Annual Assessment of Salmon Stocks and Fisheries in England and Wales 2003

CEFAS
The Centre for Environment, Fisheries & Aquaculture Science

Environment Agency

Drift net fishermen in action off the North East coast of England where 52 licencees signed buy-out agreements in 2003 *(photograph by John Tickner Photography)*

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SALMON STOCKS AND FISHERIES IN ENGLAND AND WALES, 2003

Preliminary assessment prepared for ICES, March 2004

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FOREWORD

This is the seventh annual report on the state of salmon stocks in England and Wales prepared by the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) and the Salmonid Fisheries Science Group of the Environment Agency (the Agency). Each annual report is designed to stand alone so that the reader does not need to refer back to previous reports for background information. This means that much of the descriptive information in this report is similar to that in reports for previous years.

The main purpose of the report is to provide information on the status of stocks and fisheries in England and Wales to the International Council for the Exploration of the Seas (ICES), which is used, in turn, to provide advice to the North Atlantic Salmon Conservation Organisation (NASCO). An account of the way in which ICES uses the national data presented in this report to make an assessment of the status of salmon stocks is presented in section 3.4.

The objectives of NASCO are to contribute to *'the conservation, restoration, enhancement and rational management of salmon stocks*'. In particular, NASCO is responsible for negotiating the quotas for the salmon fisheries at West Greenland and Faroes. Annex 1 gives further information on NASCO and ICES.

The full list of information requested by NASCO from ICES for its annual meeting in 2004 is given at Annex 2. However, for this report, the pertinent requests relating to events in 2003 are to:

- *provide an overview of salmon catches and landings, including unreported catches by country and catch and release, and production of farmed and ranched salmon;*
- *describe the key events of the 2003 fisheries and the status of the stocks;*
- *evaluate the effects of management measures introduced in the last 5 years;*
- *provide age-specific stock conservation limits for all stocks; and*
- *provide a compilation of tag releases.*

NASCO has previously indicated that it would like the information on the fisheries to relate to *catches, gear, effort, composition and origin of the catch (including escapees and sea ranched fish), and rates of exploitation*. These headings have, therefore, been used in the appropriate sections of the report.

Over 500 copies of this report are disseminated to managers and fishermen so that this information is available to them at the earliest opportunity. **It must be noted, however, that most of the data relating to 2003 are provisional and will not be finalised until complete catch data are obtained and records can be fully validated**. In compiling the report, the previous year's data are routinely updated. Where corrections have been made to data from earlier years, this is indicated by a footnote. Final data for 2003 will be presented in the Agency's annual publication of the Salmonid and Freshwater Fisheries Statistics, which will be published later in the year (e.g. Environment Agency, 2003a).

Salmon Action Plan (SAP) progress reports will be published in April 2004. SAPs are the means by which the Agency aims to meet the objectives of its National Salmon Management Strategy (launched in 1996) at a local level. Each SAP is the result of responses to a Consultation Document which reviewed stock and fishery status (including the use of conservation limits), identified factors limiting performance and listed a series of costed options to address these. These were circulated to outside interests to seek their opinion and support for the plan. The Final Plan contains an agreed list of actions which the Agency, in partnership with others, is committed to address in the five year lifetime of the plan. Progress against these actions is reviewed annually at both regional and national levels, but this is not included in the present report.

A questionnaire survey was circulated with the 2002 report to assess its value to various user groups (fisheries managers, riparian owners, anglers, netsmen etc.) and to seek suggestions for possible improvements that could be incorporated into future reports. A total of 58 completed questionnaires were received. The vast majority of respondents considered that the report presented a clear overview of the current status of salmon stocks and fisheries in England and Wales (84%); summary tables and figures (maps and graphs) presented in the report were clear and adequately explained in the text (90%), and definitions and explanations of terms such as Conservation Limits, Catch per Unit Effort, Net Limitation Order, etc. provided in the text were concise and clear (86%). A number of additional comments and suggestions for improvements were received, several of which have been acted upon this year. These include:

- Footnotes wherever changes were made to data that had been presented in previous years;
- Standardise all tables to SI units (imperial in brackets);
- Include graph in main features summary to show time series of catches;
- Include a comprehensive glossary of terms;
- Reference to EU Habitats Directive and SAC rivers.

We conclude that the report is held in high regard by the majority of readers from the various interest groups, but would welcome any further comments or suggestions for its improvement (see inside front cover for address details). We would also like to take this opportunity to thank all those who submitted a completed questionnaire.

MAIN FEATURES OF REPORT FOR 2003

- The declared salmon catch by nets and fixed engines in 2003 was 69.2 tonnes (17,188 fish), a reduction of 63.8 tonnes on 2002 (133 tonnes; 38,279 fish) and half the average catch of the last five years. The major factor in this reduction was the buy-out in 2003 of 52 drift net licences in the north east coast fishery, though this fishery still accounted for 60% of the total net catch (by weight).

- The declared rod catch (10,898 fish; 46.7 tonnes) was 29% lower than that in 2002 and reflected a substantial reduction in fishing effort. Low flows for most of the fishing season are thought to have inhibited salmon from entering rivers, reduced fishing opportunities and thus limited the catch.

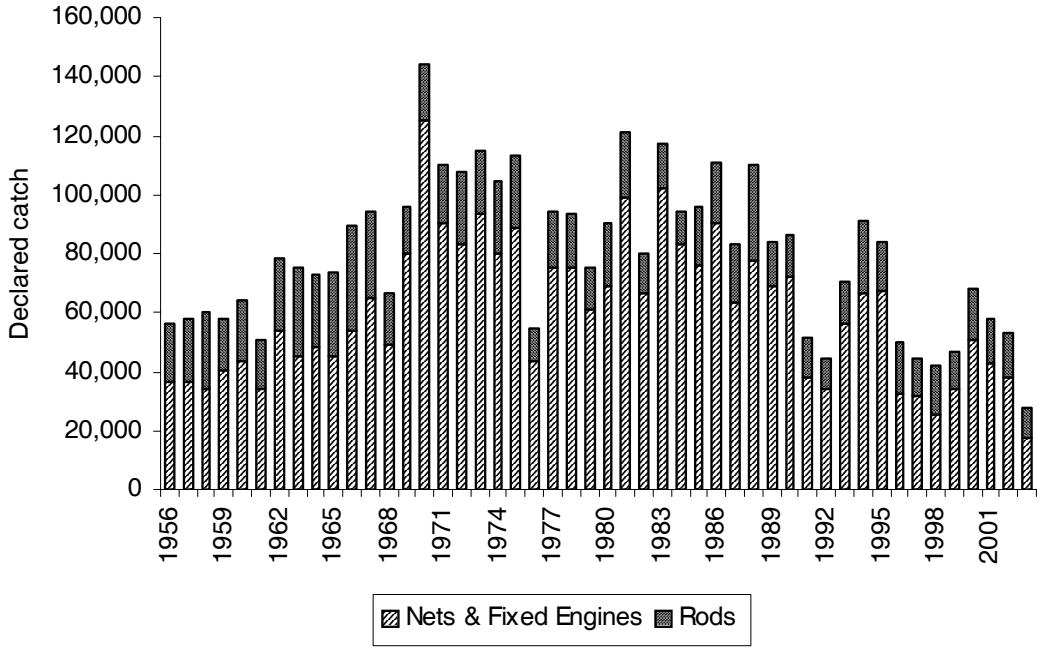
- Rod catches of multi-sea-winter fish in 2003 were around the 5-year (1998-2002) average, whilst grilse catches were 35% below average.

- Most adult counts and returning stock estimates for 2003 were lower than the recent five-year averages, and some were at the lowest level recorded (Test, Frome, Caldew). However, some rivers in the South West (Tamar and Fowey), North West (Lune and Kent) and in North Wales (Dee) show an increasing trend over this period.

- Since the introduction of the national measures in 1999, anglers have been releasing a greater proportion of all fish caught, and of large salmon in particular, with 55% (some 6,000 fish) of rod-caught salmon released in 2003, the highest level ever recorded.

- A programme was initiated in 2003 to assess the incidence of fish-farm escapees in catches taken by net and rod fisheries in England and Wales. Very few "suspect" fish were reported, and only 1 was confirmed as likely to have originated in a fish farm.

- Spawning escapement was estimated to be above the conservation limit in 25% of rivers in England and Wales. The majority of salmon stocks in England and Wales continue to be in a depleted state.



Declared catch of salmon by nets & fixed engines and rods (including released fish) in England and Wales, 1956-2003

SUMMARY

This report presents a preliminary assessment of the state of salmon stocks and fisheries in England and Wales in 2003 to assist ICES in providing scientific advice to NASCO and to provide early feedback to fishery managers and anglers. The chief indicators of the state of salmon stocks are the catches taken by rod and net fisheries. The declared salmon catch for 2003 (including those fish released alive by anglers) is provisionally estimated at 115.9 tonnes, representing about 28,000 fish, and comprising 69.2 tonnes (~17,200 fish) by nets and fixed engines and 46.7 tonnes (~10,900 fish) by rods. Almost 6,000 fish caught by rods were released alive (27 tonnes), representing 55% of all the fish caught by number. These figures do not take account of catches of salmon which go unreported (including those taken illegally), and it is estimated that there may have been a total of 24 tonnes of additional fish caught in 2003, 21% of all fish killed (including the additional fish).

Net catch

The declared net catch, which is dominated by drift net and T- and J-net fisheries in the North East Region, was 55% lower in 2003 than in 2002, and less than half the mean for the previous five years. The main reason for this was the partial buy-out of drift nets in the English north-east coast fishery (16 licencees fished in 2003 compared to 69 in 2002), which now represents an 89% decline in the number of licences issued for drift nets in this fishery since a phase-out in the fishery commenced in 1992. Nationally, the number of licensed nets and fixed engines fell by 14 in 2003; the decline in the north east coast drift nets being offset somewhat by an increase in licensed T- and J-nets and lave nets. The number of days/tides fished by netsmen increased slightly compared with 2002 in the Midlands Region and in Wales. Catch per unit of fishing effort (CPUE) for net fisheries in 2003 was above the previous 5-year mean in the South West, Midlands and North West Regions, but below average elsewhere.

Rod catch

The number of salmon rod licences issued in 2003 (~27,200) was 8% lower than in 2002, but still higher than in 2001 when fishing was severely restricted due to Foot and Mouth Disease. The number of days declared to have been fished by anglers also showed a marked decrease (down 13%). As a consequence, the rod catch in 2003 (including released fish) decreased considerably on that in 2002 (down 29%), and the catch was the lowest since 1992 (when no catch return reminders were sent out). The improvements in the catch reporting system introduced in 2001 (better targeting of reminders and a routine second reminder) continued in 2003, and the (provisional) data presented in this report include many returns received as a result of the second reminder.

Over the past six years, the annual rod catch has fluctuated between about 10,900 and 17,600 fish without any evident trend. This has chiefly been due to variability in the catches of grilse. In 2003, the overall declared catch of grilse was much lower than both the catch in 2002 and the mean for the previous five years, whilst the catch of multi-sea-winter (MSW) salmon was slightly lower than that in 2002 and just above the mean for the previous five years. There were some regional variations: catches of grilse were higher than the five-year average in the Midlands Region, just below average in the North East and well below average in all other Regions; catches of MSW salmon were well above average in the Southern and Midlands Regions, just above average in the North East and Wales, and a little below average in the South West and North West. The CPUE for the rod fisheries was lower in 2003 than in 2002 and below the previous 5-year mean for all Regions except North East and Midlands.

Stock status update

The reduction in rod fishing effort and late running of many stocks due to high temperatures and low river flows in 2003 make it difficult to draw general conclusions about current stock status from catches.

The actual relationship between catch and stock abundance depends upon exploitation rates (i.e. the proportion of the salmon population actually taken in the catch - both retained fish and those released). This can be estimated where there is a fishery-independent measure of the salmon run, such as that obtained from fish counters. Data from a number of counters and traps in England and Wales show that runs into freshwater in 2003 were lower than those in 2002, with the exception of the Lune in the North West and the Wye in Wales, though half were above the average of the previous five years. In all but one of the 10 rod fisheries in England and Wales where exploitation rates could be determined in 2003, these were below the average of the previous five years. Therefore, salmon populations in these rivers were bigger than suggested by the differences in catches alone. The exception was on the Test, where exploitation rates in rod fisheries increased, though a very high proportion of fish caught there are released alive.

Conservation limits (CL) for 64 rivers across England and Wales were revised to take account of reduced marine survival in recent years. In 2003, only 16 of 64 rivers (25%) exceeded their CL, a marked reduction on 2002 (39%) and the lowest in the time series. This reflects the poor runs due to unusually low flows for much of the fishing season in 2003. Overall, estimated egg deposition was below average (1994-2002), and 42% of rivers in 2003 had less than half the egg deposition required to meet the conservation limit. Thus, the majority of salmon stocks in England and Wales continue to be in a depleted state.

Management measures

Viewed against historical data, current stock estimates and catches provide ongoing cause for concern and the conservation of salmon remains a top priority. The number of licences issued for nets and fixed engines has continued to decline as a result of measures taken to reduce levels of exploitation and the declining commercial viability of some fisheries. Overall, the number of net licences issued has decreased by an average of about 3.3% per year between 1985 and 2003 (total decrease, 59%).

Concerns about the decline in the numbers of MSW salmon and particularly those returning early in the year ('spring salmon') resulted in national measures being introduced in 1999, banning netsmen from killing and, in most cases, fishing for salmon before 1 June in England and Wales. These measures have reduced the proportion of the net catch taken before June from a five-year average of 6.7% in the mid-1990's to 0.14%, on average, from 1999: all such fish are released.

A number of measures aimed at better management of this valuable resource were implemented or strengthened in England and Wales in 2003. Several net fisheries in England and Wales are being (or have been) phased out because they exploit migratory salmonids returning to more than one river (i.e. mixed stock fisheries). The most important development in 2003 was that agreement was reached to buy out a substantial proportion of the north east coast drift net fishery, reducing the number of operating licencees to 16 from 69 in 2002. A new reducing net limitation order (NLO) was introduced for lave nets on the river Leven, in Cumbria, and in 2003 the number of nets permitted fell from 6 to 4. Arrangements have also been made to reduce netting effort in some fisheries by compensating netsmen not to fish for a particular period.

As with the net fisheries, national measures to safeguard spring salmon were introduced for rod fisheries in 1999 and continued through 2003. These banned the killing of salmon caught by anglers prior to 16 June and restricted the methods that they could use at this time to artificial flies or lures. The proportion of the rod catch taken before June fell from 11% over the period 1994-98 to 6% in the years 1999-2003, and these fish are now required to be released. The rod catch of spring salmon (caught before 1 June) in 2003 was the highest since 1997. Non-statutory restrictions on methods and fishing areas imposed by fishery owners and angling associations include weekly and seasonal bag limits, and there is a continued emphasis on encouraging anglers to return rod-caught fish. As a consequence, the proportion of salmon released by anglers increased steadily from 10% in 1993 to 42-44% over the three-year period 1999-2001; the proportion increased again in 2002 to 50% and in 2003 to 55% (provisionally). The increase in 2003 may, in part, reflect the fact that catches were relatively good in the spring, and at the very end of the fishing season when a higher proportion of coloured fish are likely to have been caught. Tagging studies suggest that, if handled appropriately, the majority of released salmon can go on to spawn successfully.

Other, non-regulatory factors may also have contributed to changes in exploitation rates in 2003. River flow is a key factor affecting angler effort; the monthly river flows for 13 monitored rivers in England and Wales showed generally low flows throughout 2003, and especially in August, September and October (typically peak months for rod catches in many areas), which may have inhibited salmon from entering rivers and provided less than ideal conditions for angling.

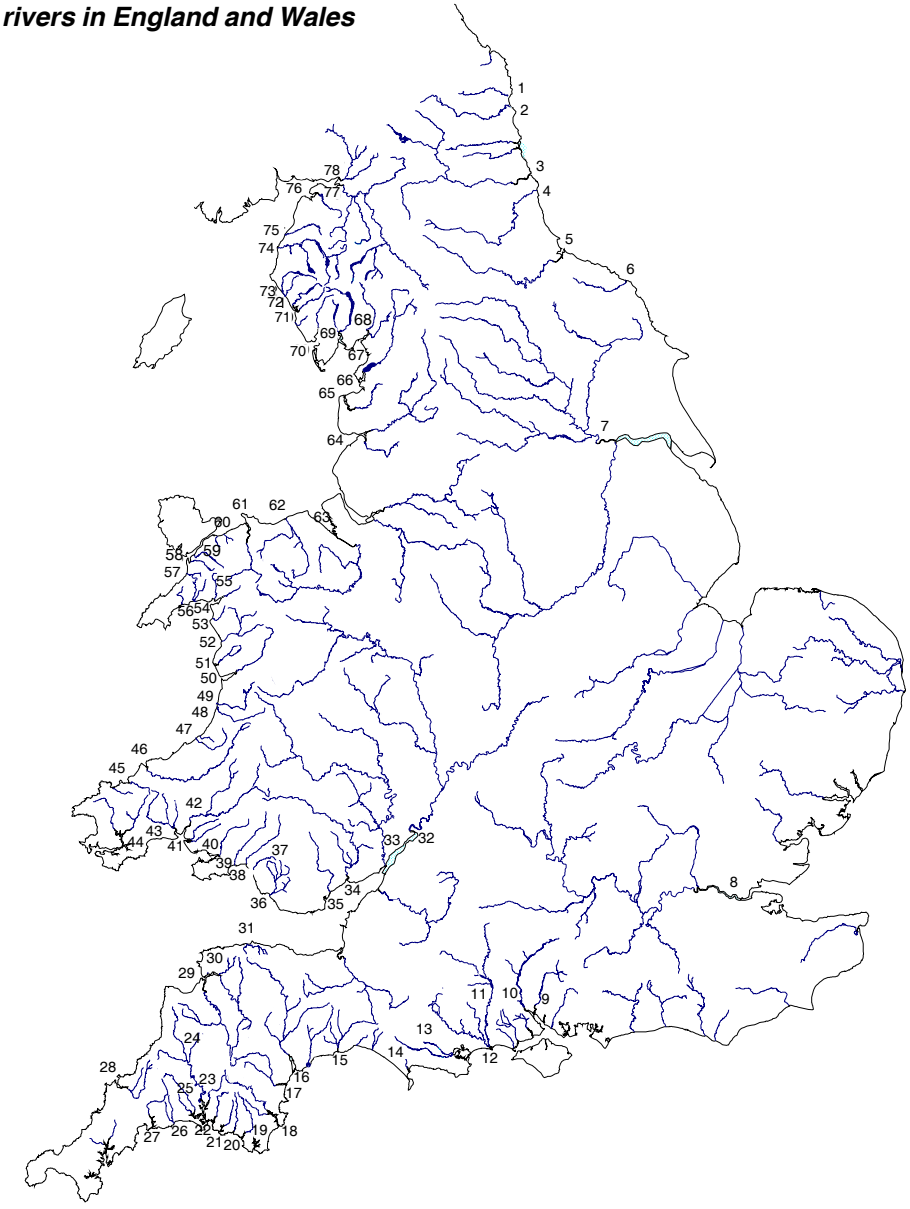
National overview

The ICES North Atlantic Salmon Working Group makes an annual assessment of the status of national stocks in the Northeast Atlantic (NEAC) area as a basis for advising managers. The pre-fishery abundance (PFA) of salmon for each country (defined as the number of 1SW salmon alive in the sea on January 1st in the first sea winter) is estimated. A description of the assessment process and the latest national assessment for stocks in England and Wales is included in this report (Section 3.4).

The NEAC PFA model endeavours to provide an interpretation of what the available catch and effort data may tell us about changes in the status of the total national stock of salmon over the past three decades. The model output suggests that, for salmon from rivers in England and Wales, the overall PFA has declined by just over 50% from the 1970s to the present time. The majority of this decline has been in the non-maturing (i.e. potential MSW) component of the PFA, which is thought to have declined by about 70%, whilst the maturing (i.e. potential grilse) component has declined by about 30% (the estimated PFA of maturing fish in 2003 was the lowest in the time series). It should be noted that these trends mask conflicting changes in individual river stocks. Many rivers have experienced more serious declines but these are obscured by the very substantial improvements in others. The results also suggest that there was a marked decline in PFA around 1990, which is consistent with the general perception of a decrease in the marine survival for many stocks around the North Atlantic around this time.

The estimated number of salmon returning to England and Wales and the total spawning escapement show similar trends to the PFA, although the declines are less marked due to the reductions in net exploitation both in distant water and homewater fisheries, and in rod fisheries. Thus, numbers of returning fish are estimated to have declined by about 35% between the 1970s and the present time, and the spawning escapement by about 30%. However, as with the PFA, the decline in MSW components has been at least twice that of 1SW components. There was a slight improvement in returning fish and spawner numbers in 2000 and 2001, however these have both declined in 2002 and 2003, with estimates for 2003 among the lowest in the time series.

