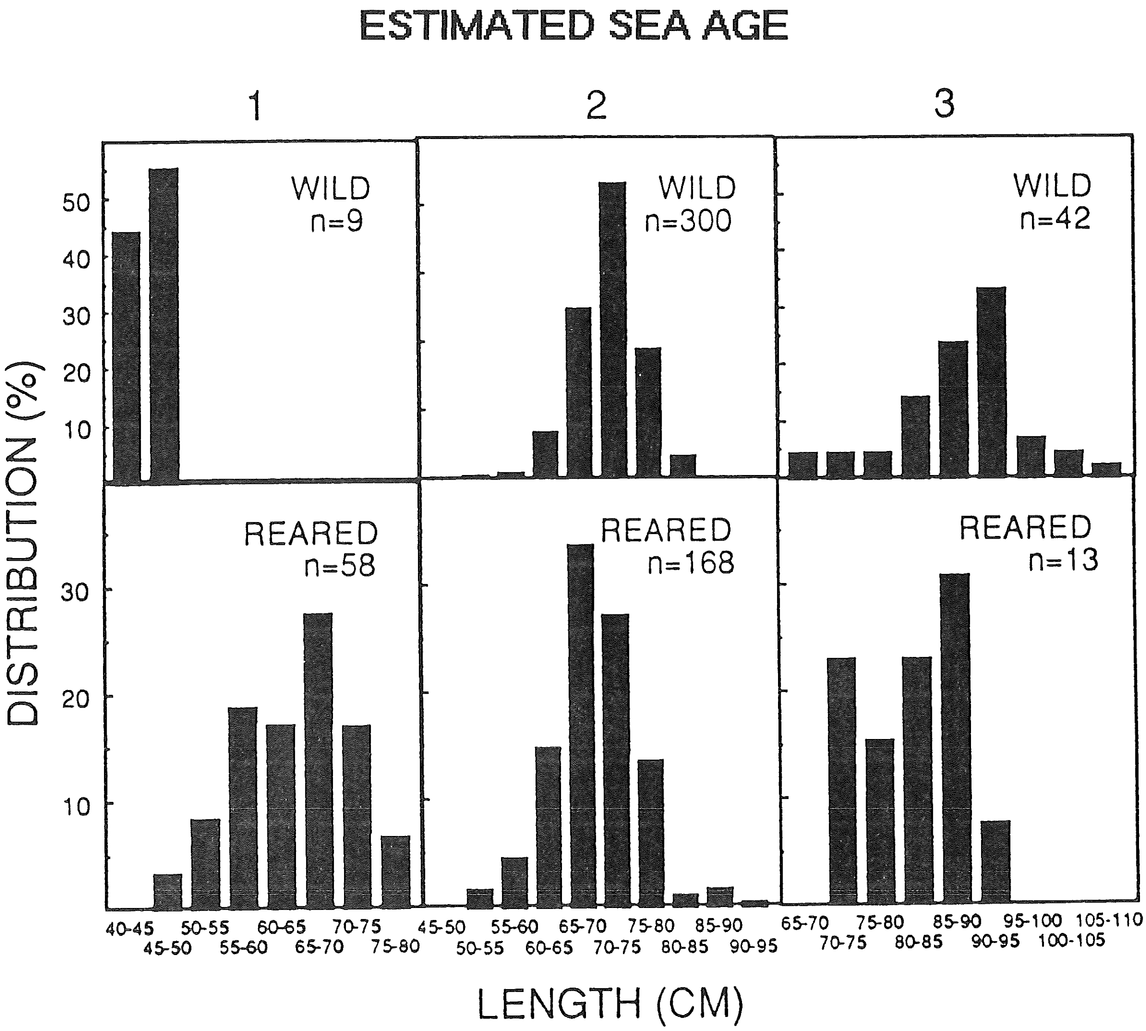


Figure 4.1.12 Length distribution of salmon within sea age groups (1-3)(estimated from scale reading) of wild and reared salmon in pooled samples from the Faroes salmon fishery.

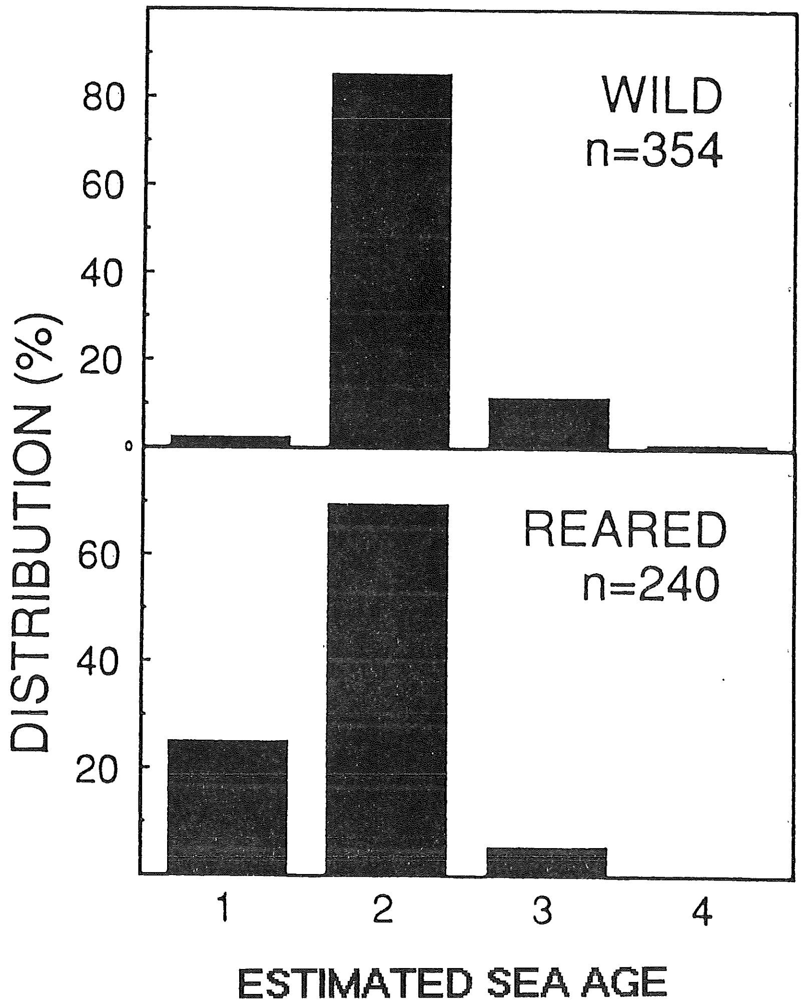


Figure 4.1.13 Sea age distribution (estimated from scale reading) of wild and reared salmon in pooled samples from the Faroes salmon fishery.

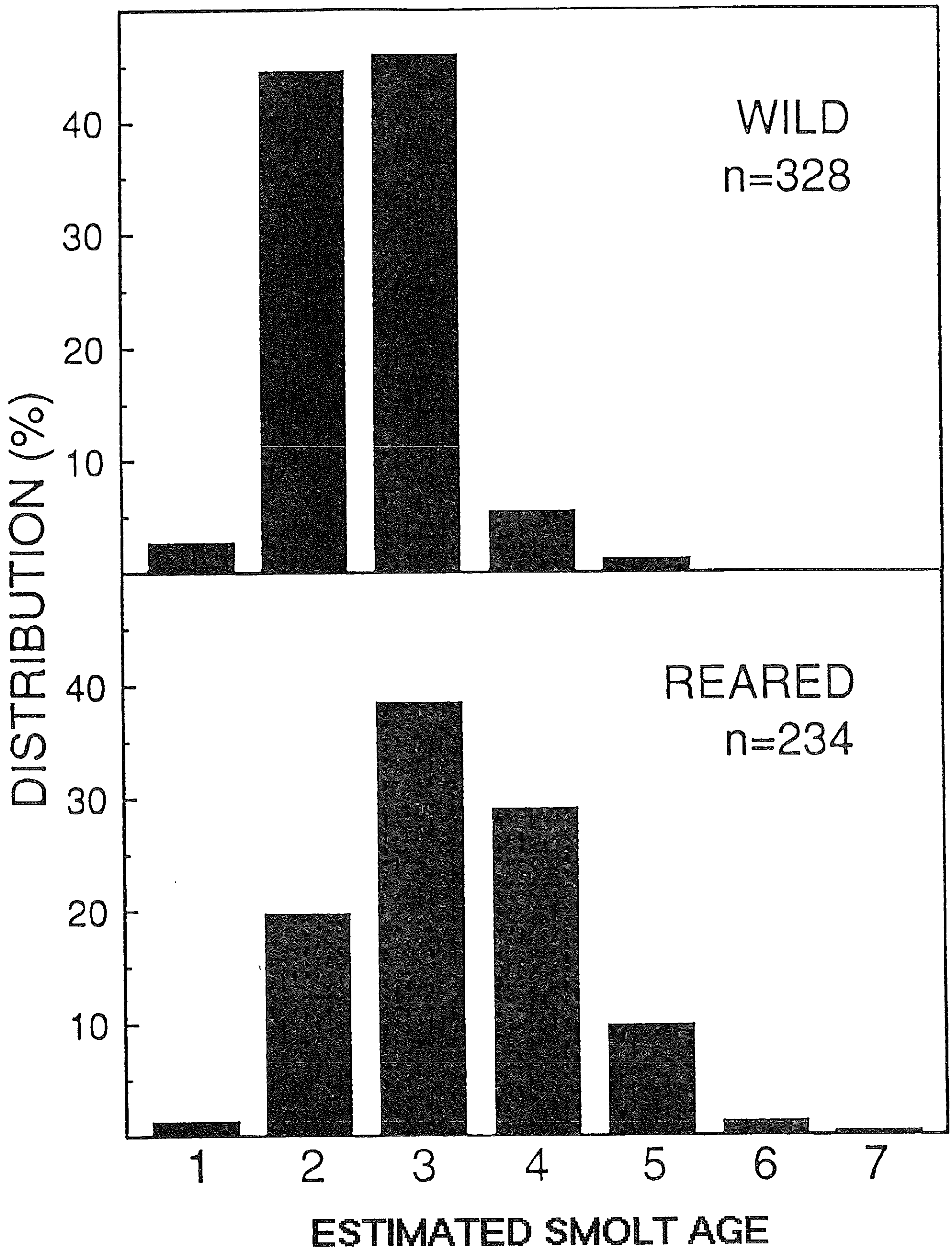


Figure 4.1.14 Smolt age distribution (estimated from scale reading) of wild and reared salmon in pooled samples from the Faroes salmon fishery.