Salmon rivers in England and Wales



Key

No.	River	No.	River	No.	River	No.	River
1	Aln	21	Yealm*	41	Gwendraeth Fawr	61	Conwy*
2	Coquet*	22	Plym*	42	Tywi*	62	Clwyd*
3	Tyne*	23	Tavy*	43	Taf*	63	Dee*$
4	Wear*	24	Tamar*	44	E & W Cleddau*	64	Ribble*
5	Tees*	25	Lynher*	45	Nevern*	65	Wyre*
6	Esk (Yorkshire)*	26	Looe	46	Teifi*$	66	Lune*
7	Ouse	27	Fowey*	47	Aeron	67	Kent*
8	Thames*	28	Camel*$	48	Ystwyth	68	Leven*
9	Itchen*$	29	Torridge*	49	Rheidol*	69	Crake*
10	Test*	30	Taw*	50	Dyfi*	70	Duddon*
11	Avon (Hants)*$	31	Lyn*	51	Dysynni*	71	Esk (Cumbria)*
12	Stour (Dorset)*	32	Severn*	52	Mawddach*	72	Irt*
13	Piddle*	33	Wye*$	53	Artro	73	Ehen & Calder*$
14	Frome*	34	Usk*$	54	Dwyryd*	74	Derwent*$
15	Axe*	35	Taff*	55	Glaslyn*	75	Ellen
16	Exe*	36	Ogmore*	56	Dwyfach & Dwyfawr*	76	Wampool
17	Teign*	37	Afan*	57	Llyfni	77	Eden*$
18	Dart*	38	Neath	58	Gwyrfai$	78	Esk (Border)*
19	Avon (Devon)*	39	Tawe*	59	Seiont*		
20	Erme*	40	Loughor*	60	Ogwen*		

Figure 1. Map of England and Wales, showing the main salmon rivers and denoting those (*) with a Salmon Action Plan (SAP, see page 6 for definition) and those ($) designated as candidate Special Areas of Conservation (cSAC) in which salmon must be maintained or restored to favourable conservation status (see Section 3.1.2)

REPORT ON SALMON FISHERIES IN 2003

1. Gear and fishing effort

1.1 Gear

Salmon are caught in a variety of nets and traps around the coasts of England and Wales. These comprise: gill nets, including drift, trammel and coracle nets; sweep nets, such as seine (draft, draw and wade) nets; fixed engines, which include T-nets, J-nets, stop (compass) nets, putcher ranks, traps, cribs (coops); and hand-held nets, which include haaf/heave and lave/dip nets. Brief descriptions of all these nets and fixed engines are given in Annex 3. The principal salmon rivers for which data are presented in this report are shown in Figure 1, and the types of gear used in each net fishery operating in 2003 are listed in Table 1.

There were no substantial changes in the types of gear used to capture salmon in England and Wales in 2003, although dip nets in the Parrett Estuary and fixed engines on the Avon and Lyn (weir and trap, respectively) in Devon are no longer being fished.

1.2 Effort

The restrictions on fishing introduced in England and Wales in 1999 to protect early-running 'spring' multi-sea-winter (MSW) salmon remained in force in 2003. Details of the restrictions imposed on net and rod fisheries are provided in Sections 1.2.1 and 1.2.2, respectively.

Levels of exploitation of migratory salmonids by both rods and nets in England and Wales are regulated by byelaws controlling the fishing gear that may be used, and where and when fishing may take place. Separate licences are required to use rods and nets. There is no restriction on the number of rod licences that may be issued, but the numbers of licences in most net fisheries are subject to Net Limitation Orders (NLOs) as noted in Table 1.

The regulatory measures provide an overall limit on the 'allowable' fishing effort. The single most important change in 2003 was the north east coast buy out, in which 52 of the 69 licencees using drift nets along the coast of Northumberland and Yorkshire in 2002 were compensated for relinquishing their right to fish from 2003 onwards, in perpetuity. In addition to these restrictions, there will be annual variations in the amount that both netsmen and anglers actually fish (the 'utilised' effort), due to weather conditions, perceptions about the numbers of fish returning, and other factors. Netting effort has probably also been affected by the price of salmon. This has decreased in real terms over the past two decades due to the rapid expansion in the production of farmed salmon, and the costs of net licences, fuel and fishing gear have increased. The price of wild salmon has risen sharply in the past two years, possibly reflecting reduced availability of wild fish and concerns about the quality of farmed fish. Changes in costs and the unwillingness on the part of some anglers to practice compulsory catch-and-release may also have affected the take-up of rod licences and angling effort.

For rod fisheries, river flow is a key factor affecting angler effort. Figure 2 shows the monthly river flows for 13 rivers in England and Wales expressed as a percentage of the long-term average for the same month. Overall, flows were below the long-term average for most rivers throughout 2003. March and April were very dry with little angling effort, but relatively high flows in May resulted in more effort and good catches (around 700 salmon were caught in May 2003 compared with just 160 in May 2002). June and July were dry and very warm, though there was sufficient rain at the end of July to raise levels in some rivers and encourage fish to run. August and September also remained hot and dry. The resultant below-average flows persisted until the end of the fishing season in many

Table 1. Allowable and utilised effort for the principal salmon net fisheries in England and Wales in 2003

Region	River/ Fishery	Method	No. lics	NLO	Days available *	Allowable effort net days **	Utilised effort net days	Utilised effort net tides	% utilised #	Av. utilised effort day/lic.
NE	N Coastal (N)	Drift & T	5	X	113	565 }				
	N Coastal (N)	Drift	5	X	65	325 }	1,115		34	36
	N Coastal (N) [1]	T	21	25	113	2,373 }				
	N Coastal (S)	Drift	4	X	65	260	192		74	48
	N Coastal (S) [1]	T	1	1	113	113	32		28	32
	Y Coastal	Drift	2	X	65	130	85		65	43
	Y Coastal [1]	T or J	19	50	113	2,147	763		36	40
	NE Region		**57**			**5,913**	**2,187**		**37**	
SW	Avon & Stour	Seine	5	6	53	318		131	29	19
	Poole Harbour	Seine	1	1	53	53		48	65	34
	Exe	Seine	9	18	65	1,170		256	16	20
	Teign [1]	Seine	6	6	145	870		291	24	35
	Dart [1]	Seine	12	13	130	1,690		594	25	35
	Camel [4]	Drift	7	7	52	364		62	12	6
	Tavy [2]	Seine	4	1	25	100		59	42	11
	Tamar [3]	Seine	14	15	59	885		499	40	25
	Lynher [3]	Seine	5	5	59	295		62	15	9
	Fowey [1,5]	Seine	2	2	66	132		42	23	15
	Taw/Torridge	Seine	3	X	52	156		104	48	25
	SW Region		**68**			**6,033**		**2,148**	**25**	
Midlands	Severn	Putchers	7		76	532	434		82	62
	Severn	Seine	3	4	76	304		17	4	4
	Severn	Lave	29		76	2,204		665	22	16
	Midlands region		**39**			**3,040**	**434**	**682**	**30**	
Wales	Tywi [1]	Seine	8	9	130	1,170		564	34	50
	Tywi [1]	Coracles	6	12	130	1,560		301	14	36
	Taf	Coracles	1	1	130	130		10	5	7
	Taf	Wade	1	1	130	130		17	9	12
	E/W Cleddau	Compass	7	6	78	546		119	16	12
	Nevern [1]	Seine	0	1	131	131		0	0	0
	Teifi [1]	Seine	2	4	131	524		18	2	6
	Teifi [1]	Coracles	10	11	131	1,441		345	17	25
	Dyfi [1]	Seine	3	3	131	393		126	23	30
	Mawddach	Seine	1	2	78	156		61	28	44
	Conwy	Seine	2	3	78	234		104	32	37
	Dee	Trammel	4	2	52	208		161	55	29
	Dee	Seine	12	8	52	624		488	56	29
	Welsh Region		**57**			**7,247**		**2,314**	**23**	
NW	Ribble	Drift	6	6	79	474		206	31	25
	Lune	Haaf	12	12	79	948		525	40	31
	Lune	Drift	7	7	79	553		374	48	38
	Lune	Seine	1	X	79	79		59	53	42
	Kent	Lave	8	8	79	632		168	19	15
	Leven	Lave	4	X	53	212		266	90	48
	S & W Cumbria [6]	Drift	1	1	79	79		60	54	43
	Eden & Esk	Haaf	100	155	79	12,245		3,564	21	25
	Eden & Esk	Coops	2		86	172		32	13	11
	NW Region		**141**			**15,631**		**5,254**	**24**	

Notes: National spring salmon byelaws apply - all net fisheries closed until June 1.
(Note several sea trout fisheries exempted from byelaws, but all salmon caught before June 1 to be returned).
NLO refers to number of nets allowed under the terms of the net limitation order for that fishery.
In calculating the days available, any day, or part day, on which fishing has been allowed is included.
For fisheries in which utilised effort is recorded in terms of tides fished (Wales, Midlands, SW and NW Regions) the proportion of the available effort used has been estimated by assuming that an average of 1.4 tides have been fished per day.

*Key: * Days available have been adjusted to take account of partial buy-off arrangements.*
*** Allowable effort is calculated by multiplying the days available by the number of nets permitted under the NLO, except where the number of licences excedes the NLO, in which case the higher figure is used.*
 # Expressed as % days utilised (i.e. tide data x 1.4).
X Denotes reducing NLO - fishery being phased out as existing licensees leave the fishery.
[1] Sea trout fisheries - exempted from national spring salmon byelaws (all salmon caught before 1 June to be released).
[2] Buy-off 1 July to 31 August.
[3] Buy-off 8 August to 31 August.
[4] Buy-off 1 August to 31 August.
[5] Buy-off 2 March to 15 June.
[6] Partial buy-off operating in 2003.

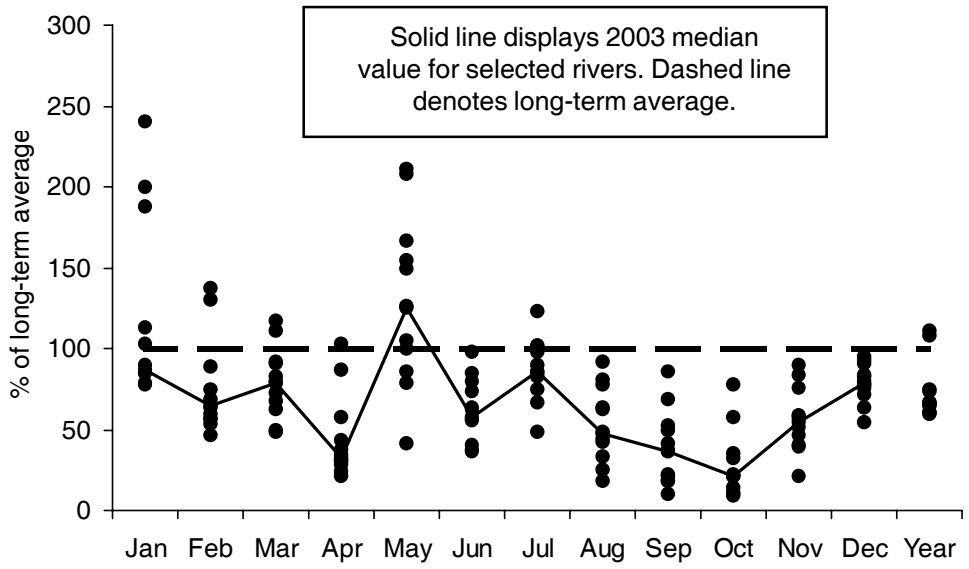


Figure 2. Monthly mean river flows (cubic metres per second) in 2003 for 13 rivers (South Tyne, Tees, Itchen, Avon, Exe, Taw, Severn, Wye, Cynon, Teifi, Dee, Lune and Eden) in England and Wales, expressed as a percentage of the long term average for the same month. (Data supplied by Centre for Ecology and Hydrology). The long term average is calculated for the available time series, which varies from river to river, but is in the range of 25-40 years.

areas and provided poor conditions for angling and hence reduced catches; though rain at the beginning of October in the north and in a few areas in November provided good fishing conditions and higher catches were reported.

1.2.1 Allowable effort in net fisheries

The various fishing gears used to catch salmon in England and Wales have been grouped into broad categories based on their method of capture (see definitions in the footnote to Table 2 and descriptions in Annex 3). Since 1985, there has been a steady decline in the numbers of netting licences issued for gill nets, sweep nets and hand-held nets and, since 1990, for fixed engines, as a result of measures taken to reduce levels of exploitation and the declining commercial viability of some fisheries. The total number of licences issued fell by 3.6% in 2003 (Tables 1 and 2, and Figure 3), the large reduction (58 in 2003;113 in 2002) in drift net licences being to some extent balanced by an increase in licensed fixed engines on the north east coast (57 in 2003; 32 in 2002) and by hand-held (lave) nets in the Severn Estuary (29 in 2003; 18 in 2002). Overall, the number of net licences issued between 1985 and 2003 has decreased by an average of about 3.3% per year (total decrease, 59%).

The national measures to safeguard spring salmon, introduced in 1999, continued to apply in 2003. Under these measures, netsmen are banned from killing, and in most cases fishing for, salmon before 1 June. There are derogations that allow fishing in some areas where netting is predominantly for sea trout, on the basis that any salmon caught are returned alive (see Table 1).

Table 2. Numbers of rod licences (1994-2003) and net and fixed engine licences (1983-2003) issued in England and Wales

Year	Rod licences		Gear Type					Total net licences
	Short-term	Annual	Gill	Sweep	Hand-held	Fixed Engines	Combined drift/T net #	
1983			232	209	333	74	75	848
1984			226	223	354	74	75	877
1985			223	230	375	69	75	897
1986			220	221	368	64	75	873
1987			213	206	352	68	75	839
1988			210	212	284	70	75	776
1989			201	199	282	75	75	757
1990			200	204	292	69	75	765
1991			199	187	264	66	75	716
1992			203	158	267	65	75	693
1993			187	151	259	55	36	652
1994	10,637	26,641	177	158	257	53	30	645
1995	9,992	24,949	163	156	249	47	29	615
1996	12,508	22,773	151	132	232	42	29	557
1997	11,640	21,146	139	131	231	35	27	536
1998	11,364	21,161	130	129	196	35	26	490
1999	10,709	18,423	120	109	178	30	26	437
2000	10,916	19,223	110	103	158	32	25	403
2001	9,434	14,916	113	99	143	33	24	388
2002	10,039	19,368	113	94	147	32	24	386
2003 *	**7,604**	**19,605**	**58**	**97**	**160**	**57**	**5**	**372**

Notes: Rod short-term licences are for 1 or 8 days; annual licences are valid from the date of issue to 31 March following.
Gill nets include: drift, trammel, sling and coracle nets.
Sweep nets include: seine (draft and draw) and wade nets.
Hand-held nets include: haaf/heave and lave/dip nets.
Fixed engines include: T-nets, J-nets, stop (compass) nets, putcher ranks, traps, weirs and cribs (coops).
East Anglian coastal nets are not included, as they are targeted primarily at sea trout and catch few salmon.
Key: # Combined drift/T net licences (issued in Northumbria (northern area)) have been included in the gill net totals.
** Provisional*

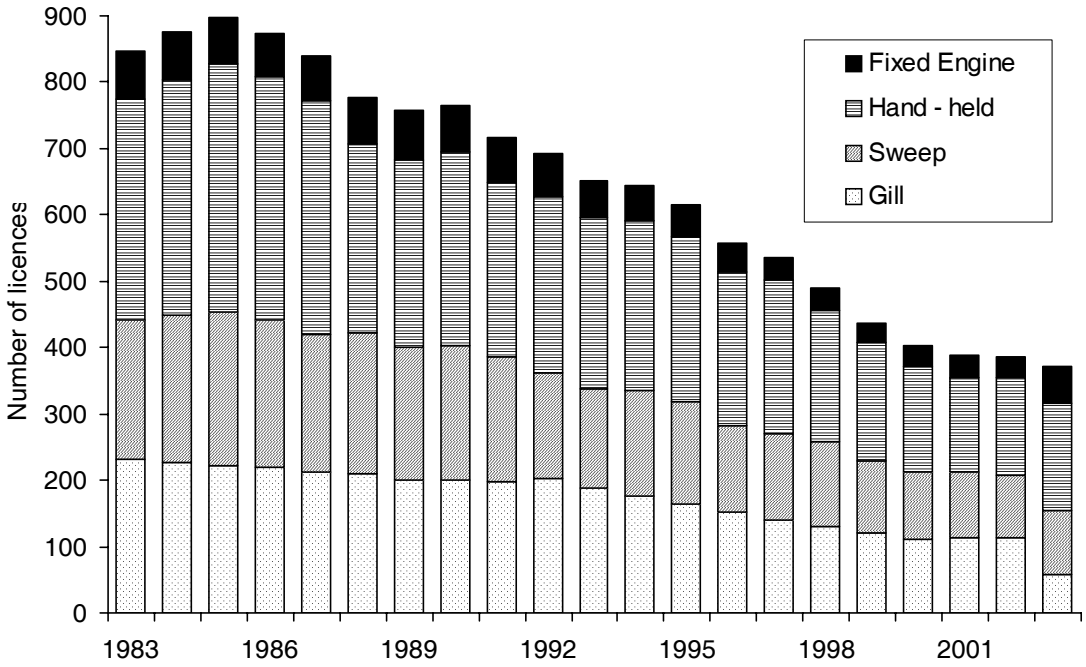


Figure 3. Numbers of salmon net and fixed engine licences issued in England and Wales, 1983-2003

A number of net fisheries in England and Wales are being (or have been) phased out because they exploit migratory salmonids returning to more than one river (i.e. mixed stock fisheries). Licence numbers are being reduced as fishermen retire from the fishery. The phase out of the north east coast drift net fishery was accelerated by a compensation scheme (full details in Section 2.1.3). Progress with those phase-outs that were incomplete in 2002 is summarised in the text table below:

Fishery	Netting Method	Start of phase out	Number of nets: before start	in 2003	Reduction %
North East Coast	drift nets	1993	142	16	89%
Anglian Coast	coastal nets	1996	59	45	24%
River Taw/Torridge	seine nets	2002	14	3	79%

In 2003, one new reducing NLO was introduced for lave nets in the Leven Estuary in north-west England. In addition, the netting season on the Leven Estuary has been reduced to July and August only (previously June - August). Seven licensees fished in the Cleddau compass net fishery under a reducing NLO (target 6, from 8 in 1997). New NLOs were introduced on the Rivers Dart and Teign, reducing the number of seine nets allowed to 13 and 6, respectively from 2003. The right to fish a trap on the River Lyn, north Devon, which dates back to the 1600s and produced catches averaging 69 salmon in the 1990s (208 caught in 1995), was purchased by the Agency in June 2003, though the trap will be maintained to retain its heritage value.

River Lyn fish trap at low tide

In addition, arrangements were made to reduce netting effort in the following fisheries in 2003 (as in earlier years) by compensating netsmen not to fish for the periods shown, or to release fish alive:

River/ Fishery	Method	Period without netting (starting year) (*full season in parentheses*)	Funding agency
Tavy	seine nets	1 July - 31 August (*1 June - 31 August*)	South West Water plc and Environment Agency
Tamar	seine nets	8 August - 31 August (*1 June - 31 August*)	
Lynher	seine nets	8 August - 31 August (*1 June - 31 August*)	
Fowey	seine nets	2 March - 15 June (*2 March - 31 August*) (Varying measures have applied on the above rivers since 1997)	
Camel	drift nets	1 August - 31 August (commenced 2002) (*1 June - 31 August*)	Environment Agency
Lyn	fish trap	complete season (in perpetuity) (commenced 2003) (*1 June - 31 August*)	Environment Agency
Cumbrian coast	drift nets (3 of 4 nets only)	complete season (in perpetuity) (commenced 1999) (*1 June - 31 August*)	Derwent Owners Association
Avon and Stour (Christchurch Harbour)	seine nets	All salmon caught to be released (scheme operating since 1993) (*1 June - 31 July*)	Avon & Stour Rivers Association
Severn Estuary (Usk)	drift nets	complete season (in perpetuity*) (commenced 2000) (*1 June – 31 August*)	Local owners/angling interests, NASF & River Wye & Usk Foundation
Severn Estuary (Usk)	1 putcher rank	complete season (for 5 years) (commenced 2000) (*1 June – 31 August*)	
Severn Estuary (Wye)	1 putcher rank	complete season (for 5 years) (commenced 2000) (*1 June – 15 August*)	Environment Agency

Notes: NASF = North Atlantic Salmon Fund.
National byelaw - salmon season start delayed until 1 June from 2000.
Fowey buy-off - fishing from 2 March to 31 May for sea trout only.
Severn Estuary - Usk drift nets and putcher fisheries bought-out from 2000.
** Closure byelaw awaiting approval by Welsh Assembly Government.*

There have thus been substantial reductions in net fisheries in England and Wales over the past 10 years as a result of various controls and restrictions; details are summarised in Table 3.