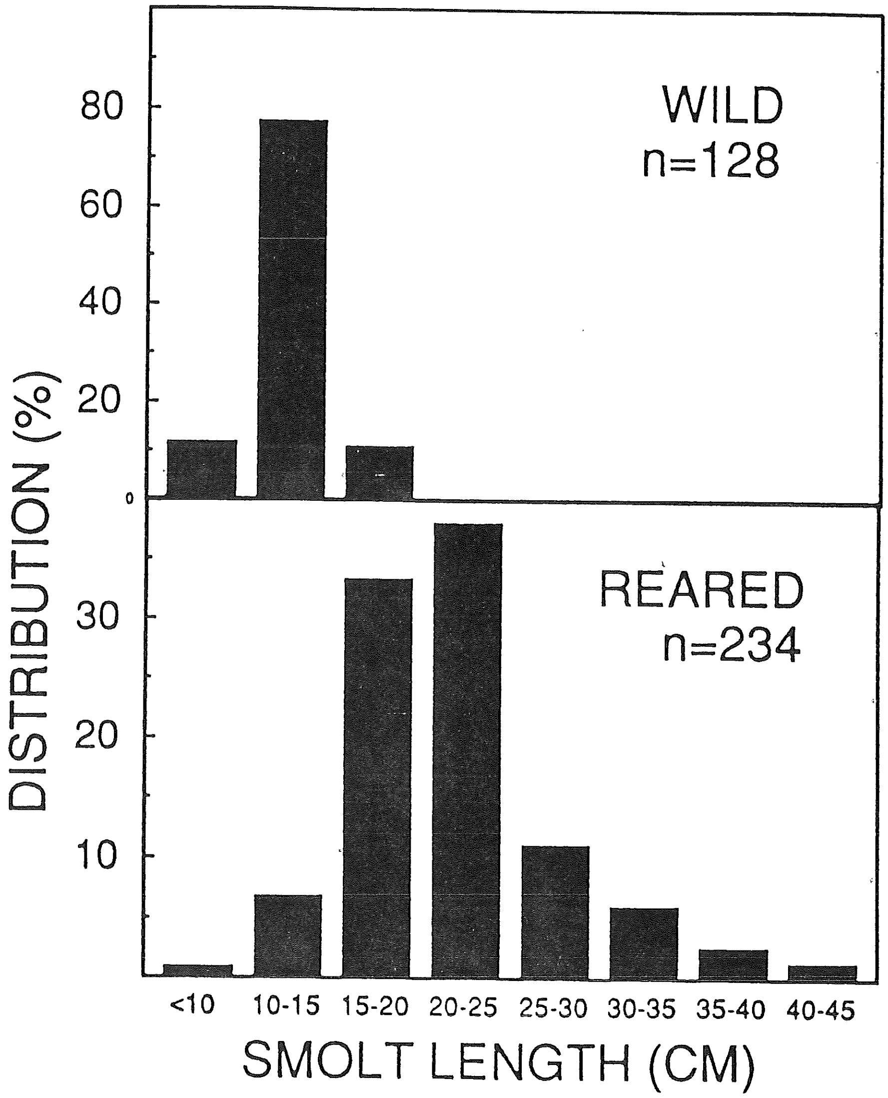


Figure 4.1.15 Smolt length distribution (estimated by back calculation from scales) of wild and reared salmon in pooled samples from the Faroes salmon fishery.

Figure 4.1.16 Comparison of tag recapture rates in the Faroes fishery per 1000 tagged smolts released from countries in the North East Atlantic (external tags and CWTs)

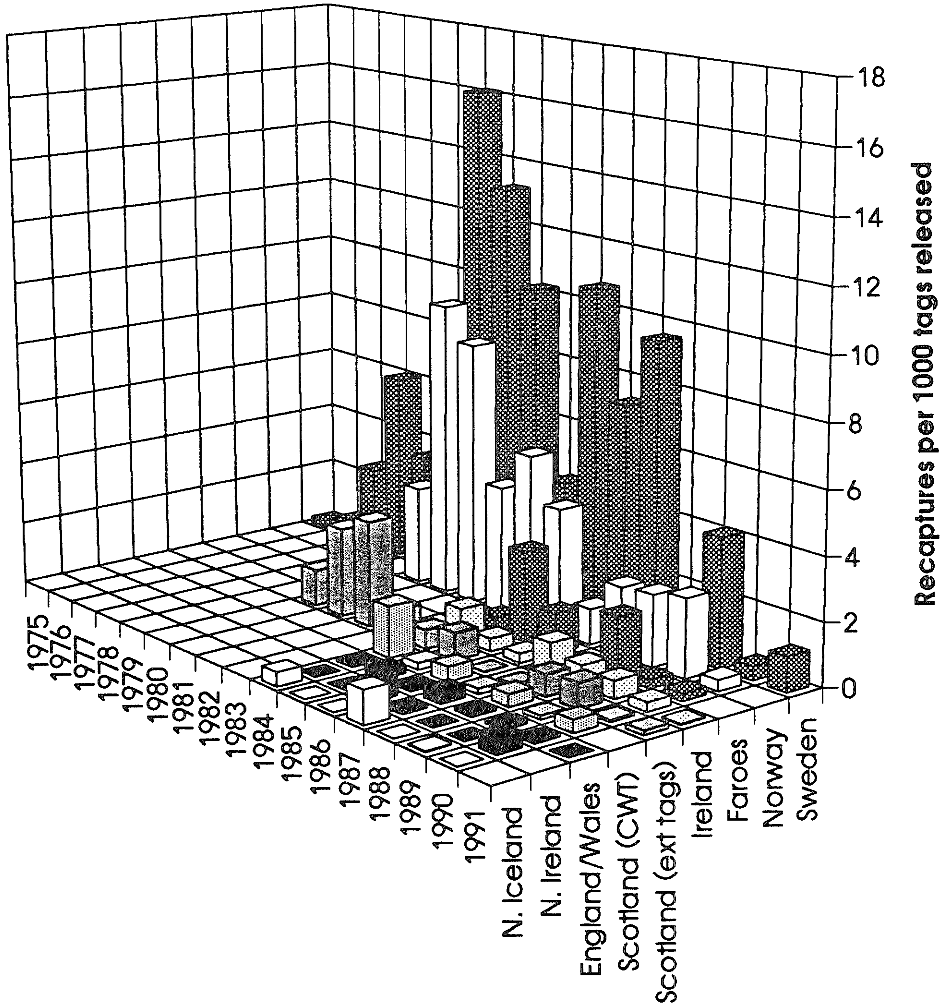


Figure 4.2.1a Numbers of units of some gear used or authorised for use for salmon fishing in countries in the North East Atlantic, 1980-92