1.2.2 Allowable effort in rod fisheries

The national measures to safeguard spring salmon, introduced in 1999, continued to apply in 2003. These ban the killing of salmon caught by anglers prior to 16 June and restrict the methods that they can use at this time to artificial flies or lures.

No other statutory effort restrictions were imposed on rod fisheries in 2003, although trial season extensions continued to apply on a small number of rivers in North Wales and were extended to other rivers on Anglesey. These schemes resulted in the following additional catch of salmon: Seiont (2); Ogwen (not fished); Dwyryd (0); Conwy (3); Dyfi (1); Angelsey and Lleyn (0). A number of additional new schemes were implemented in 2003. On the Teifi in southwest Wales, a trial season extension from 17 to 31 October, restricted to fly fishing and spinning with barbless hooks and employing mandatory catch and release, resulted in 62 salmon caught and released. A trial extension on the Exe in Devon from 30 September to 14 October, restricted to fly only and with catch and release, co-incided with very low flows and only 3 salmon were reported caught.

A new catch-and-release byelaw was introduced from 16 June 2003 for the Leven and Crake upstream of the Leven viaduct near Ulverston. This required that salmon caught there by rods must be returned and, therefore, no salmon should have been killed in 2003.

The new Wye byelaws came into force on 1 September 2003 (expire 31 December 2008) which delayed the start of the salmon season until 3 March (from 26 January), allowed spinning from the opening day until 31 August and banned bait fishing at all times.

Non-statutory restrictions on methods and fishing areas are known to be imposed by some fishery owners and angling associations, but there is no national record of these. For example, anglers on a number of the southern chalkstream rivers are encouraged to return all rod-caught fish, and 100 salmon were returned in 2003, with 18 fish donated for broodstock on the Test. The latter fish are treated as 'killed' for ICES reporting, since they do not contribute to natural spawning.

1.2.3 Utilised effort in net fisheries

Table 1 presents data on utilised effort for salmon net fisheries in England and Wales in 2003. A new national net catch return system was introduced in 2001 in all regions, except the North East. This requires netsmen to report catch and effort data monthly according to the number of tides fished, and represents a change in effort reporting procedures for the South West Region (previously, days fished). Reporting rates for net fisheries have been at, or close to, 100% in all regions for many years. Consequently, the effort data for the nets and fixed engines presented in this report are not expected to change significantly due to late returns. In comparison with 2002, there was a decrease in the numbers of days/tides fished in 2003 in the North East (down 50%) and South West (down 6%) Regions (reflecting a decrease in the number of licences issued there), but an increase in the number of days/tides fished in the Midlands (up 50%) and in Wales (up 4%), with little change in the North West Region.

Table 3. Regulatory controls on net fisheries introduced in England and Wales, 1993-2003

Year	Phase-outs		NLO			Buy-offs	Other measures
	Fishery	Status	Fishery	Old	New		
1993	North East coast drift nets	Reducing NLO starts (licences not replaced as fishermen leave the fishery) 124 nets down from 142 at start				Buy-off of Taw & Torridge seine nets	Itchen seine net fished for scientific purposes only - all fish released
1994	North east coast drift nets	Phase out continues - licences reduced to 114				Buy-off of Taw & Torridge seine nets	Itchen seine net fished for scientific purposes only - all fish released
1995	North east coast drift nets	Phase out continues - licences reduced to 99				Buy-off of Taw & Torridge seine nets	Reduced netting season (delayed start) in Wye, Usk and Dee fisheries
1996	North east coast drift nets	Phase out continues - licences reduced to 89					New net licence fees resulted in reduced 'take up' of licences
	Anglian coastal nets	Reducing NLO starts (licences not replaced as fishermen leave the fishery) 59 nets at start					
1997	River Ogwen - seine nets	Reducing NLO starts (licences not replaced as fishermen leave the fishery) 2 nets at start	Fowey - seine nets	4	2	Full- or part-season buy-offs in place for 4 fisheries: Tavy, Tamar, Lynher and Fowey (all seine nets)	Reduced netting season (earlier close) in Tywi & Taf fisheries
	North east coast drift nets	Phase out continues - licences reduced to 81	River Cleddau compass nets	8	6		
	Anglian coastal nets	Licences reduced to 56	Teifi seine nets	6	4		
			Solway - haaf/heave nets	165	155		
1998	North east coast drift nets	Phase out continues - licences reduced to 75				Full- or part-season buy-offs in place for 6 fisheries: Tavy, Tamar, Lynher, Exe, Fowey (all seine nets), and Cumbrian coast (drift net)	Reduced netting season (delayed start) on Taw & Torridge seine net fishery
	Anglian coastal nets	Phase out continues - licences reduced to 54					Compensation scheme on Avon & Stour (seine nets) - fish released alive
	SW Wales coastal - seine & wade nets	Licences reduced to 0 (phase out complete)					
	Dwyfawar - seine nets	Licences reduced from 2 to 1					
	Ogwen - seine nets	No change					
	Seiont - seine nets	Licences reduced to 0 (phase out complete)					
	Clwyd - drift nets	Licences reduced to 0 (phase out complete)				Clwyd - phase out accelerated by buy-off	
	Llyfni - seine nets	Licences reduced to 0 (phase out complete)					
	Teifi - seine net	Licences reduced to new NLO level					
1999	North east coast drift nets	Phase out continues - licences reduced to 72				Full- or part-season buy-offs in place for 6 fisheries: Tavy, Tamar, Lynher, Exe, Fowey (all seine nets), and Cumbrian coast (drift net)	National measures introduced - all net fisheries banned from taking, and in most cases fishing for, salmon before 1 June
	Anglian coastal nets	Phase out continues - licences reduced to 54					Reduced netting season (delayed start) on Taw & Torridge seine net fishery
	SW Wales coastal - seine/ wade nets	Licences reduced to 0 (phase out complete)					Compensation scheme on Avon & Stour (seine nets) - fish released alive
	Dwyfawar - seine nets	Licences reduced from 2 to 1					
	Ogwen - seine nets	No change					
	Seiont - seine nets	Licences reduced to 0 (phase out complete)					
	Clwyd - drift nets	Licences reduced to 0 (phase out complete)				Clwyd - phase out accelerated by buy-off	
	Llyfni - seine nets	Licences reduced to 0 (phase out complete)					

Table 3. continued:

Year	Phase-outs		NLO			Buy-offs	Other measures
	Fishery	Status	Fishery	Old	New		
2000	North east coast drift nets	Phase out continues - licences reduced to 71	Lune - drift nets	10	7	Full- or part-season buy-offs in place for 8 fisheries: Tavy, Tamar, Lynher and Fowey (all seine nets), Cumbrian coastal and Usk (drift nets), Usk and Wye (fixed engines)	New net licence fees resulted in reduced 'take up' of licences
	Anglian coastal nets	Phase out continues - licences reduced to 46	Lune - seine nets	1	0		Some fisheries in SW Wales closed due to Sea Empess oil spill
	River Ogwen - seine nets	Licences reduced to 1	Lune - haaf nets	26	12		Compensation scheme on Avon & Stour (seine nets) - fish released alive
	River Usk - drift nets	Licences reduced to 0 (phase out complete)	Cumbrian Coast - drift nets	4	1		Phase out accelerated by buy out (in perpetuity)
			River Dart - seine nets	18	15		
			River Teign - seine nets	10	6		
2001	North East coast drift nets	Phase out continues - licences reduced to 70	Tavy - seine nets	5	1	Full- or part-season buy-offs in place for 8 fisheries: Tavy, Tamar, Lynher and Fowey (all seine nets), Cumbrian coast and Usk (drift nets), Usk and Wye (fixed engines)	Compensation scheme on Avon & Stour (seine nets) - fish released alive
	Anglian coastal nets	Phase out continues - licences reduced to 46					
	River Ogwen - seine nets	Licences reduced to 0 (phase out complete)					
	Cumbrian Coast - drift nets	Phase out continues - 1 net (as for 2000)					
2002	North East coast drift nets	Phase out continues - licences reduced to 69				Taw/Torridge - phase out accelerated by buy-off	Compensation scheme on Avon & Stour (seine nets) - fish released alive
	Taw/Torridge	14 nets reduced to 3 in 2002				Full- or part-season buy-offs in place for 9 fisheries: Tavy, Tamar, Lynher and Fowey (all seine nets), Camel, Cumbrian coast and Usk (all drift nets), Usk and Wye (fixed engines)	
	Anglian coastal nets	Phase out continues - licences reduced to 46					
	Cumbrian Coast - drift nets	Phase out continues - 1 net (as for 2000)					
	Duddon - seine net	Fishery closed by byelaw					
2003	North East coast drift nets	Phase out accelerated - licences reduced to 16	Dart - seine	15	13	NE Coast - phase out accelerated by buy-off	Compensation scheme on Avon & Stour (seine nets) - fish released alive
	Anglian coastal nets	Phase out continues - licences reduced to 45	Teign - seine	9	6	Full- or part-season buy-offs in place for 10 fisheries: Tavy, Tamar, Lynher and Fowey (all seine nets), Camel, Cumbrian coast and Usk (all drift nets), Usk, Wye and Lyn (fixed engines)	Leven lave nets - delayed start of season to 1 July
	Cumbrian Coast - drift nets	Phase out continues - 1 net (as for 2000)					
	Leven - lave nets	Reducing NLO commences - licences reduced to 4 (from 6)					
	Cleddau - compass nets	Licences reduced from 8 to 7 (1997 reducing NLO - target 6)					

As in previous years, the proportion of the allowable effort that was utilised in 2003 varied considerably between fisheries and was highest on average for the North East Region (37%), but was similar to that in 2002, on average, for all regions. It is virtually impossible for most fisheries to utilise 100% of the allowable effort due to factors such as weather conditions, tide heights and availability of fishing stations. In the north east coast fishery, for example, it has been suggested that no more than about 75% of the allowable effort could be used in the summer months under typical weather conditions (Anon., 1997).

1.2.4 Utilised effort in rod fisheries

The numbers of licences purchased each year for salmon and migratory trout angling (annual and short-term) between 1994 and 2003 are shown in Table 2; the data for 2003 are provisional (annual licences are valid from the date of purchase to the 31 March following). No comparable data are available for earlier years because of changes in licensing arrangements. The total number of rod licences issued in 2003 decreased by 7% from 2002, and by 22% during this eight year period. The number of annual licences has fallen by 26% since 1994, whilst the number of short-term (one day and eight day) licences issued remained relatively stable until 2002, but fell by 24% in 2003. As a proportion of the total, short-term licences have increased from about 28% in 1994-5 to between 30 and 39% since 2001. These changes in the numbers of licence types issued are thought to have been influenced by the decline in salmon stocks, possibly by the recent introduction of restrictions on angling, especially those to protect early-run MSW fish, and certainly in 2003 because of the poor angling conditions (low flows) from June until the end of the season experienced in most regions.

The Agency maintains a national rod licence database for England and Wales. In order to maximise the quantity and quality of returns received, reminders are issued to as many anglers as possible in November, soon after most rod fisheries have closed. In 2001, various improvements to these procedures were made, reflecting NASCO's resolution to reduce the level of unreported catch: a more complete list of anglers was available in November compared to previous years; a second reminder was issued some 10 weeks after the first, to anglers who had failed to send in a return (in previous years only a single reminder was issued). These improvements continued to apply in 2003; a second reminder was issued on 13 February 2004.

The proportion (%) of salmon rod licence holders making a catch return, by licence type, 1998-2003 are presented in the text table below:

Year	Licence Type	
	Annual (Full & concessionary)	Short-term (1 & 8 day)
1998	78	51
1999	76	53
2000	71	53
2001	83	61
2002	94	60
2003*	**86**	**44**
Mean 1998-2000	75	52

** Provisional data*

Reporting rates for all licence categories increased in 2001 and 2002, and provisional data for 2003 indicate that these improvements have been maintained for annual licence holders, though only 44% of short-term licence holders made a return due, possibly, to low catches. A brief description of the Agency's catch reporting and reminder system is provided at Annex 1.

It is known that many anglers who purchase more than one short-term licence during a season combine catch details on a single licence return, and this contributes to the lower return rate for this licence category. Also, in general, short-term licence holders fish less and catch fewer fish than those anglers who hold an annual licence. A detailed analysis of catch return data for 2002 for the Rivers Dee (North Wales) and Tyne indicated that 89% and 86% respectively of short-term licence holders making a return declared a nil catch, and that 98% and 96% respectively of the total declared salmon catch for these rivers was made by anglers holding an annual licence. The lower return rates for short-term licence holders is, therefore, expected to have a negligible impact on the declared catch.

Rod Effort

Table 4 shows the total declared number of rod days fished by anglers in each of the regions in each year from 1994 to 2003. Most of the salmon and sea trout angling in 2003 took place in Wales (42%) and in the North West (22%) and North East (18%) Regions, as in previous years. There was relatively little angling for these species in Thames and Southern Regions. In the North East, South West, Welsh and North West Regions, the number of days fished decreased substantially compared with 2002 (13% decrease overall), and was below the average of the previous five years in all Regions except Southern. Rod fishing effort has decreased by 45% since 1994. This reflects both the fall in the number of licences issued over recent years and the introduction of compulsory catch-and-release before 16 June in 1999. The distribution of fishing effort before and after 16 June for 2003 is shown in Table 5, as extracted from a random sample of 8,000 rod catch returns. Based on this sample, 23% of the overall angling effort took place prior to June 16, with the proportion varying regionally from 16% (North West) to 30% (South West) (excluding the Thames). This represents a small increase on 2002, when only 22% of the overall angling effort was prior to June 16 (range 15-35% by Region). Expressed as a percentage of all the days fished early in the season in England and Wales, the highest fishing effort before June 16 was in Wales. This also applied in 2002 and may reflect early season fishing targeted at sea trout rather than salmon.

Table 4. Total number of rod days fished from catch returns for each Region, 1994-2003

Total days	NE	Thames	Southern	SW	Mids	Welsh	NW	Total
1994	37,937	343	2,446	41,087	13,596	118,862	78,176	292,447
1995	38,724	414	2,696	35,853	14,893	85,107	65,601	243,288
1996	34,726	154	1,928	32,504	13,056	84,922	64,454	231,744
1997	40,345	181	2,332	38,809	14,886	102,930	70,222	269,705
1998	38,229	145	2,095	31,285	11,493	85,906	64,248	233,401
1999	31,676	311	2,018	25,642	7,024	70,660	50,667	187,998
2000	32,319	143	1,771	22,401	5,373	66,270	49,255	177,532
2001	27,485	111	2,117	18,573	4,084	59,163	23,320	134,853
2002	34,423	91	2,462	25,526	4,720	72,328	43,278	182,828
2003*	**28,350**	**125**	**2,478**	**21,848**	**5,072**	**66,491**	**35,587**	**159,951**
Mean (1998-02)	32,826	160	2,093	24,685	6,539	70,865	46,154	183,322
% change:								
2003 on 2002	-18	+37	+1	-14	+7	-8	-18	-13
2003 on 5-yr mean	-14	-22	+18	-11	-22	-6	-23	-13

* *Provisional.*

Table 5. Number and proportion of rod days fished in 2003 before (<) and from (≥) 16 June (based on a sample of 8,000 rod catch returns)

Region	No. days fished			As % of Regional total		As % of days fished in period	
	< June 16	≥ June 16	Total	< June 16	≥ June 16	< June 16	≥ June 16
North East	3,389	14,301	17,690	19	81	17	21
Thames	35	52	87	40	60	0	0
Southern	373	1,053	1,426	26	74	2	2
South West	3,317	7,572	10,889	30	70	17	11
Midlands	748	2,068	2,816	27	73	4	3
Wales	8,655	25,458	34,113	25	75	44	38
North West	3,168	17,136	20,304	16	84	16	25
Total	**19,685**	**67,640**	**87,325**	**23**	**77**		

1.3 Catch limits

There are no regulations limiting national catches of salmon in net or rod fisheries in England and Wales, but a number of restrictions have been introduced under local byelaws for rod fisheries. Details of the rod bag limits currently in force are listed below. Non-statutory restrictions have also been introduced in some areas by fishery owners and angling associations, but there is no national record of these.

Region	River	Salmon Bag Limit - rods			Other constraints
		per day	per week	per season	
Thames	Thames	2			
South West	Taw	2	3	10	) No fish > 70 cm to be
	Torridge	2	2	7	) retained after August 1
Wales	Tywi	2	5		
	Taf	2	5		
	E&W Cleddau	2	5		
	Nevern	2	5		
	Teifi	2	5		
	Aeron	2	5		
	Ystwyth	2	5		
	Rheidol	2	5		
North West	Lune			4	

2. Catches and CPUE

2.1 Catches

The provisional catch statistics for 2003 are based upon returns received up until 20 February 2004. The rod catch data are based largely on anglers' returns, except for a few rivers where the data from fishery owners' returns are considered to be more complete (Rivers Wye, Test & Itchen), and include fish reported as a result of the second reminder. A further small increase is expected as a result of late returns. The catch returns for the nets and fixed engines are not expected to change substantially.

2.1.1 Catches in 2003

Table 6 presents the provisional total salmon catch for England and Wales for 2003, compared with confirmed catches for the previous 5 years. A breakdown of the provisional 2003 rod and net catches for each Region is provided in Table 7.

The total declared catch for nets and fixed engines in 2003 was 54% lower than in 2002, and less than half of the average for the previous 5 years (Table 8, Figure 4). Catches were lower than those in 2002 in all Regions except Midlands. Despite the drift net buy-off, the catch was still dominated by the north east coast fishery, which has accounted for between 57% and 85% of the national annual net catch during the period 1992-2003 (61% in 2003). Because of the variability in catches from year to year, care must be taken in comparing annual figures. A more reliable picture of recent catch trends may be obtained by comparing data aggregated over a period of years. Between the periods 1997-99 and 2000-2003, there has been a substantial decline in the average net catches in some regions; the greatest reductions have occurred in Wales (56%) and the South West (12%). However, there was an increase in the average catches between these two periods in the Midlands (6%), the North West (32%) and in the North East until 2002 (65%), followed by a 66% fall there in 2003 due to the buy out of the north east coast drift net fishery. These figures may reflect, in part, the better status of the main river stocks in the north of the country, compared with other regions of England and Wales. It has also been suggested that the declared catch in the North East for a few years prior to 2003 might have been inflated by the prospect of a buy out (Section 2.1.3).

The rod catches (both retained and released fish) for recent years are shown in Table 9 and Figure 5. The total declared catch has varied between about 12,500 and 17,600 fish over the period 1997 to 2002 without any evident trend; but the catch of 10,900 fish in 2003 is much lower than catches in 2001 when Foot and Mouth Disease restrictions severely constrained angling activity on many rivers. This is associated with a considerable reduction in angling effort in 2003. Catches in 2003 were below those in 2002 in all Regions except the Midlands (up 70%), and were 29% down on 2002 overall. The perception from local Fishery Officers was that runs of salmon early in the season had been relatively good, but that the grilse run had been poor and late running fish had arrived too late to feature prominently in catches. The recent rod catch trends for different Regions show marked variability (Figure 5), with several Regions (particularly Wales, the North West and South West) showing a declining catch trend and lowest values in 2003, whereas there has been an increasing trend over the period in the North East's catches.

2.1.2 Catches in coastal, estuarine and riverine fisheries

Catch data grouped for coastal, estuarine and riverine fisheries are requested by ICES and these data (fish caught and retained only) for the years 1993 to 2003 are presented in Table 10. The catch for the coastal fisheries mainly reflects the catch in the north east drift net fishery, but also includes fixed nets in this area, drift nets on the Cumbrian coast (North West Region) and a number of nets and fixed engines fished around the Welsh and East Anglian coasts and in the Bristol Channel. The data set starts in 1993, as this marks the start of the phase out of the north east drift net fishery; other mixed stock fisheries have also been phased out since this date. A full list of the fisheries included in the coastal category appears in the footnote to Table 10. In 2003, only three coastal fisheries remained in operation, and one of these, Anglian, usually takes very few salmon. The riverine fisheries comprise catches in freshwater and represent the rod catch plus the very small catches in two ancient fixed engines, the River Conwy basket trap and River Eden coops. The estuarine category includes all the other net and fixed engine fisheries (Table 1).