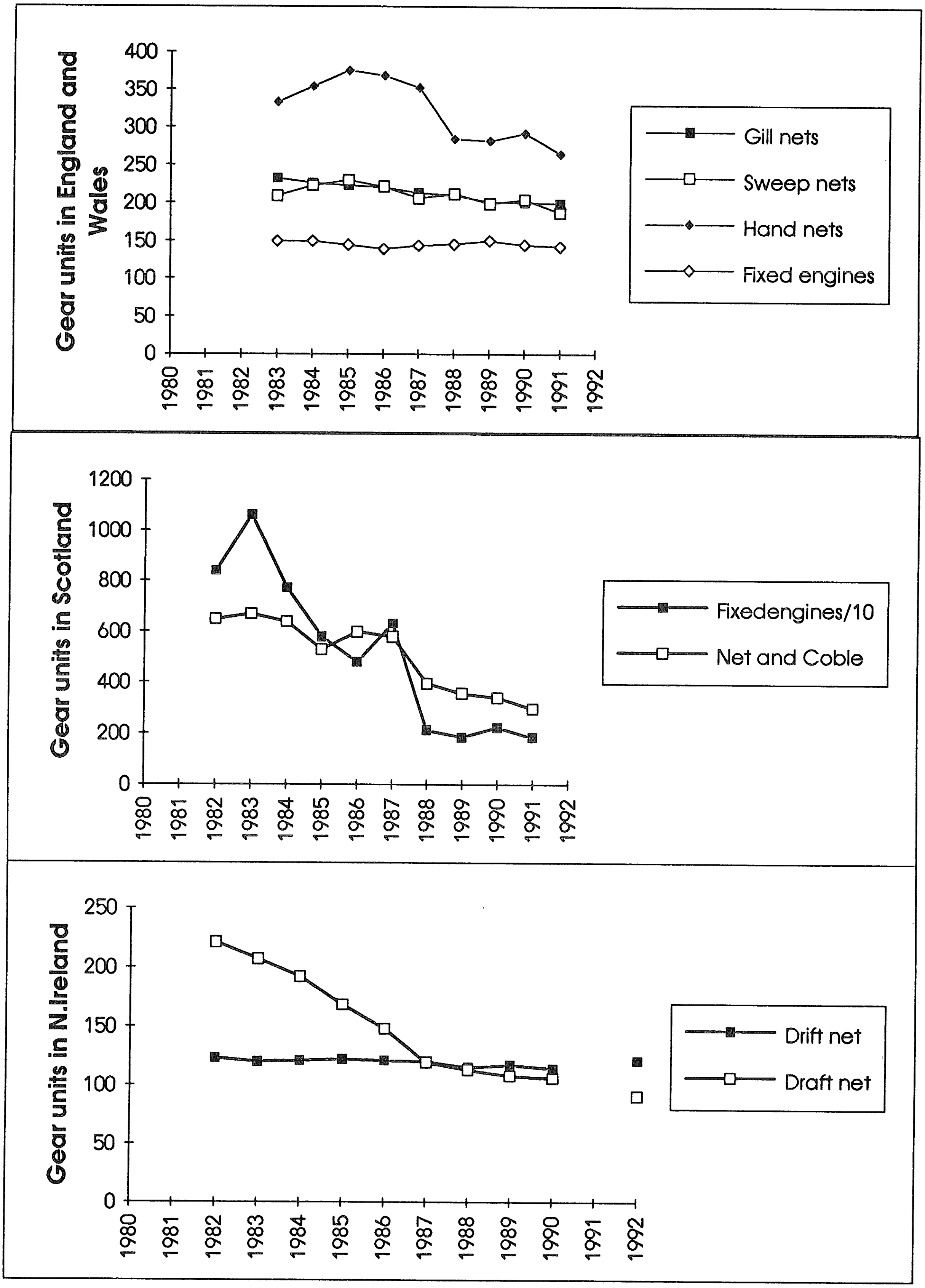
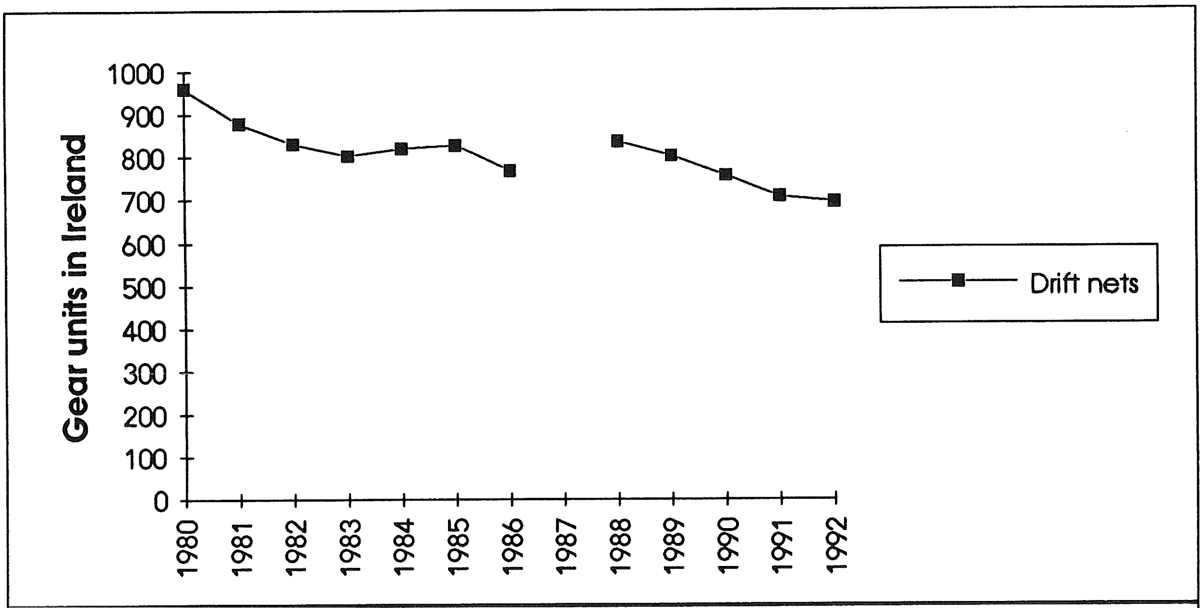


Figure 4.2.1b Numbers of units of some gear used or authorised for use for salmon fishing in countries in the North East Atlantic, 1980-92



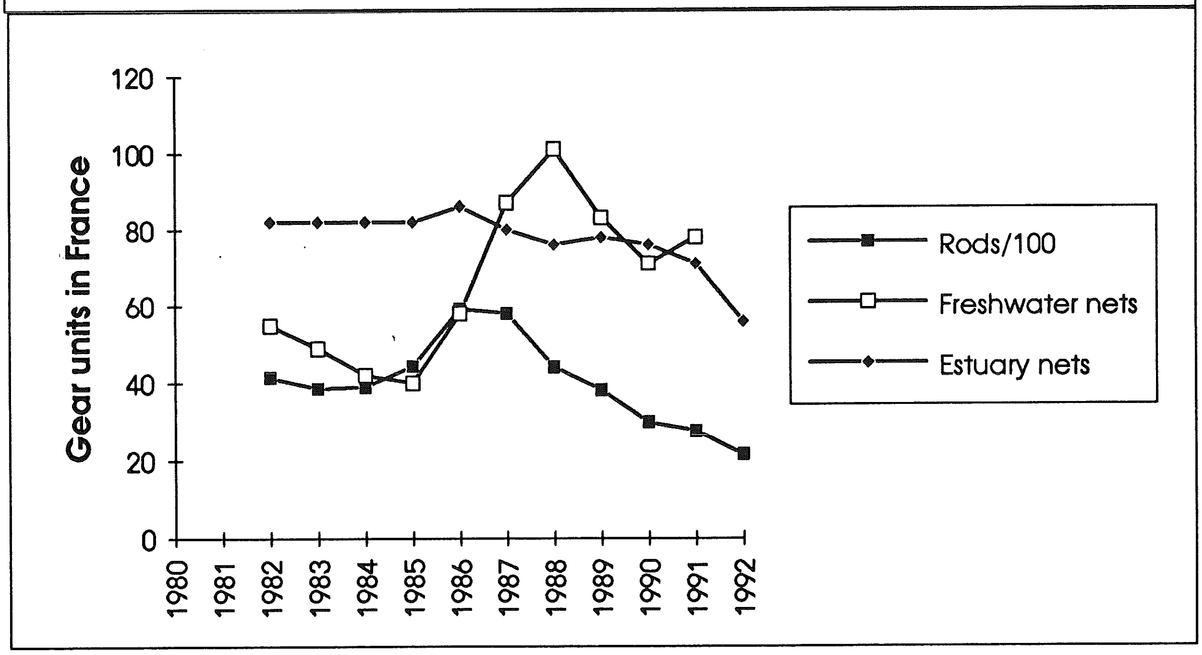


Figure 4.2.1c Numbers of units of some gear used or authorised for use for salmon fishing in countries in the North East Atlantic, 1980-92

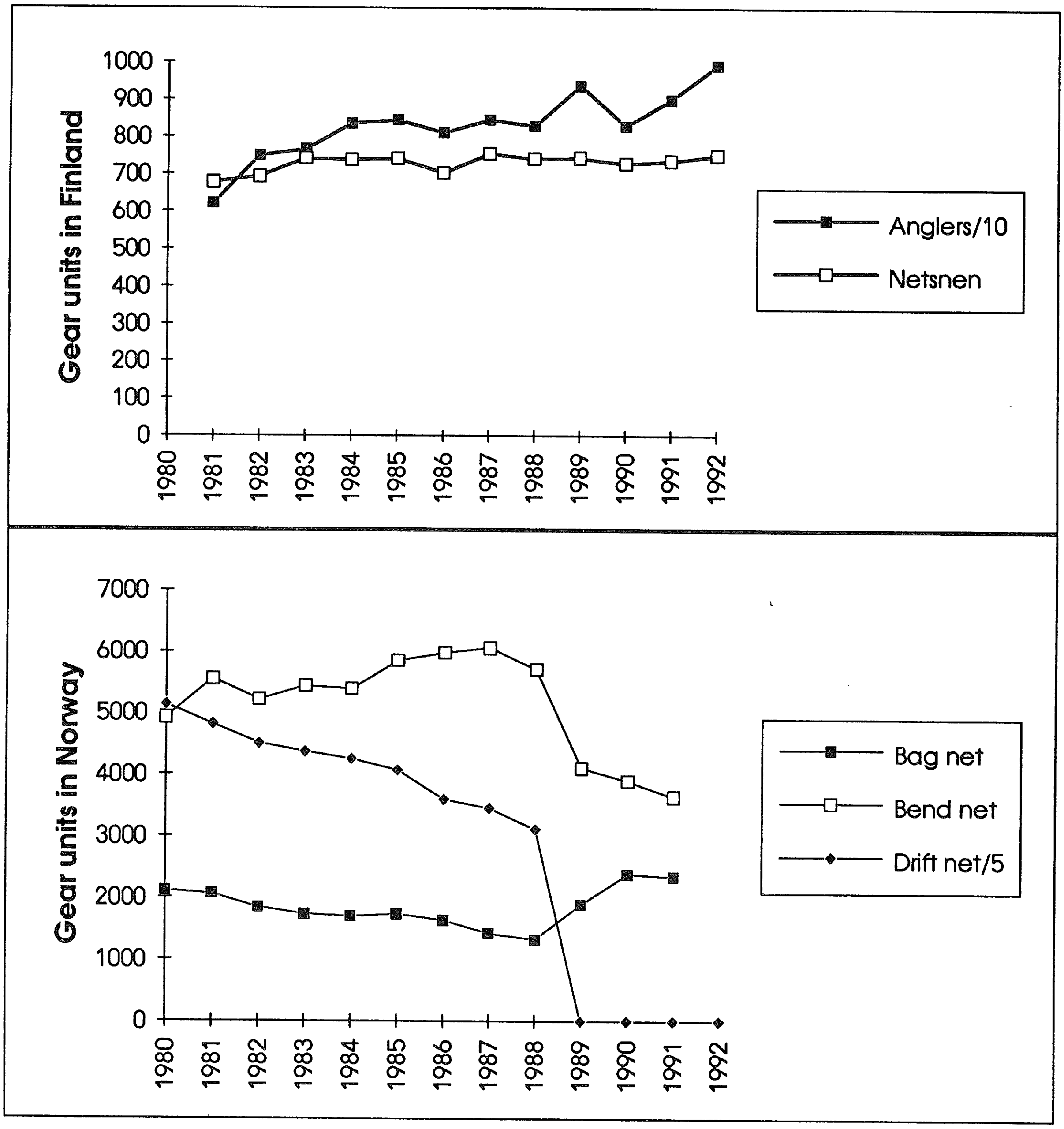
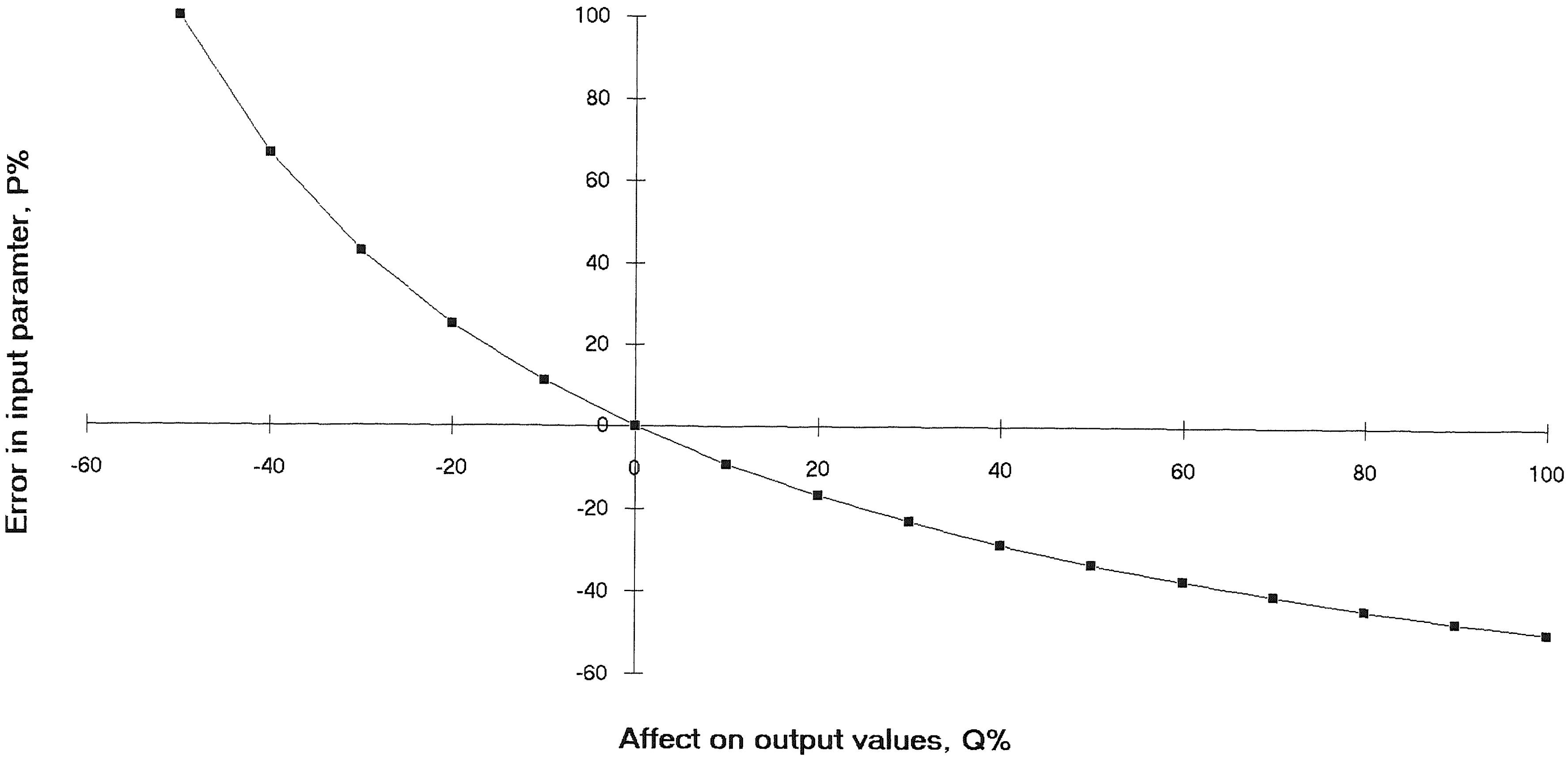