Table 6. Declared catch of salmon for England and Wales for 1998-2003

Year	Nets & Fixed Engines		Rods (inc. released fish)		Total caught		Total retained	
	No.	Wt (t)	No.	Wt (t)	No.	Wt (t)	No.	Wt (t)
1998	25,179	84.7	17,109	59.1	42,288	143.9	36,917	122.9
1999	34,167	124.4	12,492	49.8	46,659	174.2	41,094	150.0
2000	50,998	182.7	17,596	67.5	68,594	250.2	60,953	218.8
2001	43,243	153.3	14,383	56.8	57,626	210.1	51,307	184.2
2002	38,279	133.3	15,282	60.4	53,561	193.7	45,669	161.0
2003*	**17,188**	**69.2**	**10,898**	**46.7**	**28,086**	**115.9**	**21,985**	**88.4**
Mean (1998-2002)	38,373	136	15,372	59	53,746	194	47,188	167

** Provisional*

Table 7. Provisional regional salmon catches (including released fish) for England and Wales - 2003 season

Region	Net catch		Rod catch		Total catch	
	No.	Weight (kg)	No.	Weight (kg)	No.	Weight (kg)
North East	10,415	41,498	3,249	15,493	13,664	56,991
Anglian	13	32	0	0	13	32
Thames	0	0	0	0	0	0
Southern	0	0	234	1,018	234	1,018
South West	1,444	5,456	1,206	4,542	2,650	9,998
Midlands	1,540	7,651	331	1,666	1,871	9,317
Welsh	975	3,784	2,515	10,494	3,490	14,278
North West	2,801	10,791	3,353	13,446	6,154	24,237
Unknown	0	0	10	39	10	39
Total	**17,188**	**69,212**	**10,898**	**46,698**	**28,086**	**115,910**

Table 8. Summary of declared regional salmon and grilse net and fixed engine catches (including released fish), 1992-2003

Year	Region						
	NE	Anglian	SW	Mids	Wales	NW	Total
1992	20,144	11	5,521	2,117	2,927	3,123	33,843#
1993	41,800	4	5,017	950	3,324	5,460	56,555#
1994	46,554	3	6,437	2,321	4,995	6,143	66,453#
1995	53,210	5	3,251	2,588	3,039	5,566	67,659
1996	18,581	3	5,093	1,608	2,931	4,464	32,680
1997	21,922	0	2,466	1,282	2,628	3,161	31,459
1998	18,265	3	1,759	1,074	2,300	1,778	25,179
1999	26,833	6	1,605	989	2,347	2,387	34,167*
2000	43,354	0	2,171	973	1,004	3,496	50,998*
2001	36,115	0	1,794	1,027	997	3,310	43,243
2002	30,980	112 $	1,404	1,190	1,275	3,318	38,167*
2003 (provisional)	**10,415**	**13**	**1,444**	**1,540**	**975**	**2,801**	**17,188***
Mean (1998 - 2002)	31,109	2	1,747	1,051	1,585	2,858	38,351
% change:							
2003 on 2002	-66	-88	+3	+29	-24	-16	-55
2003 on 5-yr mean	-67	-46	-17	+47	-38	-2	-55

Key: *# Totals exclude small numbers of fish caught in the Southern Region. River Itchen seine net fished for scientific purposes only; all salmon caught tagged and released.*

** Includes a small number of fish caught & released (Anglian, Wales & SW Regions only)*

$ It is unusual for salmon to be caught in this sea trout fishery in any numbers; these reported fish were of low mean weight and may have been misidentified.

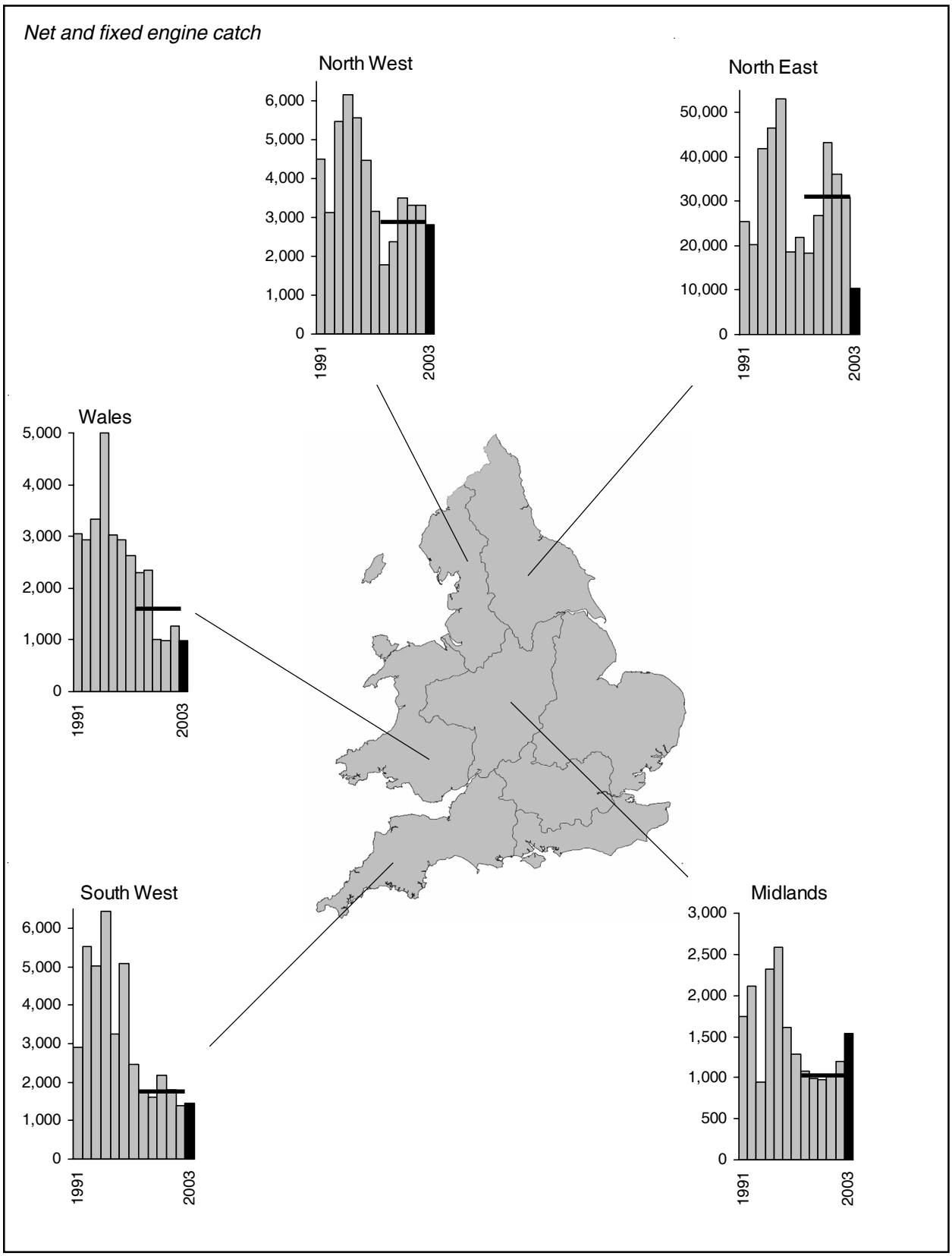


Figure 4. Regional declared salmon net and fixed engine catches. The histograms display data for the thirteen years 1991 to 2003, together with the five-year mean for the period 1998-2002 (displayed as a horizontal line). Note that the histograms are not drawn to the same scale. Data for 2003 are provisional.

Table 9. Summary of declared regional salmon and grilse rod catches, 1998-2003 - including details of fish caught and released and fish caught and killed

Year	Region							
	NE	Thames	Southern	SW	Midlands	Wales	NW	Total*
Declared catch (fish caught and retained)								
1998	1,904	0	144	1,842	155	3,346	4,340	11,738
1999	1,322	0	116	983	120	2,166	2,338	7,045
2000	1,712	0	69	1,335	224	2,785	3,998	10,126
2001	1,878	0	8	761	145	3,004	2,430	8,240
2002	1,710	0	3	817	122	1,966	2,998	7,624
2003 (provisional)	**1,179**	**0**	**21**	**509**	**184**	**1,411**	**1,609**	**4,917**
Declared catch (fish released)								
1998	1,037	0	222	1,077	31	979	2,019	5,371
1999	1,348	1	137	898	65	1,203	1,795	5,447
2000	1,888	0	247	1,152	103	1,264	2,816	7,470
2001	1,855	0	397	635	128	1,347	1,779	6,143
2002	2,257	0	528	920	73	1,346	2,534	7,658
2003 (provisional)	**2,070**	**0**	**213**	**697**	**147**	**1,104**	**1,744**	**5,981**
% of fish released								
1998	35		61	37	17	23	32	31
1999	50		54	48	35	36	43	44
2000	52		78	46	31	31	41	42
2001	50		98	45	47	31	42	43
2002	57		99	53	37	41	46	50
2003 (provisional)	**64**		**91**	**58**	**44**	**44**	**52**	**55**
Declared catch (including fish caught and released)								
1998	2,941	0	366	2,919	186	4,325	6,359	17,109
1999	2,670	1	253	1,881	185	3,369	4,133	12,492
2000	3,600	0	316	2,487	327	4,049	6,814	17,596
2001	3,733	0	405	1,396	273	4,351	4,209	14,383
2002	3,967	0	531	1,737	195	3,312	5,532	15,282
2003 (provisional)	**3,249**	**0**	**234**	**1,206**	**331**	**2,515**	**3,353**	**10,898**
Mean - including fish caught & released (1998-2002)	3,382	0	374	2,084	233	3,881	5,409	15,372
% change:								
2003 on 2002	-18		-56	-31	+70	-24	-39	-29
2003 on 5-yr mean	-4		-37	-42	+42	-35	-38	-29

** Totals include some fish of unknown region of capture.*
Most 2003 figures are angler's catch returns received up to 20 February 2004 (including the second reminder); data for the Rivers Wye, Test and Itchen are based upon owners' returns.

Table 10. Declared catch of salmon (fish caught and retained only) in coastal, estuarine and riverine fisheries, 1993-2003

Year	Coastal		Estuarine		Riverine		Total
	Wt (t)	%	Wt (t)	%	Wt (t)	%	Wt (t)
1993	158.8	64	43.4	18	45.9	18	248.1
1994	183.5	57	58.4	18	81.9	25	323.8
1995	200.3	68	45.4	15	48.9	17	294.6
1996	83.3	45	42.3	23	57.5	31	183.2
1997	80.5	57	26.7	19	34.6	24	141.8
1998	65.2	53	19.4	16	38.2	31	122.9
1999	101.0	67	23.1	15	26.0	17	150.0
2000	156.6	72	25.4	12	36.9	17	218.8
2001	128.6	70	24.2	13	31.3	17	184.2
2002	107.9	67	24.4	15	28.7	18	161.0
2003*	**42.0**	**48**	**26.6**	**30**	**19.8**	**22**	**88.4**
Mean (1993-02)	126.6	61.9	33.3	16.4	43.0	21.6	202.8

** Provisional*

Notes: Coastal catches include: North East coast nets, Anglian coastal nets, River Parrett putcher rank, River Usk drift nets & putcher rank, SW Wales coastal wade & seine nets, River Ogwen seine nets, River Seiont/Gwyrfai seine nets, River Dwyfawr seine nets, N. Caernarvonshire seine nets, River Clwyd sling (drift) nets and the SW Cumbria drift nets.
Riverine fisheries include: rod catches, River Conwy basket trap and River Eden coops.
Estuarine fisheries include all other nets and fixed engines not mentioned above.

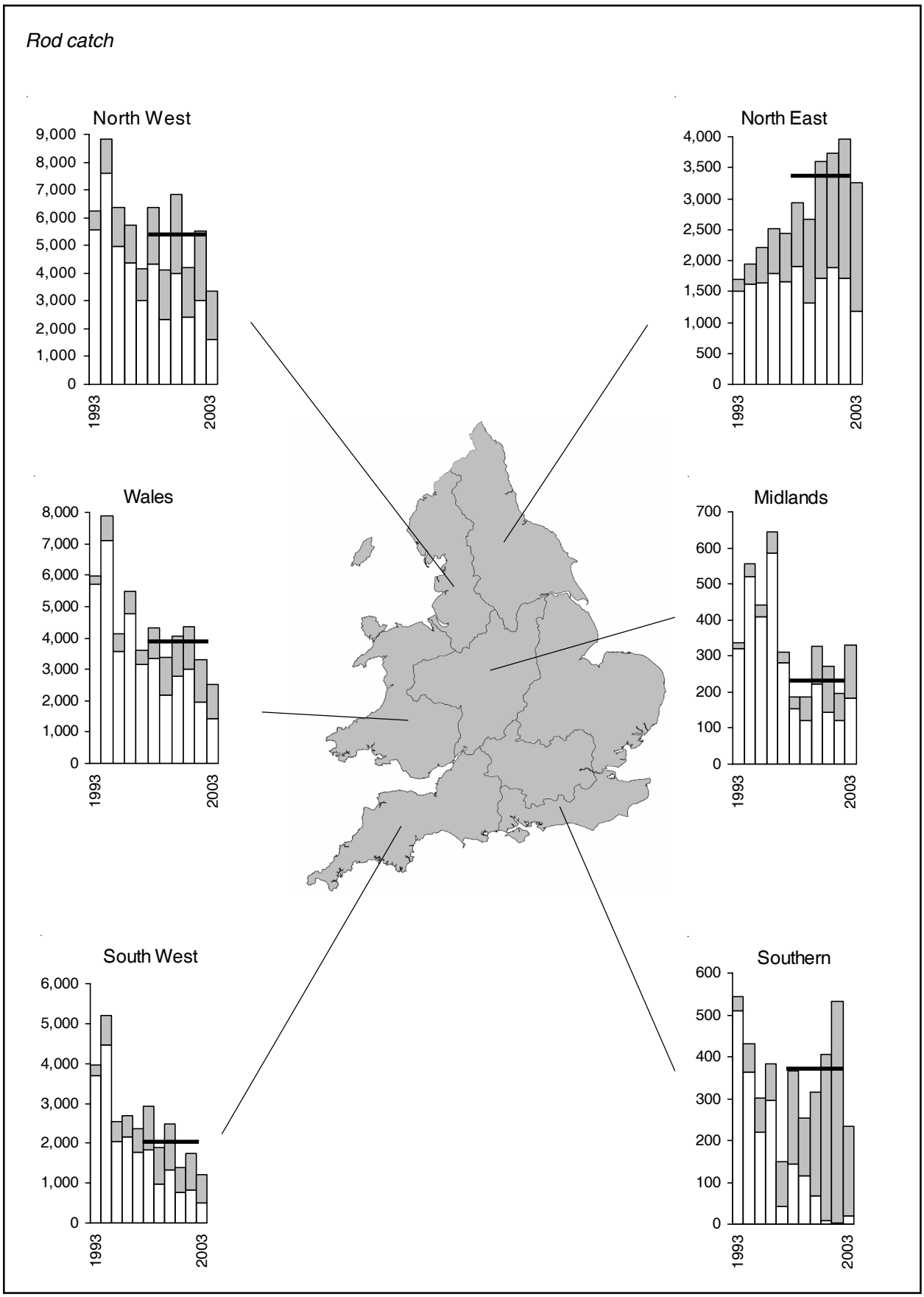


Figure 5. Regional declared rod catch. The histograms display total declared catch, with the shaded area denoting fish caught and released, for the eleven years 1993-2003, together with the five-year mean for the period 1998-2002 (displayed as a horizontal line). Note that the histograms are not drawn to the same scale. Data for 2003 are provisional.

On average, over the period 1993-2003, coastal catches have comprised 62% of the total (declared fish caught and retained), estuarine catches 16% and riverine catches 22%. Over the period 1999 to 2002, the coastal proportion of the catch was at its highest level over the ten-year time series (67-72%). In 2003, the coastal catch comprised 48% of the total, estuarine catches 30% and riverine catches 22%.

2.1.3 Effects of significant management measures (and other events) on catches

Catch and release: Within England and Wales, there has been increasing use of catch and release by salmon anglers in recent years, and this has been re-inforced by the introduction in 1999 of a national byelaw requiring the compulsory release of all salmon caught by rods before 16 June. This was in response to the well-publicised and ongoing concerns about the decline in the numbers of spring salmon. The number of fish caught before June fell from a five-year average (1994-98) of 1,898 (10.9% of the total catch) prior to the introduction of the national measures to a mean of 841 fish (6% of the catch) since 1999. This reflects both the decline in the abundance of spring salmon and the reduction in fishing effort due to the national measures. Details of fish caught and released are published for each major salmon river in England and Wales in the annual catch statistics and these data are summarised in Tables 9 and 11 and in Figure 5. In 2003, this amounted to 6,101 fish (27.5 tonnes); 5,981 (27.0 tonnes) by rods and 120 (0.5 tonnes) by nets. The proportion of rod-caught salmon released by anglers increased steadily from 10% in 1993 to 42-44% over the three-year period 1999-2001; the proportion increased again in 2002 to 50% and 55% (provisionally) in 2003. The increase in 2003 may, in part, reflect the fact that catches were relatively good in the spring and at the very end of the fishing season when a higher proportion of MSW and coloured fish would have been caught and released.

Catch and release has been enhanced on some rivers in recent years through negotiated agreements. On the Rivers Test and Itchen in the Southern Region, voluntary agreements have been reached with the salmon fisheries for all the fish to be released. This has taken a few years to receive unanimous support, but is now widely observed, except where fish are donated for broodstock purposes. A formal agreement has also been reached with fishery owners on the Hampshire Avon for all fish to be released; this agreement will be reviewed in 2006.

An analysis of the numbers of salmon released by weight category (<3.6 kg (8 lbs), 3.6 - 6.4 kg (14 lbs), and >6.4 kg) and season, for the years 1998 to 2003, is shown at Table 12. This indicates that, since the introduction of the national measures to protect spring salmon, anglers have been voluntarily

Table 11. Number, weight and proportion of declared salmon rod catch released by anglers, and number and weight of net catch released, 1993-2003

	Salmon released by rods			Salmon released by nets	
	Number	Weight (t)	As % of declared catch	Number	Weight (t)
1993	1,448	5.26	10.3		
1994	3,227	12.19	13.0		
1995	3,189	12.11	19.9		
1996	3,428	13.99	19.7		
1997	3,132	13.77	24.0		
1998	5,365	20.98	31.4		
1999	5,447	23.87	43.6	118	0.4
2000	7,470	30.70	42.4	171	0.7
2001	6,143	25.50	42.7	176	0.4
2002	7,658	31.80	50.0	234	0.9
2003*	**5,981**	**27.00**	**54.8**	**120**	**0.5**

** Provisional*

Notes: Many of the salmon released by nets have been as a result of a compensation scheme on the River Avon (see Section 1.2.1). Data on catch and release not collected prior to 1993.

Table 12. Number and proportion (%) of salmon released, by weight category (kg) and season, 1998-2003

Season	April to June			July to August			September to October			April to October		
Wt. category (kg)	<3.6	3.6-6.4	>6.4	<3.6	3.6-6.4	>6.4	<3.6	3.6-6.4	>6.4	<3.6	3.6-6.4	>6.4
Number												
1998	148	124	20	687	206	40	2,298	965	253	3,133	1,295	313
1999	240	658	194	328	178	61	1,663	1,105	466	2,231	1,941	721
2000	295	581	148	555	241	72	2,722	1,515	502	3,572	2,337	722
2001	179	774	138	494	318	52	2,320	1,255	420	2,993	2,347	610
2002	241	659	213	488	207	57	2,084	1,473	488	2,813	2,339	758
2003*	**182**	**568**	**177**	**242**	**223**	**60**	**1,328**	**1,259**	**552**	**1,752**	**2,050**	**789**
Percentage (%)												
1998	24	16	18	18	23	18	36	44	45	29	34	35
1999	60	67	74	23	26	30	40	46	53	38	48	53
2000	63	70	72	21	28	30	41	47	56	37	48	55
2001	61	61	68	25	28	26	41	46	58	37	46	55
2002	64	65	71	24	27	33	47	54	63	41	52	61
2003*	**65**	**73**	**77**	**29**	**29**	**34**	**48**	**57**	**69**	**45**	**55**	**66**

** Provisional.*
1998 Pre national byelaw.
1999 National byelaw requiring compulsory catch and release before 16 June introduced on 14 April.
2000 First full year of national catch and release byelaw.

releasing an increased proportion of all fish caught after June, and large salmon in particular. For example, in the months of September and October, 45% of large salmon were voluntarily released by anglers in 1998 and this rose to 63% in 2002 and 69% (provisionally) in 2003. For all categories of fish, release rates were at an all-time high in 2003.