Figure 4.2.2 Nominal catches in Norwegian homewaters 1982-92 broken down by method.

Figure 6.1 Effect of errors in specified input parameters for the national run-reconstruction model on certain output values (see text for details)



APPENDIX 1

TERMS OF REFERENCE FOR THE NORTH ATLANTIC SALMON WORKING GROUP

The Working Group on North Atlantic Salmon (Chairman: Dr K. Friedland, USA) will meet in Dublin from 5-12 March 1992 to:

1. With respect to Atlantic salmon in each Commission area, where relevant:

   a) describe the events of the 1991 fisheries with respect to catches, gear, effort, composition and origin of the catch (including escapees and sea ranched fish), and rates of exploitation;

   b) describe the status of the stock occurring in the Commission area;

   c) begin a time series of aggregate estimates of all unreported catches, including those taken in international waters (the latter should be provided separately);

   d) specify data deficiencies and research needs;

   e) evaluate the by-catches of fish, birds and marine mammals in the salmon drift-net fisheries.

2. With respect to the West Greenland Commission, propose and evaluate methods to estimate:

   a) abundance of salmon in the area of the fishery at the time it operates;

   b) total abundance of stocks exploited by the fishery wherever they are;

   c) possible catch levels based upon maintaining adequate spawning biomass;

   d) some index based on the rivers which make a major contribution to the West Greenland fishery.