Later net fishery opening under National Byelaws: The national measures introduced in April 1999 also closed all net fisheries for salmon before 1 June. This has resulted in a large reduction in the number of fish caught by net fisheries before June, from a five-year average (1994-98) of 2,997 fish (6.7% of the total catch) to a mean of 51 (0.14% of the catch) since 2000 (Table 13). However, a small number of fisheries (primarily targeted at sea trout) are allowed to operate prior to 1 June, provided any salmon caught before that date are released. In 2003, a total of 120 salmon, weighing 0.5 t, are reported to have been caught and released by netsmen. The majority of these fish (78) were

Salmon in landing net, prior to release

Table 13. Number and proportion of declared salmon net and rod catch taken before (<) 1 June, and the numbers taken from (≥) 1 June, 1989-2003

Year	Net catch				Rod catch (including released fish)			
	Numbers			%	Numbers			%
	< 1 June	≥ 1 June	Total	< 1 June	< 1 June	≥ 1 June	Total	< 1June
1989	4,742	64,198	68,940	6.9	3,199	11,529	14,728	21.7
1989	4,742	64,198	68,940	6.9	3,199	11,529	14,728	21.7
1990	7,339	64,488	71,827	10.2	2,397	12,290	14,687	16.3
1991	3,637	34,038	37,675	9.7	2,240	11,496	13,736	16.3
1992	2,497	31,352	33,849	7.4	1,012	9,725	10,737	9.4
1993	1,630	54,936	56,566	2.9	865	13,194	14,059	6.2
1994	4,824	61,633	66,457	7.3	2,609	22,282	24,891	10.5
1995	4,888	62,771	67,659	7.2	2,141	13,865	16,006	13.4
1996	2,913	29,767	32,680	8.9	2,691	14,753	17,444	15.4
1997	1,528	29,931	31,459	4.9	1,335	11,278	12,613	10.6
1998	832	24,335	25,167	3.3	712	15,275	15,987	4.5
1999	116	34,043	34,159	0.3	920	11,211	12,131	7.6
2000	19	50,979	50,998	0.04	760	16,496	17,256	4.4
2001	47	43,196	43,243	0.11	708	13,675	14,383	4.9
2002	32	38,247	38,279	0.08	815	14,250	15,065	5.4
2003*	**42**	**17,146**	**17,188**	**0.24**	**1,002**	**9,811**	**10,813**	**9.3**
Mean (1994-98)	2,997	41,687	44,684	6.71	1,898	15,491	17,388	10.9
Mean (1999-2003)	51	36,722	36,773	0.14	841	13,089	13,930	6.0

** Provisional.*

Notes: National measures to protect 'spring' salmon introduced on April 15 1999 - required compulsory catch and release of all rod caught salmon prior to June 16, and closed most net fisheries prior to June 1.
Rod catch data only include fish for which date of capture recorded; data differ from total catch (Table 9).

actually released after 1st June as a result of a compensation scheme on the Hampshire Avon (65 fish - see Section 1.2.1) and in the Anglian net fishery (13 fish), thus only 42 salmon, mainly originating from a number of sea trout fisheries in Wales and the South West, arose from the derogation to the national measures. Summary data are included in Table 11.

The contribution of MSW salmon to catches in recent years is covered in Section 2.5.

Review of national byelaws: A 5-year review of the national measures to protect spring salmon was carried out by the Agency in 2003 (Environment Agency, 2003b). It found that spawning escapement of spring salmon may have increased by up to one third on some rivers as a result of the measures, but spring salmon stocks are still seriously depleted on many rivers. The review concluded that the measures should remain in place until 2008 and no further measures specifically aimed at early running salmon are required at this stage. However, the need for enhanced river-specific measures before the 2008 review will be examined on a case-by-case basis through the SAPs (see page 6).

Mixed stock fisheries: Since 1993, there has been a policy to phase out coastal mixed stock salmon fisheries in England and Wales as existing licensees retire. In December 2000, the Government offered up to £750,000, subject to matching funds from interested parties, to launch compensation arrangements designed to accelerate the phase out of mixed stock fisheries on a voluntary basis with particular emphasis on the north east coast fishery. Ultimately, the scheme was based on funding of nearly £3.4 million of which £1.25 million came from the Government, and 52 licencees have now signed agreements with NASF(UK) to permanently relinquish their licences in return for payments of agreed sums. As a consequence, 16 drift net licences were issued in 2003 compared with 69 in 2002 (-77%), and the number of drift net licences issued for the north east coast has now been reduced by 89% since 1992. The remaining drift nets took a catch of 5,511 salmon compared with 27,685 in 2002 (-80%). Some of these netsmen were able to remain in the fishery by switching to inshore T- or J- nets, which are known to

exploit a higher proportion of local fish and sea trout. The catch by T/J nets rose from 3,295 in 2002 to 4,904 in 2003 (an increase of 49%), taken by 41 and 46 nets (including combined drift and T- and J-net licences) respectively. The overall catch on the north east coast fell from 30,980 in 2002 to 10,438 in 2003 (-66%).

It is difficult to draw any firm conclusions on the impact of the reduction in netting effort in the North East on salmon runs and catches based on a single year, and particularly given the unusually low flows and the death of at least 1000 fish in the Tyne estuary in 2003. That said, the fish counter on the Tyne (combined count for salmon and sea trout) suggested a large increase in the run of fish into the river (44,063 fish in 2003 compared with 18,886 fish in 2002 and a five-year mean of 21,152 fish) and the numbers of fish spawning were reported to have been good. Similarly, the combined count on the River Wear was also over 20% up on both 2002 and the five-year average. However, the rod catch of salmon on the Tyne in 2003 (2,054) was below the catch in 2002 (2,585) and the previous five-year mean (2,220). The 2003 salmon rod catches in most other rivers in the North East (Wear, Coquet, Tees and Yorkshire Esk) were also down on those in 2002; catches on the Rivers Coquet and Tees also fell below the five-year mean. In contrast, 53 rod-caught salmon were reported from the River Aln in 2003 compared with just 4 in 2002 and a 5-year mean of 5. The River Aln is the most northerly salmon river in northeast England. Sea trout rod catches showed a similar pattern. Catches on the Tyne, Wear, Coquet, Tees and Yorkshire Esk were all below those recorded in 2002 and below the five-year mean. Catches of sea trout on the Aln were, however, well above 2002 and almost twice the five-year average.

Nine other small coastal mixed stock fisheries have also been subject to reductions in recent years, seven of which are no longer operating, while the remaining two are in the process of been phased out (Table 3). These are the Anglian coastal fishery, for which 45 (33 drift net and 12 other gear) licences were issued in 2003, one down on 2002, and the Cumbrian coastal drift net fishery, in which one licensee continued to operate in 2003.

Although there have been large annual fluctuations in the declared catches, the overall effect of these measures has been to reduce the catches in these coastal fisheries from an average of about 41,000 fish for the period 1988-92 to a little under 32,000 for the period 1998-2002 and 10,526 fish in 2003. In addition to the north east coast buy-out, the nets and fixed engines on the River Usk were bought off in 2000, prior to which the average catch of this fishery was about 1,000 fish each year (~40% of the total net catch in Wales). The more recent buy-off of the Taw/Torridge fishery has resulted in a drop in the catch from a five-year mean (1997-2001) of 665 fish to just 276 in 2003.

Low flows: River flows throughout much of 2003 were unusually low and conditions were unfavourable for fish to run and for angling. In addition, salmon mortalities were recorded in a number of estuaries due to low dissolved oxygen and poor water quality. In the Tyne Estuary, for example, some 1,136 carcases were recovered, and a number of distressed fish were seen below the barrage in the Tees Estuary. Releases of water in August and September were authorised from Kielder reservoir to alleviate the situation on the Tyne and Wear, and from Llyn Brianne to encourage fish to run the Tywi (though no mortalities were reported there).

2.1.4 Long-term catch trends

Figure 6 shows the annual declared net catch for England and Wales since 1956, and distinguishes the catch in the north east coast fishery, which increased rapidly in the late 1960s with the introduction of synthetic nets and has comprised well over 50% of the total net catch in most of the subsequent years. The partial buy out in 2003 led to a 66% reduction in the reported north east coast catch.

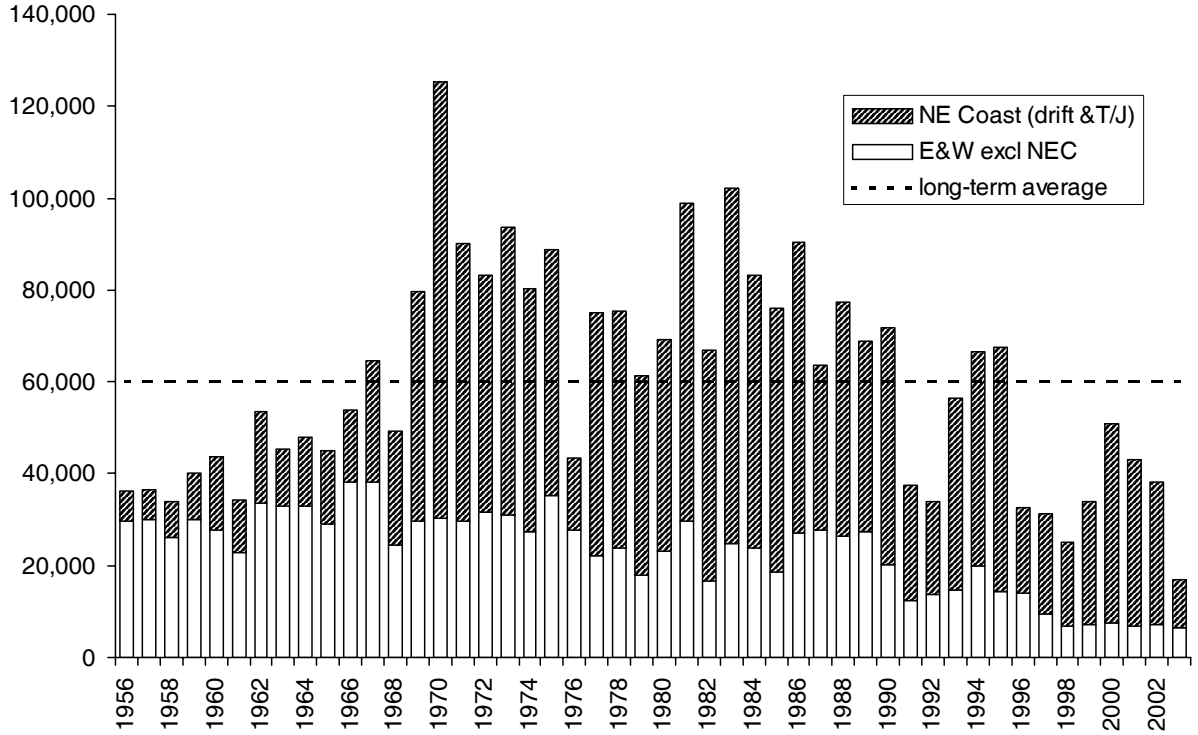


Figure 6. Total declared salmon net and fixed engine catch for England and Wales 1956-2003; the shaded area indicates the catch in the north east coast fishery

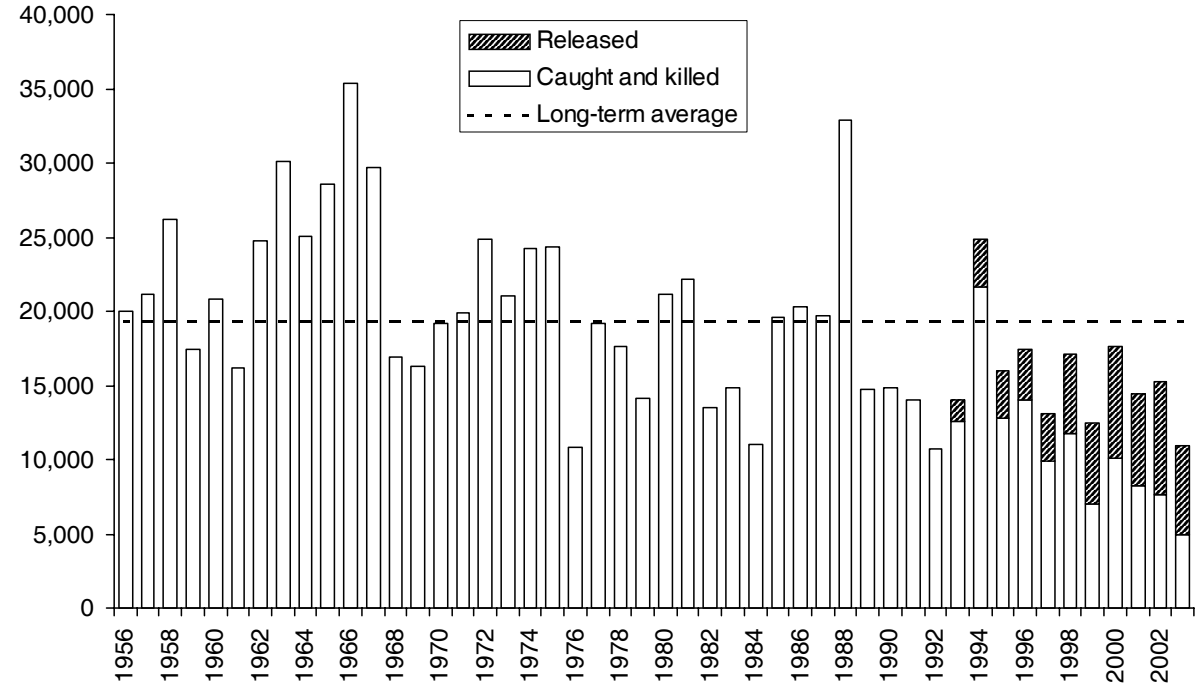


Figure 7. Total declared salmon rod catch for England and Wales 1956-2003; the shaded area indicates fish caught and released. (N.B. Data for 2003 are provisional; fish caught and subsequently released were not reported prior to 1993)

The catches in the other net fisheries have been declining since the mid 1970s and, since 1998, have remained near the lowest level in the past 40 years. The decline in catches in the 1990s reflects reductions in both fishing effort (see Table 2) and stock size.

The declared rod catch of salmon has declined by around 60% from its peak in the mid-1960s to the present day (Figure 7). This trend underestimates the true rate of decline in catches because reporting rates have improved and catch data for the past seven years are the most complete in the time series. In addition, the pattern on individual rivers has varied from much more severe declines to substantial recoveries. Although angling effort appears to have declined considerably since 1995 (Table 4), we do not know how this relates to the level of fishing activity in earlier years. The total annual rod catch (including released fish) since 1989 has fluctuated around a level of about 14,000 fish, though 2003 was a particularly poor year and among the lowest in the time series.

2.2 Catch per unit effort (CPUE)

Catch levels are influenced by stock abundance, the catchability of the fish, and by the variation in the time anglers and netsmen spend fishing. Catch per unit of fishing effort (CPUE) is, therefore, used as well as the declared catch in order to help evaluate the relative status of stocks. CPUE can also provide a measure of angler satisfaction (most people would rather catch one salmon for every 10 days they fished than one every 20 days), and indicates changes in the profitability of net fishing, the income from the catch being set against the costs of time spent netting. For net fisheries in England and Wales, regional CPUE data have been collated using the number of tides fished (or in the North East Region the number of days fished) as a measure of the amount of fishing undertaken by each licence holder. Rod CPUE data (catch per licence day fished) are now reported for all major salmon rivers in England and Wales in the annual catch statistics reports.

2.2.1 CPUE in net fisheries

Regionally aggregated CPUE data for 2003, compared with previous years, are shown in Table 14. It should be noted that these data do not take account of the differing fishing methods employed in the various regions, nor of any changes in the relative proportions of different gears used. It is also possible that measures to reduce fishing effort through reducing NLOs have tended to encourage the least efficient netsmen to leave the fishery, and thus resulted in an improvement in the overall catchability (the relationship between CPUE and stock). CPUE is also likely to vary within a season. Thus, cautious interpretation is required.

To partially address the above concerns, and to provide a more consistent time series of CPUE data, CPUE for the drift nets in the north east coast fishery are included separately in Table 14. These data are for the summer months only (June to August inclusive) since 1993. The CPUE for this specific fishery varies from 4.9 to 12.2 salmon per day over the period 1993-2003; the CPUE in 2003 was 7.1 salmon per day, a little below the average for the previous five year period (9.15).

In 2003, the CPUE values for nets and fixed engines were below the mean of the previous five years in the North East Region and in Wales. In the Midlands, North West and South West Regions, CPUE values were above the previous five-year average. Generally, CPUE levels appear to have been relatively high in the periods 1993-95 and again in 1999-2002. The recent relatively high levels in most Regions may reflect the effect of the national measures to safeguard spring salmon, which have concentrated effort on the more productive time of year. This would tend to mask the effects of any reduced availability (stock abundance) of salmon on the CPUE in recent years, and it would be inadvisable to draw conclusions about stock status based on catch data alone.

Table 14. Regional CPUE data for net and fixed engine salmon fisheries, 1988-2003

Data are expressed as catch per licence-tide in all Regions except the North East, for which the data are recorded as catch per licence-day.

Year	NE	Region (aggregated data, various methods)					
	Drift nets (June-August)	NE	Southern	SW	Midlands (a)	Wales	NW
1988		5.49	10.15				
1989		4.39	16.8			0.90	0.82
1990		5.53	8.56			0.78	0.63
1991		3.20	6.40			0.62	0.51
1992		3.83	5.00			0.69	0.40
1993	8.23	6.43	No fishing			0.68	0.63
1994	9.02	7.53	"			1.02	0.71
1995	11.18	7.84	"			1.00	0.79
1996	4.93	3.74	"			0.73	0.59
1997	6.84	5.30	"	0.42		0.77	0.35
1998	6.49	5.12	"	0.56	0.25	0.69	0.32
1999	8.77	7.28	"	0.48	0.36	0.83	0.37
2000	12.21	10.50	"	0.64	0.43	0.40	0.64
2001	10.06	8.70	"	0.62	0.42	0.47	0.56
2002	8.23	7.00	"	0.62	0.34	0.53	0.63
2003 (Provisional)	**7.10**	**4.69**	"	**0.67**	**0.48**	**0.39**	**0.51**
Mean (1998 - 2002)	9.15	7.72		0.58	0.36	0.58	0.50

Note: Revised reporting procedures introduced in 2001 required fishermen in all Regions, except NE, to report catches per tide fished.

Key: (a) Seine nets and lave nets only.

2.2.2 CPUE in rod fisheries

Regional summaries of rod CPUE data for anglers making returns (expressed as number of salmon caught per 100 days fished) are presented in Table 15 for the period 1997 to 2003. These figures include returns from a wide variety of anglers; for example, from locals who fish regularly, those who only fish for salmon whilst on holiday, and those who fish primarily for sea trout. River characteristics (e.g. underlying geology, flow patterns, etc.) also vary markedly between regions. This will result in the CPUE for salmon varying between regions, but still provides scope for comparisons through time within a region. It should also be noted that reductions in effort due to the national measures to protect spring salmon may have affected CPUE from 1999 onwards. The rod CPUE in 2003 was near to the highest recorded in the period in the Midlands and North East

Table 15. Rod CPUE - number of salmon (including released fish) caught per 100 days fished for regional rod fisheries, 1997-2003. (Catches shown in Table 9).

Year	Region							England & Wales
	NE	Thames	Southern	SW	Midlands	Wales	NW	
1997	5.0	0.6	3.1	5.2	1.7	2.6	5.3	4.0
1998	6.5	0.0	5.9	7.5	1.3	3.9	8.6	6.0
1999	7.4	0.3	3.1	6.3	2.1	3.5	7.4	5.5
2000	9.2	0.0	5.2	8.8	4.9	4.4	11.7	7.9
2001	11.3	0.0	11.0	6.6	5.4	5.5	15.4	8.7
2002	9.4	0.0	17.2	5.8	3.5	3.6	10.6	6.8
2003*	**9.8**	**0.0**	**6.4**	**4.8**	**5.4**	**3.0**	**8.3**	**5.8**
Mean (1998 - 2002)	8.8	0.1	8.5	7.0	3.4	4.2	10.7	7.0
% change:								
2003 on 2002	+4		-63	-17	+54	-17	-22	-15
2003 on 5-yr mean	+12		-25	-31	+57	-28	-23	-17

Note: Based only on catch returns for which effort data have been reported.

** Provisional.*

Regions and above the recent five-year average. Elsewhere, CPUE was reduced compared with the relatively high values noted in 2000 - 02 (down 36% overall) and fell below the five-year average in the North West, Southern, Wales and the South West Regions. The relatively low CPUE values in these regions in 2003 suggest low in-season availability of fish and overall poor angling success, possibly due to high temperatures and low flows in the summer and autumn deterring fish from running. However, CPUE values reflect only the availability of salmon during the fishing season, and may bear less relation to spawning escapement of late-running fish in November and December. Thus, as with nets, it should be noted that the relationship between CPUE for rod fisheries and salmon abundance can be influenced by confounding factors.

2.3 Unreported and illegal catches

If the full effects of fisheries upon stocks are to be assessed, managers must take account of unreported catches by net and rod licence holders and also the scale of illegal catches. In earlier years, estimates of the levels of under-reporting and illegal fishing (expressed as percentages of the declared regional catches) have been provided by regional fisheries staff. However, in an effort to improve these estimates, the methodology was re-examined in 1997 and an approach agreed. This has been used for estimating the extent of unreported and illegal catches since 1998.

2.3.1 Under-reporting by licence holders

The rate of under-reporting for net fisheries is generally considered to be low in most regions of England and Wales, and this has been supported by the findings of two studies. In the North East, under-reporting in the coastal fishery has previously been estimated at about 7% (Anon., 1991). In the North West, comparison of the catches seen by the bailiff with those declared for that day, suggested that catches in the estuary net fishery on the River Lune were under-reported by around 8%. Opinions on the level of under-reporting in net fisheries in other regions of England and Wales were collected from Agency regional fisheries personnel in February 1998; these fell in the range 0% to 15%. It has been suggested that over-reporting of catches may occur in some fisheries in response to rumours about potential future buy-outs (and the perception that compensation will be based on declared catches). This may have applied recently to the north east coast fishery and in 2000-2002 there was assumed to be no under-reporting in this fishery. Apart from this, a figure of 8% has been used for the level of under-reporting of the net catch in recent years and again in 2003.

For the purpose of setting conservation limits under their Salmon Action Plan guidelines, the Agency have estimated that declared salmon rod catches from 1994 onwards should be increased by 10% to allow for under-reporting of the legal rod catch across England and Wales. This has been based on a study of annual catch returns made following reminders (Environment Agency, 1998). Exceptions to this apply for the River Wye in Wales and the Rivers Test and Itchen in the Southern Region for which the fishery owners' returns are regarded as being accurate, and for which no scaling factor has been applied for under-reporting. The 10% correction for under-reporting has continued to apply through to the 2003 season, although it is expected that this will be reviewed in light of the recent issue of second reminders for catch returns.

2.3.2 Illegal catches by unlicensed fishermen

By their nature, illegal catches are very difficult to quantify. However, assessments can be made on the basis of enforcement activities. Consultation with Agency regional fisheries personnel was used as the basis for an assessment in February 1998, which provided estimates of illegal catches in coastal waters and within rivers and estuaries. These ranged from 5% to 18% of the declared catch for different regions.

These estimates were reviewed in 2003 through a brief questionnaire sent to Agency Regional fisheries personnel, as in 1998, asking them whether they agreed with the current estimate or to provide a revised estimate together with any justification for their decision. The results indicated a similar overall level of illegal catches, though regional estimates ranged from 5% (Southern Region, with just 1% of the national catch) to 24% (North West Region, with 17% of the national catch). These catches of salmon tended to arise as by-catch taken by nets legitimately targeting bass and other marine species, although in-river poaching was reported to be an ongoing problem in many areas, driven partly by the premium prices paid for wild salmon.

It is recognised that the use of a national average might not be entirely appropriate given the variation in the regional estimates and the proportion of the England and Wales catch declared by each Region. However, pending further refinement of this analysis, the value of 12% was applied in 2003 (as in all years since 1998), to estimate the total illegal catch for England and Wales.

2.3.3 Under-reported and illegal catch estimate for 2003

On the basis of the above estimates, the non-reported and illegal catch for England and Wales in 2003 is estimated at about 24 tonnes, which represents 21% of the total weight (including the under-reported and illegal catch) of salmon caught and killed.

2.4 Other sources of non-catch fishing mortality

Non-catch fishing mortality includes all sources of mortality generated directly or indirectly by fishing which are not included in the recorded catch. It includes the illegal and unreported catches discussed above, in addition to losses of fish that are removed from fishing gear by predators, dead fish that fall out of a net and fish that escape or are released and subsequently die.

The extent of the likely losses will vary between fisheries because of the type of gear used and its method of operation. In addition, the impact of predators, particularly seals, varies between areas. However, in most net fisheries in England and Wales, the netsmen remain with their gear and remove any fish caught quite quickly; thus relatively few fish will drop out and losses to predators can usually be limited. Sweep and hand-held nets cause very little damage to the fish and so losses of fish that may escape are likely to be minimal. However, small losses may occur from enmeshing nets, and predation losses may be significant in the north east coast fishery, which is close to a large grey seal colony.

No data are available of the mortality of salmon incurred during normal angling activities (e.g. due to lost or foul-hooked fish that subsequently die) that are not recorded in the retained catch. Whilst the use of catch-and-release is likely to result in some fish dying through exhaustion or damage, studies have demonstrated that if fish are appropriately handled, mortality following capture is low and a large proportion of fish survive to spawn (Webb, 1998a and b: Whoriskey *et al.*, 2000). Recent radio-tracking studies carried out by the Agency on the River Eden, Cumbria, found that upwards of 85% of released spring salmon can reasonably be expected to survive to spawning (Environment Agency, 2003b).

2.5 Composition of catches

2.5.1 Age composition of net catches

Prior to 2001, it was not possible to estimate the proportions of grilse (one-sea-winter) and MSW salmon in the catch of all regional net fisheries, because netsmen were generally not required to report the sizes of individual fish caught and few scale samples were collected. However, data collection procedures for all fisheries, except the North East, were standardised in 2001 and this will permit age composition of catches to be reported in the future.

Catches in some net fisheries are reported as small (<3.6 kg = 8 lb) or large (>3.6 kg) salmon, based upon weight splits, and this can be used as a rough indication of sea-age, although this will result in some grilse being classed as MSW salmon and some MSW fish as grilse. Such data are available for 2003 for a number of regions as shown in the text table below:

	Small salmon		Large Salmon		Total
	(<3.6 kg)	%	(>3.6 kg)	%	
NE	4,923	47	5,492	53	10,415
Anglian	9	69	4	31	13
NW	1,595	57	1,206	43	2,801
Mid	286	24	921	76	1,207
Wales	464	47	518	53	982
SW	740	51	704	49	1,444
Total	**8,017**	**48**	**8,845**	**52**	**16,862**

Where the reporting systems have been consistent, these data can provide an indication of changes in the age-composition of the catches. In the North East Region, for example, large ('MSW') salmon are estimated to have made up between 31 and 35 % of the catch over the period 1997 to 2002, which is below the long-term average of 42% (1965-2002). The proportions of MSW salmon recorded since 1999 are expected to have been reduced by the introduction of the national measures restricting netting effort in the early part of the season when MSW salmon comprise the majority of the catch. Though the estimated proportion of 'MSW' salmon in 2003 (53%) is the highest recorded for many years (Figure 8), this in part reflects the poor grilse run in 2003. In all Regions, most notably the Midlands, the proportion of 'MSW' salmon in 2003 was higher than in 2002. Overall, the proportion of large salmon in the net fishery increased from 32% in 2002 to 52% in 2003.

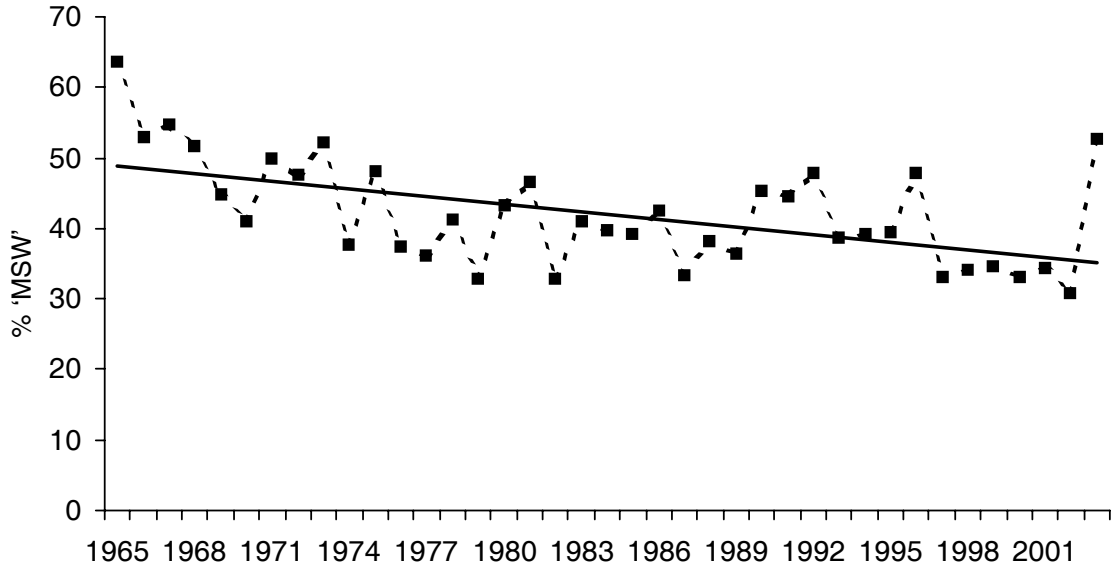


Figure 8. Estimated proportion (%) of MSW salmon (salmon >8lb, as declared by netsmen) in the north east coast fishery, 1965-2003

2.5.2 Age composition of rod catches

Monthly age-weight keys are available for salmon caught in the River Dee trap over the period 1992-2003, and these have been used to estimate the age composition of catches for the principal salmon rivers (Table 16). These estimates were derived from the declared catches where a weight and date of capture have been provided.

Table 16. Proportions of grilse and MSW salmon in provisional declared 2003 rod catches, including fish released

Region	River	No. grilse	%	No. MSW	%
NE	Coquet	307	63	182	37
	Tyne	1,142	56	894	44
	Wear	368	83	77	17
Southern	Itchen	48	37	83	63
	Test	22	46	26	54
SW	Hants Avon	11	11	93	89
	Frome	30	65	16	35
	Exe	102	72	40	28
	Teign	37	79	10	21
	Dart	25	71	10	29
	Tavy	9	64	5	36
	Tamar	72	72	28	28
	Lynher	20	74	7	26
	Fowey	82	84	16	16
	Camel	269	93	20	7
	Taw	36	35	68	65
	Torridge	4	21	15	79
	Lyn	51	73	19	27
Midlands	Severn	103	32	220	68
Wales	Wye	74	24	231	76
	Usk	82	29	198	71
	Ogmore	21	84	4	16
	Tywi	285	68	134	32
	Tawe	38	64	21	36
	Taf	17	68	8	32
	E & W Cleddau	26	81	6	19
	Teifi	178	63	104	37
	Dyfi	42	89	5	11
	Mawddach	70	71	28	29
	Ogwen	39	95	2	5
	Conwy	122	88	17	12
	Dee	284	70	120	30
NW	Ribble	372	76	119	24
	Lune	620	79	166	21
	Kent	204	93	15	7
	Leven	11	92	1	8
	Irt	40	95	2	5
	Ehen	79	87	12	13
	Derwent	366	82	81	18
	Eden	565	74	194	26
	Border Esk	314	82	67	18
Total		**6,587**	**66**	**3,364**	**34**

Note: Data only included for fish for which weight data provided on catch return; these data do not represent the total catch for the season.

In 2003, rod catches in eight of the principal salmon rivers listed in Table 16 (Itchen, Test, Hampshire Avon, Taw, Torridge, Severn, Wye and Usk) contained 50% or more MSW salmon (including fish subsequently released), an increase of two rivers on 2002. Twenty four of the listed rivers had at least 25% MSW salmon in the rod catch, a substantial increase on the period 1999 to 2002 (10 - 13 rivers each year). The estimated numbers of grilse and MSW salmon, and the proportion of MSW fish, in regional rod catches (including fish caught and released) over the period 1995 to 2003 are shown in Table 17 and Figure 9.

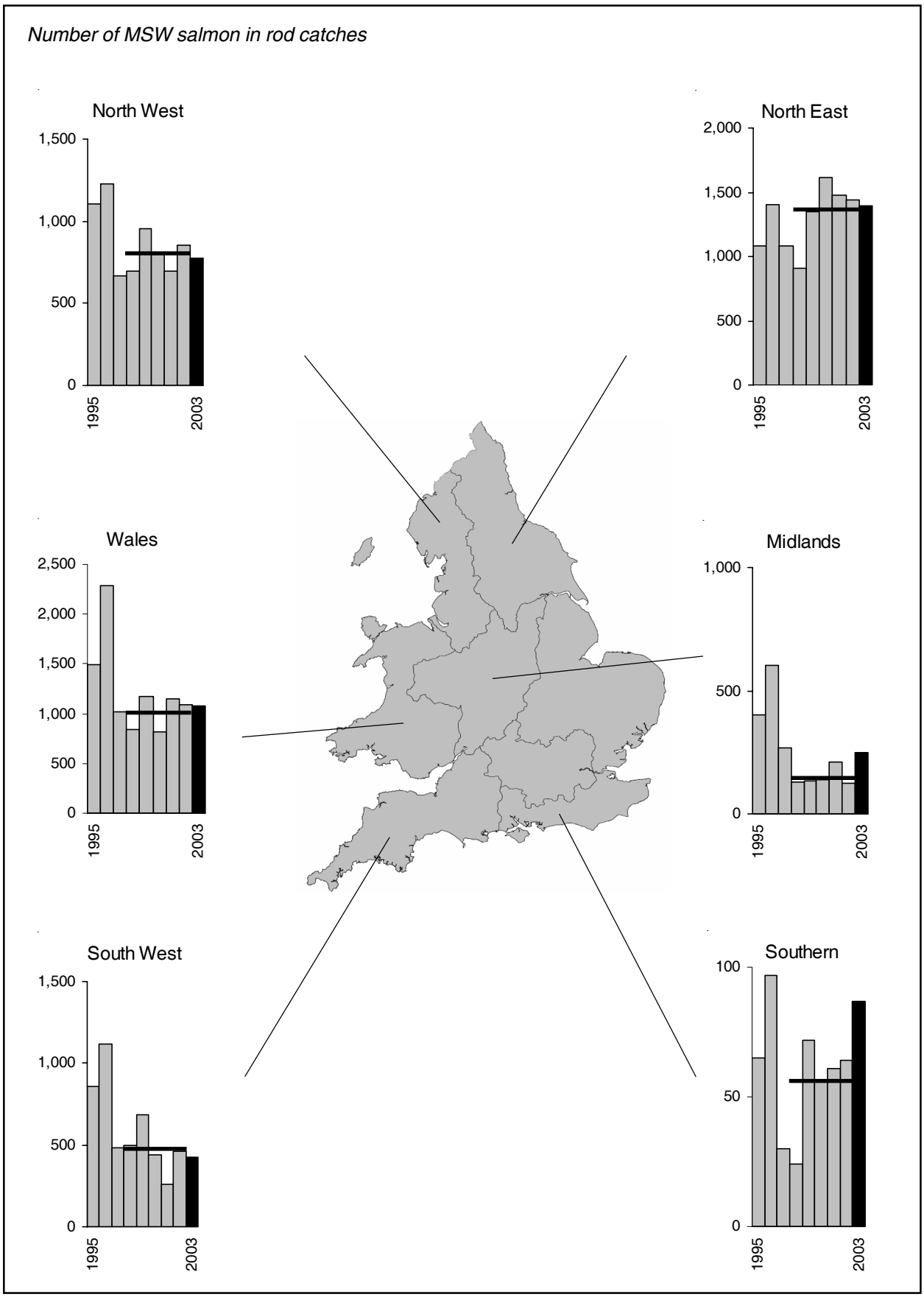


Figure 9. Estimated number of MSW salmon in regional rod catches. The histograms display data for the nine years 1995 to 2003, together with the five-year mean for the period 1998-2002 (displayed as a horizontal line). Note that the histograms are not drawn to the same scale. Data for 2003 are provisional.

Table 17. The estimated number of grilse and MSW salmon (corrected for under-reporting) and the percentage composition of MSW salmon in regional rod catches in England and Wales, 1998-2003 (including fish caught and released)

Year	Region												All Regions	
	NE		Southern		SW		Midlands		Wales		NW			
	Grilse	MSW	Grilse	MSW	Grilse	MSW	Grilse	MSW	Grilse	MSW	Grilse	MSW	Grilse	MSW
1998	2,226	909	378	24	2,543	501	66	131	3,548	843	5,975	699	14,736	3,107
1999	1,586	1,351	206	72	1,386	683	70	132	2,278	1,175	3,589	955	9,115	4,368
2000	2,188	1,618	292	56	2,270	441	200	139	3,196	816	6,507	807	12,383	3,821
2001	2,628	1,478	344	61	1,275	261	90	210	3,638	1,149	3,936	694	11,911	3,853
2002	2,924	1,440	520	64	1,452	459	92	123	2,550	1,093	5,233	852	12,771	4,031
2003*	**2,180**	**1,394**	**170**	**87**	**902**	**425**	**116**	**248**	**1,688**	**1,079**	**2,914**	**774**	**7,970**	**4,007**
Mean (1998-2002)	2,310	1,359	348	55	1,785	469	104	147	3,042	1,015	5,048	801	12,183	3,836
% change:														
2003 on 2002	-25	-3	-67	+36	-38	-7	+26	+102	-34	-1	-44	-9	-38	-1
2003 on 5-year mean	-6	+3	-51	+57	-49	-9	+12	+69	-45	+6	-42	-3	-35	+4

Percentage MSW

Year	Region						All Regions
	NE	Southern	SW	Midlands	Wales	NW	
1998	29	6	16	66	19	10	17
1999	46	26	33	65	34	21	32
2000	43	16	16	41	20	11	24
2001	36	15	17	70	24	15	24
2002	33	11	24	57	30	14	24
2003 *	**39**	**34**	**32**	**68**	**39**	**21**	**33**
Mean (1998-2002)	37	14	21	59	25	14	24

** Provisional.*

In 2003, MSW salmon were estimated to comprise 33% of the catch nationally, compared with 24% in each of 2000, 2001 and 2002. This increase in the proportion of MSW fish in river catches more probably reflects the reduced grilse run in 2003 rather than an increase in the number of MSW fish. However, notable exceptions were the Itchen, Test, Severn, Wye, Tywi, Mawddach and Dee, where substantially more MSW fish were caught than in 2002. There were fewer MSW salmon taken by rods in 2003 than in 2002 in all Regions except the Midlands and Southern, where MSW catches in 2003 were 102% and 36% higher than in 2002, respectively. In general, there is no overall trend in the MSW catches over the past 6 years, although an increasing trend is evident in the Southern Region.

In all Regions, rod catches of grilse in 2003 were much lower than in 2002 and, overall, 35% below the five-year mean and the lowest in the time series. The only exceptions were the Dart and Camel in the South West, the Severn (Midlands) and the Conwy in Wales, where more grilse were caught in 2003 than in 2002. Despite the poor grilse catches in 2003, there has been no overall trend in the grilse catches over the past 6 years, though grilse catches in some regions tend to alternate between good and bad years.

2.6 Origin of catches

2.6.1 Reared fish

There is no salmon ranching in England and Wales. Although fish farm escapees are not formally recorded in catches in England and Wales, an estimated 180 fish believed to have originated in a salmon cage-rearing facility in Glenarm Bay, County Armagh, Northern Ireland were reported in fisheries in North West England and North Wales in autumn 2001 (Milner and Evans, 2003). In 2003, a sampling programme was initiated by CEFAS and the Agency to identify any salmon suspected of being of farmed origin in the England and Wales catch. The ultimate aim of this work is to determine the extent to which such fish may be contributing to spawning stocks. The pilot study in 2003 focussed primarily on the commercial catches in the North East and those from the Severn Estuary. The scheme involved local Fishery Officers and a selection of licensed fishermen and merchants, who were asked to look through salmon catches for suspect fish, identified according to given external characteristics, and to provide morphometric data and scale samples according to a sampling protocol. The Agency already samples salmon taken in traps on four index rivers (Lune, Dee, Tamar and Tyne), and scales and other data of suspect fish were sent to the CEFAS laboratory for validation. As before, anglers were encouraged to report any fish they caught that were suspected of being an escapee.

There were no reports of salmon of farmed origin from the North East (one suspect, later deemed to be doubtful) or Severn Estuary fisheries in 2003, but three suspected escapees were reported from the North West region: one from the Caldew (Eden) trap in November – 2.7 kg approx; one in the Kent – video footage at the fish counter on 12 November – 3.2 kg approx; and an angler fishing the Derwent reported a "farm escapee" in July – 2 kg approx. Only one of these fish (that from the trap) was confirmed as likely to have originated in a fish farm.

In a number of catchments, juvenile salmon are stocked from hatcheries for mitigation or enhancement purposes. Full details of the numbers of fish stocked in these programmes, and the stage (eggs, fry, parr and smolts) of release, are included on a catchment by catchment basis in the Salmonid and Freshwater Fisheries Statistics published annually by the Agency. If they return as adults, these fish cannot usually be distinguished from fish derived from natural spawning, although marking and tagging programmes are undertaken in some areas to assess the efficacy of these programmes (Annex 4). The relatively small scale of stocking and low survival of stocked fish in most instances (Harris, 1994) suggest that these initiatives have a small overall impact on natural salmon populations in England and Wales.

2.6.2 Salmon from other countries

Based upon studies conducted in the 1970s and 1980s, approximately 75% of the salmon caught in the English north east coast fishery were estimated to be returning to rivers in Scotland. With the buy-out of many of the drift nets in 2003, most of the catch was taken by T- and J-nets which operate close inshore and are known from tagging studies to take a higher proportion of local fish. The proportion of Scottish fish will thus be lower in the 2003 catches. The fishery operating in the Solway Firth is also thought to exploit some salmon returning to rivers in Scotland, but the proportion of such fish in the Solway net catch has not been estimated. There are very few records of tagged salmon released in, or originating from, rivers in other countries being taken in English and Welsh fisheries.

2.7 Exploitation rates

2.7.1 Homewater exploitation

The relationships between catch and run are mediated by fishing effort and catchability (the proportion of the stock taken per unit of fishing effort), which in turn are shown to vary between and within rivers. A prime cause of this variation is likely to be river flow, which acts by influencing the behaviour and availability of the fish, and also angler activity.