3. Evaluate the following management measures on the stocks and fisheries occurring in the respective Commission areas:

   a) regulations introduced into the Norwegian salmon fisheries in 1989;

   b) quota management measures taken in 1990 and 1991 in the Newfoundland and Labrador commercial fisheries.

4. With respect to Atlantic salmon in the North-East Atlantic Commission and West Greenland Commission areas, provide an inventory of parasites and diseases of wild and reared salmon by country.

5. With respect to Atlantic salmon in the West Greenland Commission area, evaluate the effects which management of the West Greenland fishery has had on stocks in homewaters.

6. With respect to Atlantic salmon in the NASCO area, provide a compilation of microtag, finclip and external tag releases by ICES member countries in 1991.

7. With respect to Atlantic salmon in the West Greenland Commission area, examine historical data on catches and stock composition for the presence of predictable patterns and evaluate the adequacy of sampling programs to estimate stock composition by area and time period.

APPENDIX 2

Documents submitted to the Study Group

Holm, M. Escapees from Norwegian fish farms in 1989-92.

Lund, R.A., Jacobsen, J.A. and Hansen, L.P. Biological characteristics of wild and farmed Atlantic salmon, *Salmo salar* L., caught in oceanic waters north of the Faroe Islands.

Potter, E.C.E. A sensitivity analysis on the national run-reconstruction model.

Prévost, E. Report on salmon fisheries and stocks in France for 1992.

Russell, I.C. National report on salmon fisheries and stocks for 1992 - UK (England and Wales).

APPENDIX 3

Anon. 1984a. Report of the Atlantic Salmon Scale Reading Workshop. Aberdeen, Scotland, 23-28 April, 1984.

Anon. 1984b. Report of the Working Group on North Atlantic Salmon. Aberdeen, Scotland, 28 April - 4 May 1984. ICES, Doc. C.M. 1984/Assess:16.

Anon. 1987. Report of the Working Group on North Atlantic Salmon. Copenhagen, 9-20 March 1987. ICES, Doc. C.M. 1987/Assess:12.

Anon. 1989a. Report of the Working Group on North Atlantic Salmon. Copenhagen, 15-22 March 1989. ICES, Doc. C.M.1989/ Assess:12.

Anon. 1990. Report of the Working Group on North Atlantic Salmon. Copenhagen, 15-22 March 1990. ICES, Doc. C.M.1990/ Assess:11.

Anon. 1991b. Report of the Study Group on the Norwegian Sea and Faroes Salmon Fishery, Dublin, 4 - 7 March 1991. ICES, Doc. C.M.1991/M:4.

Anon. 1992a. Report of the Working Group on North Atlantic Salmon. Dublin, 5-12 March 1992. ICES, Doc. C.M.1992/ Assess:15.

Anon. 1992b. Report of the Study Group on the Norwegian Sea and Faroes Salmon Fishery, Dublin 28 February - 1 March 1992. ICES, Doc. C.M.1992/M:4

Anon. 1992c. Report of the Workshop on Salmon Stock Assessment Methodology. Dublin, 2-4 March 1992. ICES, Doc. C.M. 1992/M:8.

Friedland, K. and, Reddin, D.G. (in press). Marine survival of Atlantic salmon from indices of post smolt growth and sea temperature. Fourth International Atlantic Salmon Symposium, St. Andrews, Canada.

Hansen, L.P., Døving, K.B. and Jonsson, B. 1987. Migration of farmed Atlantic salmon with and without olfactory sense, released on the Norwegian coast. J. Fish Biol. 30:713-721.

Hansen, L.P. and Jonsson, B. 1991. The effect of timing of Atlantic salmon smolt and post-smolt release on the distribution of adult return. Aquaculture 98:61-67.

Jacobsen, J.A., Hansen, L.P. and Lund, R.A. 1992. Occurrence of farmed salmon in the Norwegian Sea. ICES, Doc. C.M. 1992/M:31.

Lund, R.A. and Hansen, L.P. 1991. Identification of wild and reared Atlantic salmon, *Salmo salar* L., using scale characters. Aquat. Fish. Mgmt. 22:499-508.

Lund, R.A., Hansen, L.P. and Järvi, T. 1989. Identification of reared and wild Atlantic salmon by external morphology, size of fins and scale characteristics. NINA Forskningsrapport 1:1-54. (In Norwegian with English summary.)

Lund, R.A., Økland, F. and Hansen, L.P. 1992. Escapes of reared salmon in marine homewater and in riverine fisheries in 1991. NINA Oppdragsmelding 143:1-16. (In Norwegian with English abstract.)

Potter, E.C.E. and, Dunkley, D. (in press). Evaluation of marine exploitation of salmon in Europe. Fourth International Atlantic Salmon Symposium, St. Andrews, Canada.

Scarnecchia, D.L., Isaksson, A. and White, S.E. 1989. New and revised catch forecasts for two-sea-winter Atlantic salmon (*Salmo salar*) in Icelandic rivers. J. Appl. Ichtyol. 5:101-110.

Webb, J.H. and Youngson, A.F. 1992. Reared Atlantic salmon, *Salmo salar* L., in the catches of a salmon fishery on the western coast of Scotland. Aquat. Fish. Mgmt. 23:393-397.