Relatively few rivers have independent measures of run size to compare against catch. However, such data obtained from counters and traps are available for some rivers in England and Wales (Table 21 and Figure 10). The total catch (retained and released combined) has been used in Table 18 to estimate exploitation rates. These show varying trends, but the true exploitation rates (i.e. fish retained) show a strong decline in most rivers in recent years, an effect largely attributable to catch and release, which has increased from 10% to 55% between 1993 and 2003 (see Table 3 for details of other management measures).

Overall levels of exploitation in 2003 (including released fish) were well below the average of the previous five years in all of the rod fisheries for which data are available, except the Test. Increases compared to 2002 were noted for the Teifi and Dee in Wales and the Test in the Southern Region. In both the latter rivers, a high proportion of the salmon catch is released, whilst a small proportion on the Test are retained for broodstock. Exploitation rates are also available for three net fisheries, on the Dee, Kent and Lune; all three were below the average of the previous five years in 2003, whilst only the Dee showed a small increase on 2002.

An analysis of data from seven of these rivers (Test, Itchen, Frome, Tamar, Fowey, Dee and Lune; Milner *et al*., 2001) has shown that, while exploitation rates are comparatively stable within rivers, there is more variation between years within individual rivers. From a tagging and recapture programme on the River Dee, North Wales, it has been shown that early season entrants to the river were subject to much higher exploitation than those entering later, though exploitation rates of spring salmon in the Dee declined from 26% in 1992-94 to 8% in 1999.

Since regulation changes occur frequently in salmon fisheries, with the explicit aim of changing exploitation rates, this needs to be taken into account when interpreting historical catches in terms of indicating stock abundance.

2.7.2 Exploitation in fisheries outside England and Wales

Salmon stocks in England and Wales are exploited in a number of fisheries other than those operating under the jurisdiction of the Environment Agency within national waters. These include the distant water fisheries at Faroes and West Greenland, and other fisheries such as those operating off Ireland and in homewaters in other parts of the UK. Tagging studies have provided information on the levels of exploitation for English and Welsh stocks in many of these fisheries and this is summarised briefly below.

West Greenland

This fishery exploits only salmon that would have returned to Europe and North America as MSW fish. The exploitation rates on the MSW component of English and Welsh stocks in the late 1980s/ early 1990s were estimated to be in the region of 10 to 20% (Russell and Potter, 1996). However,

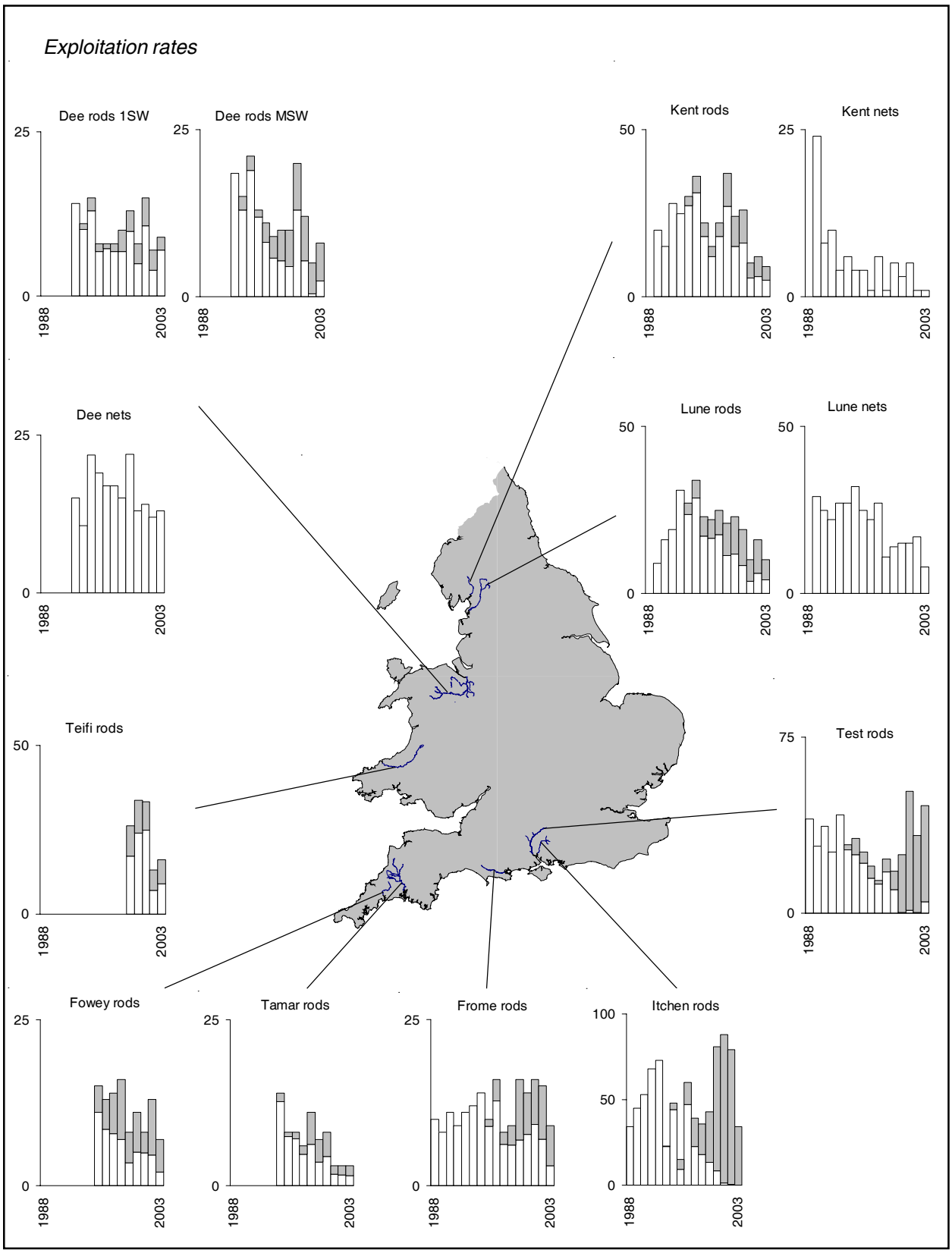


Figure 10. Estimated exploitation rates (%), including fish released (shown as shaded part of bar), for selected rod and net salmon fisheries in England and Wales. The histograms display all available data for the years 1988 to 2003. Data for 2003 are provisional. Note that estimates for the Dee rods have been split by age class (1SW and MSW); all other estimates are combined for all ages.

Table 18. Estimated exploitation rates (%) for selected rod and net fisheries in England and Wales, 1988-2003; data for rod fisheries distinguish exploitation rates for all fish (including fish released) and for retained fish only (Ret.) (Rates are corrected for under-reporting)

Region	Rod Fisheries Southern				SW						Wales						NW				Net Fisheries Wales	NW	
River	Test		Itchen		Frome		Tamar		Fowey		Dee		Dee		Teifi		Kent		Lune		Dee	Kent	Lune
Hatchery/Wild	W/H		W		W		W		W		W (1SW)		W (MSW)		W		W		W		W	W	W
Year	All (c)	Ret.	All (c)	Ret.	All (a)	Ret.	All	Ret.	All	Ret.	All (b)	Ret.	All (b)	Ret.	All	Ret.	All	Ret.	All	Ret.	Ret.	Ret.	Ret.
1988	40	40	34	34	10	10																	
1989	29	29	45	45	8	8											20	20	9	9		24	29
1990	37	37	53	53	11	11											15	15	16	16		8	25
1991	26	26	68	68	9	9											28	28	19	19		10	22
1992	42	42	73	73	11	11					14	14	18	18			25	25	31	31	15	4	27
1993	29	27	23	22	12	12					11	10	15	13			30	27	27	24	11	6	27
1994	32	25	48	44	14	14	14	13			15	13	21	19			36	31	34	29	22	4	31
1995	26	21	15	9	10	9	8	7	15	11	8	7	13	12			22	18	23	17	18	4	25
1996	20	15	60	47	16	13	8	7	13	8	9	7	10	8			15	12	22	17	17	1	22
1997	14	13	39	22	8	6	6	5	14	8	8	7	9	6			22	18	25	18	17	6	26
1998	23	18	36	18	9	6	11	6	16	7	10	7	10	5			37	27	21	11	15	1	11
1999	18	10	43	13	16	7	7	4	8	4	13	10	10	5	26	17	24	15	23	12	22	5	14
2000	25	0.3	81	8	14	8	8	4	11	5	8	5	20	13	34	24	26	16	19	8	13	3	15
2001	52	1	88	1	16	9	3	2	8	5	15	11	12	5	33	25	10	6	10	4	14	5	15
2002	33	0.2	79	0.4	15	7	3	1.6	13	5	7	4	5	0.4	13	7	12	6	16	6	12	1	17
2003*	**46**	**5** (d)	**34**	**0** (d)	**9**	**3**	**3**	**1.5**	**7**	**2**	**9**	**7**	**8**	**2.4**	**16**	**9**	**9**	**5**	**10**	**4**	**13**	**1**	**8**
Mean (1998-2002)	30	6	65	8	14	7	6	4	11	5	10	7	11	6	27	18	22	14	18	8	15	3	14
% change																							
2003 on 2002	+39		-57		-40	-57	0	-6	-46	-60	+41	+69	+65	+492	+23	+29	-25	-17	-38	-33	+12	+41	-50
2003 on 5-yr mean	+52		-48		-36	-59	-53	-58	-38	-61	-11	-9	-29	-58	-40	-51	-59	-64	-44	-51	-14	-54	-42

Key: (a) Data based on CEH counter at Wareham, and supplied courtesy of CEH.
(b) Data derived from mark recapture experiment.
(c) Includes rod caught fish retained for broodstock.
(d) Voluntary agreement from 2003 that all fish should be released; 'exploitation' on Test represents fish removed from the river for use only as broodstock.
** Provisional.*

Notes: Estimates for Dee, Kent, Leven and Lune net fisheries are based on declared catches and are minimum estimates.
The entire catch from net fisheries is assumed killed.
Data corrected and updated from previous years.

following significant quota reductions and other initiatives since the late 1980s (Annex 1), exploitation of MSW fish is believed to have fallen to very low levels. Since 1992, catches in the fishery have remained at a low level. In 1993-94, a privately funded buy-out was negotiated and the fishery (apart from subsistence fishing) was suspended. Between 1995 and 1997 the catch ranged between 58 t and 92 t, while from 1998 to 2000 a subsistence-only fishery (<20 t) operated. In 2001 and 2002, an *ad hoc* management programme was set up to adjust the allowable catch based on CPUE data obtained during the fishery. In 2001 this resulted in a catch of 43 t, whereas in 2002 another privately funded buy-out commenced and a subsistence catch of just 9 t was recorded. This latest buy-out agreement will apply for 5 years, until 2006, on an annually renewable basis. Thus in 2003, the fishery was once again restricted to a subsistence-only catch.

Faroes

The Faroes fishery exploits both grilse and MSW salmon of largely northern European origin. Prior to the recent buy-out arrangements, few tags of English and Welsh origin were recovered in this fishery and estimated exploitation rates on English and Welsh stocks were very low (~1%) (Russell and Potter, 1996). Between 1991 and 1998, the Faroes salmon quota was bought out with NASF funds, and only a small research fishery was operated, taking up to 23 t per year. No buy-out was arranged for 1999 or 2000. Although no fishing took place in 1999, a single vessel carried out commercial fishing in 2000 and a catch of 8 t was reported. There were no reported landings in 2001 or 2002, and this is also expected to apply for 2003.

A summary of the recent regulatory measures for the West Greenland and Faroes fisheries is given at Annex 1.

Ireland

Tagging studies have demonstrated that salmon from all parts of England and Wales have been exploited in the Irish coastal fishery. However, the levels of exploitation have varied between stocks from different regions, from year to year, and as a consequence of management changes introduced in the Irish fishery in 1997. Prior to the introduction of these measures, exploitation rates in the Irish fishery were provisionally estimated at about 1% for stocks from the north east of England, higher (at about 5 to 10%) for rivers on the west coast and Wales, but highest (10 to 20%) for stocks from south coast rivers. Since the introduction of the regulatory changes, exploitation rates have been reduced substantially (provisionally estimated by about half). In recent years, the majority of the English and Welsh tag recoveries in the Irish fishery have come from fish tagged on the River Thames (292 of the 339 tags recovered over the past five years) reflecting, at least in part, the large parr/smolt release programme in this system. A Working Group comprising scientists from the Irish Marine Institute, CEFAS and the Agency has developed models to evaluate the results from selected tagging studies undertaken on English and Welsh stocks, where sufficient data have been collected to enable robust exploitation rates to be derived. Efforts are currently being made to obtain improved estimates of non-catch fishing mortality for these fisheries from the Irish authorities.

Other homewater fisheries

Few tags of English and Welsh origin have been returned from homewater fisheries in Northern Ireland and Scotland. The exploitation rates of English and Welsh salmon in these fisheries have not been estimated, but are thought to be low.

Marine by-catch

The potential catch of salmon post-smolts in marine pelagic fisheries (including those for sandeels and mackerel) is a matter of concern and ICES continues to investigate this issue (Anon., 2003a). A dedicated research vessel survey was carried out in the international waters west and north of the Voeringplateau (65-67°N) and in the Norwegian Exclusive Economic Zone (EEZ) in the Norwegian Sea in late June 2002, using a specially designed "salmon trawl". Post-smolts were captured along with mackerel in both areas; in the international zone, an estimated 13.47 post-smolts were captured per haul, and 13.25 post-smolts per haul in the Norwegian EEZ. These estimates were similar to those in 2001 and equated to between 0.026 and 0.057 post-smolts per kg of mackerel.

A Russian fishing survey for herring, blue whiting and mackerel, conducted in the Norwegian Sea in June and July 2002, reported post-smolts only in hauls to the north of 66°N in July. At the same time, scientific observers and fisheries inspectors took part in a study on the potential by-catch of post-smolts in the Russian mackerel fishery in the Faroese EEZ and international waters of the Norwegian Sea. Catches of mackerel averaged 17.5 t per haul, and the highest occurrence of post-smolts (0.065 per haul) was recorded in June, while in July this index was 0.015, and no post-smolts were found in August.

There was thus a considerable discrepancy between the large numbers of post-smolts caught along with mackerel in the Norwegian research fishery and the low by-catch levels observed in the commercial mackerel fishery. This could have been due to detection rates decreasing with increasing sample size; the research fishery being directed at post-smolts and sampling the peak post-smolt migration; the majority of the post-smolts migrating through international waters before a large-scale mackerel fishery starts there; and the substantial differences between the Norwegian research trawl and the gear used in the commercial mackerel fishery. ICES has agreed that it is necessary to continue to collect data on the biology and distribution of post-smolts in the sea and on by-catches from commercial vessels.

REPORT ON STATUS OF STOCKS IN 2003

3. Status of stocks

3.1 Conservation Limits and Management Targets

3.1.1 Progress with setting conservation limits

The use of conservation limits in England and Wales has developed in line with the requirement of ICES and NASCO to set criteria against which to give advice on stock status and the need to manage and conserve individual river stocks. Conservation limits (CLs) indicate the minimum desirable spawning stock levels below which stocks should not be allowed to fall. The CL is set at a stock size below which further reductions in spawner numbers are likely to result in significant reductions in the number of juvenile fish produced in the next generation.

Two relationships are required to derive the CLs shown in Table 19:

(i) a **stock-recruitment curve** – defining, for the freshwater phase of the life cycle, the relationship between the number of eggs produced by spawning adults (stock) and the number of smolts resulting from those eggs (recruits)

(ii) a **replacement line** – converting the smolts emigrating from freshwater to surviving adults (or their egg equivalents) as they enter marine homewaters. This relationship requires an estimate of the survival rate at sea.

The model used by the Agency to derive a stock-recruitment curve for each river assumes that juvenile production is at a 'pristine' level for that river type (i.e. is not affected by adverse water quality, degraded physical habitat, etc).

Similarly, in deriving the replacement line, marine survival rates for most river stocks were assumed to be equivalent to the rates estimated on UK monitored rivers (such as the North Esk) in the 1960s and 1970s. Default survival values recommended for this purpose were 25% for 1SW salmon and 15% for MSW fish (Environment Agency, 1998). However, given that levels of sea survival are currently much lower than those of 20 years ago (Table 22), new default values of 11% for 1SW salmon and 5% for MSW fish (based on the latest 5-year mean, for the North Esk) were introduced by the Agency in April 2003 (Environment Agency, 2003c).

All Salmon Action Plans (SAPs) produced after April 2003 adopted these new marine survival values in calculating their CLs, and these rates have been applied to earlier SAP rivers. In this year's report, therefore, CLs for all principal salmon rivers shown in Table 19 have been refined accordingly, with compliance evaluated against these revised CLs.

Introducing marine survival rates which are intended to reflect those currently experienced by UK salmon stocks will reduce the effect of high mortality at sea as a cause of failing CLs. This will help managers focus on other issues over which they have more control (e.g. poor environmental quality in-river, over-exploitation by net and rod fisheries, etc.) when compliance failure occurs. The reduction in CLs means, however, that lower levels of spawning escapement are accepted before the stock is considered to be threatened. In some cases, higher reference points may have been used for management purposes (e.g. to review Net Limitation Orders or introduce Byelaws) in order to provide additional protection for the stock.

Table 19. Conservation Limits (CL) and the proportion of CL attained for the period 1995-2003 for the principal salmon rivers of England and Wales. Compliance failure is indicated by shaded blocks based on 3 year assessment periods, and current compliance is indicated in the right-hand column - see Section 3.1.1 (all results are provisional)

Region/ River	Accessible wetted area hectares	Revised CL eggs/100m^2	Revised CL eggs (x10^6)	Management Target eggs (x10^6)	Previous* CL (Pristine) eggs (x10^6)	2003 egg deposition (millions) **			Proportion of Revised Conservation Limit attained (%)									Current compliance #
						1SW	MSW	All	1995	1996	1997**	1998**	1999**	2000**	2001**	2002**	2003**	
NE																		
Coquet	144	218	3.14	4.93	4.54	-	-	8.96	135	158	231	190	169	262	285	304	286	Pass
Tyne	542	208	11.25	20.34	15.65	-	-	42.67	180	246	218	241	307	355	421	436	379	Pass
Wear	232	250	5.80	7.52	7.81	-	-	8.44	70	81	51	84	71	121	108	144	146	Pass
Tees	620	240	14.90	15.89	20.47	1.47	1.46	2.92	20	8	6	27	25	23	16	19	20	Fail
Esk-Yorks	86	236	2.02	2.46	2.76	0.53	0.16	0.70	28	12	43	23	13	28	36	52	34	Fail
Total			**37.11**	**51.14**				**63.70**										
Southern																		
Test	138	246	3.40	3.92	3.40	-	-	0.91	32	35	23	57	65	39	28	76	27	Fail
Itchen	69	234	1.63	1.97	1.63	-	-	0.37	101	42	31	63	27	29	32	31	23	Fail
Total			**5.03**	**5.89**				**1.28**										
SW																		
Avon-Hants	369	175	6.48	7.76	8.53	0.88	1.09	1.97	42	80	17	28	40	64	58	95	30	Fail
Stour	142	149	2.12	2.18	2.82	-	-	0.13	8	7	11	7	8	14	12	19	6	Fail
Piddle	18	177	0.31	0.39	N/A	0.09	0.07	0.16	94	125	106	113	105	168	58	78	53	Fail
Frome	88	171	1.50	2.04	2.00	0.79	0.64	1.44	171	205	195	200	131	97	99	140	96	Fail
Axe	83	175	1.45	1.64	N/A	-	-	0.38	13	28	21	20	28	19	25	70	26	Fail
Exe	282	253	7.14	12.06	N/A	-	-	7.98	164	165	188	196	255	298	150	137	112	Pass
Teign	98	251	2.47	3.53	3.46	0.92	0.36	1.28	147	190	93	88	76	134	87	58	52	Fail
Dart	137	218	2.98	3.34	4.01	0.60	0.34	0.94	53	53	67	51	53	67	49	39	31	Fail
Avon-Devon	35	202	0.70	0.86	N/A	-	-	0.77	58	76	52	62	59	72	78	126	110	Fail
Erme	20	180	0.37	0.56	N/A	-	-	0.13	48	47	97	59	120	65	36	237	36	Fail
Yealm	11	212	0.24	0.35	N/A	-	-	0.02	18	61	53	163	17	91		67	10	Fail
Plym	29	188	0.55	0.78	N/A	-	-	0.11	99	111	77	69	33	57	41	57	20	Fail
Tavy	68	201	1.37	2.12	2.02	-	-	0.26	71	57	96	182	79	82	68	20	19	Fail
Tamar	197	215	4.24	7.22	5.77	-	-	2.04	163	119	69	160	106	99	45	58	48	Fail
Lynher	29	233	0.68	1.09	0.86	-	-	0.35	34	39	76	155	63	130	60	58	51	Fail
Fowey	42	207	0.86	1.33	1.27	-	-	2.22	226	193	127	152	221	222	225	311	258	Pass
Camel	56	176	0.98	1.54	1.35	-	-	2.40	280	258	177	184	131	185	180	214	245	Pass
Taw	274	211	5.78	9.58	8.20	-	-	5.28	141	226	108	213	200	353	98	123	91	Fail
Torridge	198	207	4.10	6.26	5.61	-	-	1.06	111	110	35	95	47	84	17	38	26	Fail
Lyn	27	359	0.97	1.71	N/A	-	-	2.12	179	336	144	172	208	360	293	247	218	Pass
Total			**45.28**	**66.35**				**31.03**										
Midlands																		
Severn	898	143	12.85	23.05	17.06	-	-	17.44	257	341	138	72	72	93	115	69	136	Pass
Total			**12.85**	**23.05**				**17.44**										

Wales																		
Wye	1431	125	17.88	22.49	34.50	1.14	12.60	13.74	65	107	44	35	67	67	85	42	77	Fail
Usk	407	248	10.11	13.26	14.25	-	-	9.03	130	155	122	148	153	209	216	174	89	Pass
Taff & Ely	146	219	3.19	3.51	4.58	-	-	0.85	52	25	18	19	36	15	7	18	26	Fail
Ogmore	61	180	1.10	1.27	1.41	0.24	0.05	0.29	36	48	70	76	61	77	62	46	26	Fail
Tawe	88	211	1.85	2.22	2.36	0.40	0.18	0.57	69	32	39	43	32	21	64	78	31	Fail
Tywi	500	226	11.30	14.82	15.70	5.84	3.77	9.61	99	102	56	78	71	89	44	67	85	Fail
Taf	90	189	1.70	2.33	2.31	0.39	0.15	0.54	31	53	83	54	85	107	133	48	32	Pass
E&W Cleddau	87	179	1.55	1.84	2.04	0.33	0.11	0.44	28	22	41	44	30	50	39	26	28	Fail
Teifi	326	265	8.65	12.26	11.89	4.97	2.72	7.69	77	219	139	132	145	143	164	128	89	Pass
Rheidol	31	222	0.68	0.82	0.85	0.09	0.09	0.19	76	112	76	60	56	51	48	30	27	Fail
Nevern	19	259	0.48	0.62	N/A	0.37	0.04	0.41	120	47	28	36	50	69	71	40	85	Fail
Dyfi	179	235	4.21	6.12	5.57	1.07	0.16	1.23	88	132	60	83	58	72	85	27	29	Fail
Dysinni	31	216	0.68	0.78	0.88	0.03	0.00	0.03	7	25	28	40	8	23	6	26	4	Fail
Mawddach	57	242	1.37	1.89	1.77	0.64	0.28	0.92	94	105	99	107	117	67	80	79	67	Fail
Dwyryd	9	201	0.19	0.41	0.23	0.46	0.01	0.47	296	279	279	281	140	79	234	497	251	Pass
Glaslyn	25	191	0.48	0.70	0.61	0.06	0.02	0.07	173	109	136	72	39	24	42	52	15	Fail
Dwyfawr	33	258	0.86	1.07	1.07	0.18	0.01	0.19	52	58	61	35	35	47	34	28	22	Fail
Seiont	21	226	0.48	0.77	0.61	0.36	0.01	0.37	147	147	158	198	111	214	242	69	78	Pass
Ogwen	24	362	0.87	1.67	1.07	1.09	0.05	1.14	232	180	259	336	165	279	392	195	132	Pass
Conwy	50	127	0.63	1.32	0.85	1.54	0.32	1.86	388	402	226	267	173	345	430	214	294	Pass
Clwyd	84	237	1.99	2.97	2.62	0.69	0.17	0.86	67	47	27	128	77	63	81	60	43	Fail
Dee	617	248	15.30	18.53	15.30	4.98	8.44	13.42	87	86	91	107	81	61	85	114	88	Fail
Total			**85.55**	**111.68**				**63.90**										
NW																		
Ribble	351	242	8.49	10.48	8.49	-	-	4.98	29	52	26	63	63	81	38	71	59	Fail
Wyre	67	70	0.47	0.59	N/A	-	-	0.04	13	42	16	96	15	14	35	50	9	Fail
Lune	423	280	11.84	15.86	11.84	-	-	21.85	80	83	56	120	95	165	130	154	185	Pass
Kent	68	223	1.52	3.00	1.52	-	-	6.53	250	218	139	366	117	271	414	472	429	Pass
Leven	46	182	0.83	0.98	0.83	-	-	0.68	77	45	45	56	31	92		68	81	Fail
Crake	16	194	0.32	0.41	0.32	-	-	0.02	92	51	14	109	32	64		58	6	Fail
Duddon (& Lickle)	26	121	0.31	0.43	N/A	-	-	0.16	88	92	56	200	77	69	-	115	52	???
Esk	20	181	0.37	0.57	N/A	-	-	0.22	37	93	55	161	173	261	116	89	59	Pass
Irt	35	198	0.69	0.99	N/A	-	-	0.37	175	133	90	157	47	120	35	90	54	Fail
Ehen	41	230	0.94	1.72	1.16	-	-	0.95	178	135	88	253	52	343	-	306	101	Pass
Calder	13	261	0.33	0.50	0.41	-	-	0.19	111	105	149	220	26	176	-	183	57	???
Derwent	213	185	3.93	5.83	5.77	-	-	4.65	175	135	139	146	144	299	235	209	118	Pass
Eden	688	200	13.75	20.42	20.63	-	-	11.33	197	166	110	95	92	101	108	107	82	Pass
Esk-Border	306	255	7.79	9.31	N/A	-	-	4.90	134	96	89	85	63	102	75	120	63	Fail
Total			**51.59**	**71.10**				**56.86**										
Total			**237.42**	**329.22**				**234.21**										

Footnotes

CL and compliance figures are provided for 61 of the 63 statutory SAP rivers. This excludes the Severn Estuary (where no one CL applies) and the Thames (where salmon populations are considered to be maintained entirely by stocking). In addition, figures are included for the Dwyryd (a statutory SAP river but originally combined with the Glaslyn) and the Crake and Calder (river systems associated with the Rivers Leven and Ehen, respectively, which feature in the SAPs for these rivers).

** N/A = not applicable as no refined CL has previously been published.*

*** Estimates include eggs contributed by rod-released fish.*

??? No compliance assessment possible due to missing data in 2001 (impact of FMD).

Note: Some entries in this table have been updated from that presented in previous reports as a result of river-specific refinements and corrrections.

Compliance of the spawning escapement with the CL in a particular river system is normally assessed in three-year blocks (i.e. averaged over 3-years). This is because a single year's failure cannot distinguish between a real deterioration in the egg deposition and a chance (1-in-20 year) false alarm. A river classed as failing would remain classified as such until a reassessment, for a subsequent three-year period, showed a pass. Compliance with revised CLs is shown in Table 19, with shaded 3-year blocks indicating failure episodes. For the purposes of this Table, the compliance process was begun on all rivers in 1990 (or later if egg deposition estimates were not available until after this date): current compliance according to the above criteria is shown in the right-hand column.

Table 19 also shows the Management Target (MT) for each river, based on the revised CL. The MT is a spawning stock level for managers to aim at, to ensure that the objective of exceeding the CL is met four years out of five in the long run (i.e. 80% of the time). The value of the MT has been estimated using the standard deviation (SD) of egg deposition estimates for the last 11 years, where: MT = CL + 0.842*SD. The constant 0.842 is taken from probability tables for the standard normal distribution, such that the CL forms the 20 percentile of a distribution, the average (or 50 percentile) of which equates to the MT.

CLs and MTs form only one part of the assessment of the status of a stock, and management decisions are never based simply on a compliance result alone. Because stocks are naturally variable, the fact that a stock is currently exceeding its CL does not mean that there will be no need for any management action. Similarly, the fact that a stock may fall below its CL for a small proportion of the time may not mean there is a problem. Thus, a range of other factors are taken into account, particularly the structure of the stock and any evidence concerning the status of particular stock components, such as tributary populations or age groups, based for example on patterns of run timing and the production of juveniles in the river sub-catchments. These data are provided by a programme of river catchment monitoring (section 3.2.2).

The Environment Agency is continuing to review and revise its procedures with the aim of incorporating more extensive statistical descriptions of the risks and uncertainties in reference points and assessments.

3.1.2 Habitats Directive and salmon conservation

The EU Habitats Directive 92/43/EEC, on Conservation of Natural Habitat and of Wild Fauna and Flora, stipulates that member states maintain or restore habitats and species to favourable conservation status. To comply with this Directive, a number of rivers in England and Wales have been designated candidate Special Areas of Conservation (cSACs) because they support important populations of vulnerable qualifying species.

The following rivers in England and Wales are cSACs and have salmon as a "qualifying species", which confers additional protection measures specifically for salmon in these rivers and associated on-line lakes:

Southern Region: Itchen.
South West Region: Hampshire Avon, Camel.
Wales: Wye, Usk, Teifi, Dee (and Bala Lake), Gwyrfai (and Llyn Cwellyn), Eden (west Gwynedd).
North West Region: Derwent (and Bassenthwaite Lake), Eden, Ehen.

A standardised protocol has been developed to monitor salmon stocks in SAC rivers to assess the conservation status of the species against CLs (Cowx and Fraser, 2003).

3.1.3 Spawning escapement in 2003

Egg deposition estimates for 2003 are given for 64 rivers in England and Wales in Table 19. These comprise 61 of the 63 statutory SAP rivers (excluding the Severn estuary and the River Thames) and also include the Dwyryd (a statutory SAP river, but previously combined with the Glaslyn) and the Rivers Crake and Calder (previously combined with the Rivers Leven and Ehen respectively). The CLs against which egg deposition estimates are reported in Table 19 have been derived using the revised methodology described in Section 3.1.1, incorporating the new lower marine survival estimates. The net effect of these changes has been to reduce the CLs: the scale varies from river to river, but results in a 26% reduction, on average, for rivers in for England and Wales. Values for both the revised CL and the previous (pristine) CL are given in Table 19, in which the revised CLs have been used to assess compliance back to 1995.

For rivers without traps or counters, the usual procedure for estimating egg deposition derives run size from rod catch using estimates of exploitation, which do not take into account annual changes in fishing effort. In years when effort was low – such as the current 'low-flow' year (2003) and the FMD year of 2001, this approach has probably resulted in rod exploitation being over-estimated on a number of rivers and hence escapement and egg deposition being under-estimated. An improved procedure is being developed by the Agency to address this problem. This will take account of annual changes in fishing effort, as well as partitioning effort between salmon and sea trout (no distinction is currently made between these species when reporting effort). Many rivers, and particularly some of the smaller catchments on the west coast of Wales, support relatively small salmon stocks and are principally regarded as sea trout rivers. Current procedures may fail to take adequate account of this. The new procedure has not been used to calculate compliance in Table 19, but is expected to be available later in 2004 and will subsequently be applied retrospectively to the 2003 data set and earlier years.

Compliance assessments (see Section 3.1.1) are shown in Table 19 for all 64 rivers over a series of years. However for two of these rivers, assessment was not possible in the last three years (i.e. the 'current compliance' period in Table 19) because no estimates of egg deposition were made in 2001 due to FMD. For the remaining 62 rivers, 41 (66%) have failed compliance over the most recent three-year assessment period. The compliance failures are more common in the south of England and Wales than they are in northern England.

Despite the reduction in CLs, only 16 of 64 rivers (25%) across England and Wales exceeded their CL in 2003, a marked reduction on 2002 (39%) and the lowest in the time-series (Table 20). The percentage of rivers in the middle class (50-100% of the CL) was also reduced on 2002 (down from 36% to 33%), and the percentage of rivers below 50% of their CL was 42%, the highest in the time-series. This may well reflect the fact that runs of salmon appeared to be generally poor in 2003 (Section 3.2), but results should be viewed with some caution given the limitations of the method used to derive rod exploitation/escapement estimates on most rivers (see above).

River-to-river variation in the proportion of the CL attained is illustrated in Figure 11. It is apparent that rivers in northern England and north Wales have generally performed better than those elsewhere. Spawning escapement remained below the CL in most of the south coast chalkstreams and in many of the rivers in southwest England and in south and mid Wales. A number of rivers, such as the River Tees in the North East and some catchments in South Wales, are being restored from previous polluted conditions and may require interim rebuilding targets to be set.

Table 20. Summary of the number and percentage of rivers above their Conservation Limits (CL), between 50% and 100% of the CL, and less than 50% of the CL, 1994-2003

Year	>CL		50-100% CL		<50% CL	
	No.	%	No.	%	No.	%
1994	42	66	14	22	8	13
1995	27	42	21	33	16	25
1996	32	50	15	23	17	27
1997	21	33	24	38	19	30
1998	31	48	21	33	12	19
1999	21	33	22	34	21	33
2000	26	41	26	41	12	19
2001[$]	20	34	17	29	21	36
2002	25	39	23	36	16	25
2003*	**16**	**25**	**21**	**33**	**27**	**42**

Key: [$] No CL possible for 6 rivers due to impact of FMD.
** Provisional*
Note: Data in this table differ from that presented in previous years due to revised compliance assessment procedures (see p49).

3.2 Measures of abundance/escapement

3.2.1 Adult fish

Electronic fish counters are operated on a number of catchments in England and Wales to provide estimates of the upstream run of adult salmonids. Where possible, the counts have been adjusted to provide estimates of the returning salmon stock. Time-series of counts, or other estimates of in-river stocks, are presented in Table 21 and Figure 12.

Except for the River Lune, where the returning stock estimate in 2003 was the highest in the time series, and the River Wye, the available measures of adult stock abundance were all below the levels recorded in 2002, and were at the lowest ever recorded level in some rivers (Test, Frome, Caldew). However, half (6 of 12) of the adult stock abundance values for 2003 were higher than the averages for the previous five years (1998-2002), and an overall downward trend was only seen on some rivers in the Southern Region in that period (Test, Itchen and Frome). Other rivers in the South West (Tamar and Fowey), North West (Lune and Kent) and in North Wales (Dee) show an increasing trend over the past five years, whilst the Wye and Teifi show no obvious trend over this time. Although many anglers reported a much improved spring run on the River Severn, and the net catch was the highest since 1995, drought affected fishing throughout the summer. However, good runs were seen ascending weirs once rain arrived after the close of the fishing season.

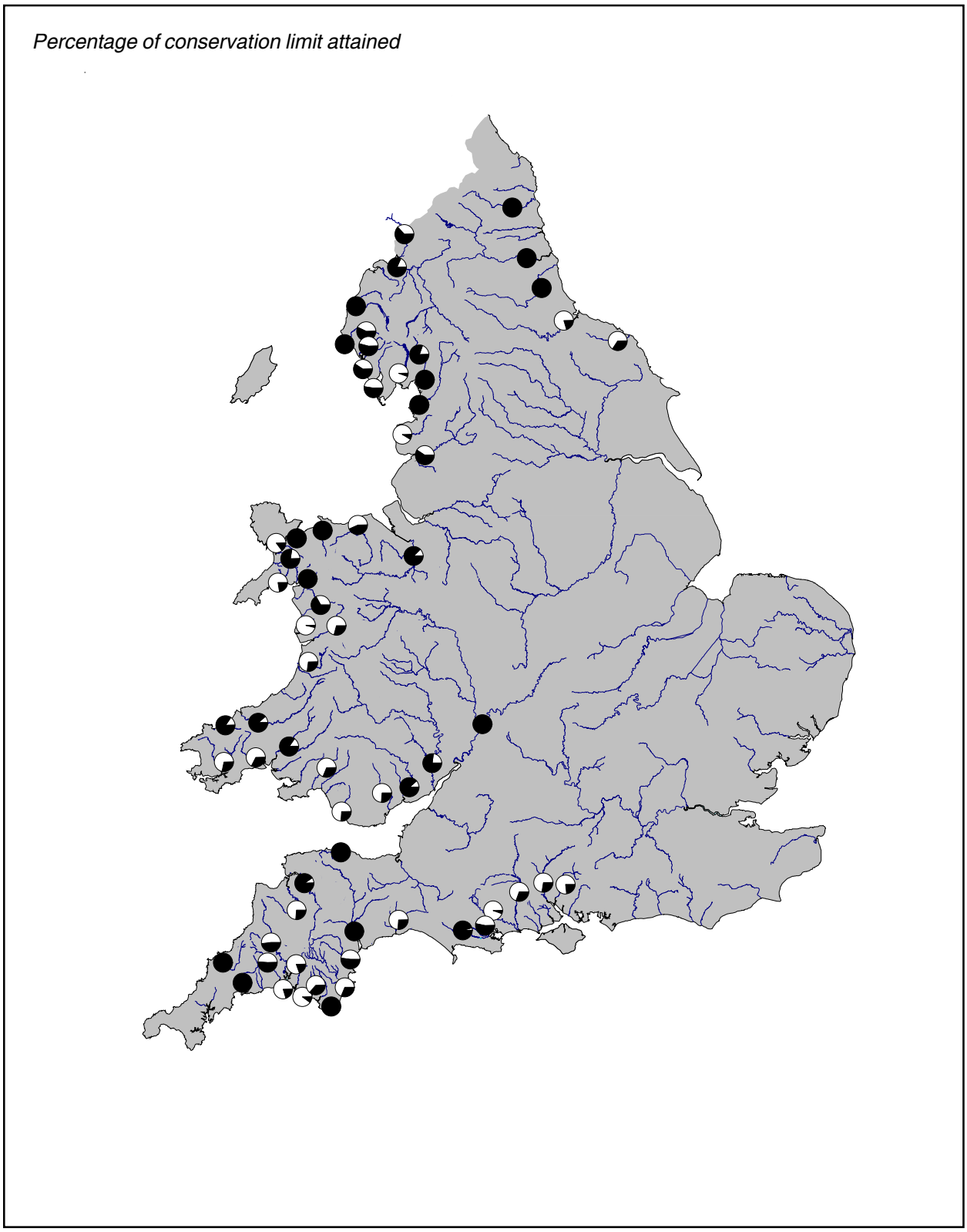


Figure 11. Pie charts for individual rivers for which conservation limits have been set (Table 19) showing the % of the conservation limit attained in 2003. A black circle indicates that the target was met or exceeded.

Table 21. Validated counts and run estimates of salmon smolts and adults in rivers in England and Wales

	Stage:	Smolts	Adults												
	Region:	Southern	Thames	Southern		SW			Wales				NW		
	River:	Test #	Thames[#]	Test	Itchen	Frome	Tamar	Fowey	Dee	Teifi	Tawe	Wye	Lune	Kent	Caldew
	Method:	Run estimate	T	RSE[1]	RSE[1]	RSE[1]	RSE[1]	C[$]	RSE[2]	C[$]	T **	C *	RSE[1]	RSE[1]	T***
1986			81												
1987			41												
1988			288	1,507	1,336	4,334									
1989			91	1,730	791	3,324							8,785	1,137	
1990			63	790	367	2,002							8,261	2,216	
1991			36	538	152	847					93		7,591	1,736	
1992		11,967	247	614	357	954			4,643		77		4,066	1,816	
1993		7,131	259	1,155	852	1,280			9,757		85		7,883	1,526	
1994		3,381	143	618	311	1,141	6,381		5,285		383		6,254	2,072	1,590
1995		6,853	162	517	798	1,102	5,656	890	5,703		43		4,589	2,762	1,417
1996		4,712	122	515	386	1,499	4,011	1,187	4,931		82		4,739	3,246	1,289
1997		7,229	25	317	232	1,207	2,989	1,075	5,496		58	4,472	3,205	1,473	889
1998		14,672	6	748	412	1,273	4,181	882	6,661		79	4,659	7,457	2,166	1,106
1999		4,138	35	777	207	815	3,590	1,262	3,664	2,319	37	1,797	4,936	1,034	1,022
2000		3,516	53	537	204	641	3,547	1,692	3,751	1,906	47	5,125	8,364	2,403	1,566
2001		2,625	9	408	214	652	4,191	1,611	4,766	2,032	88	1,676	6,198	2,961	n/a
2002		2,190	22	1,046	239	855	6,055	1,804	7,216	4,233	252	2,447	7,606	3,204	1,302
2003		**7,585**	**18**	**367**	**169**	**563**	**4,729**	**1,777**	**4,915**	**2,015**	**n/a**	**3,842**	**8,856**	**2,819**	**805**
Mean (1998-02)		5,428	25	703	255	847	4,313	1,450	5,212	2,623	101	3,141	6,912	2,354	1,249

Key to methods: *T = adult trap.*
C = adult salmon count.
RSE[1] = returning stock estimate (validated count + catch below counter).
RSE[2] = returning stock estimate (mark/recapture estimate).

Key: *# Stock supported by large-scale stocking from hatchery programme.*
** Index of run only, data adjusted for down-time (except for July 2003) but not corrected for counter efficiency.*
$ Species split of counter data based on Bayesian hierarchical model (Ellis & Davies, 2001).
*** Index of run - based on adult trap (2 days per week, April to November). Not operated in 2003 due to resource constraints.*
**** Data not adjusted for multiple entry (figures will be adjusted retrospectively in the near future: re-entry rate of c. 6% in 2002).*

Note: *Some data corrected from those reported previously.*

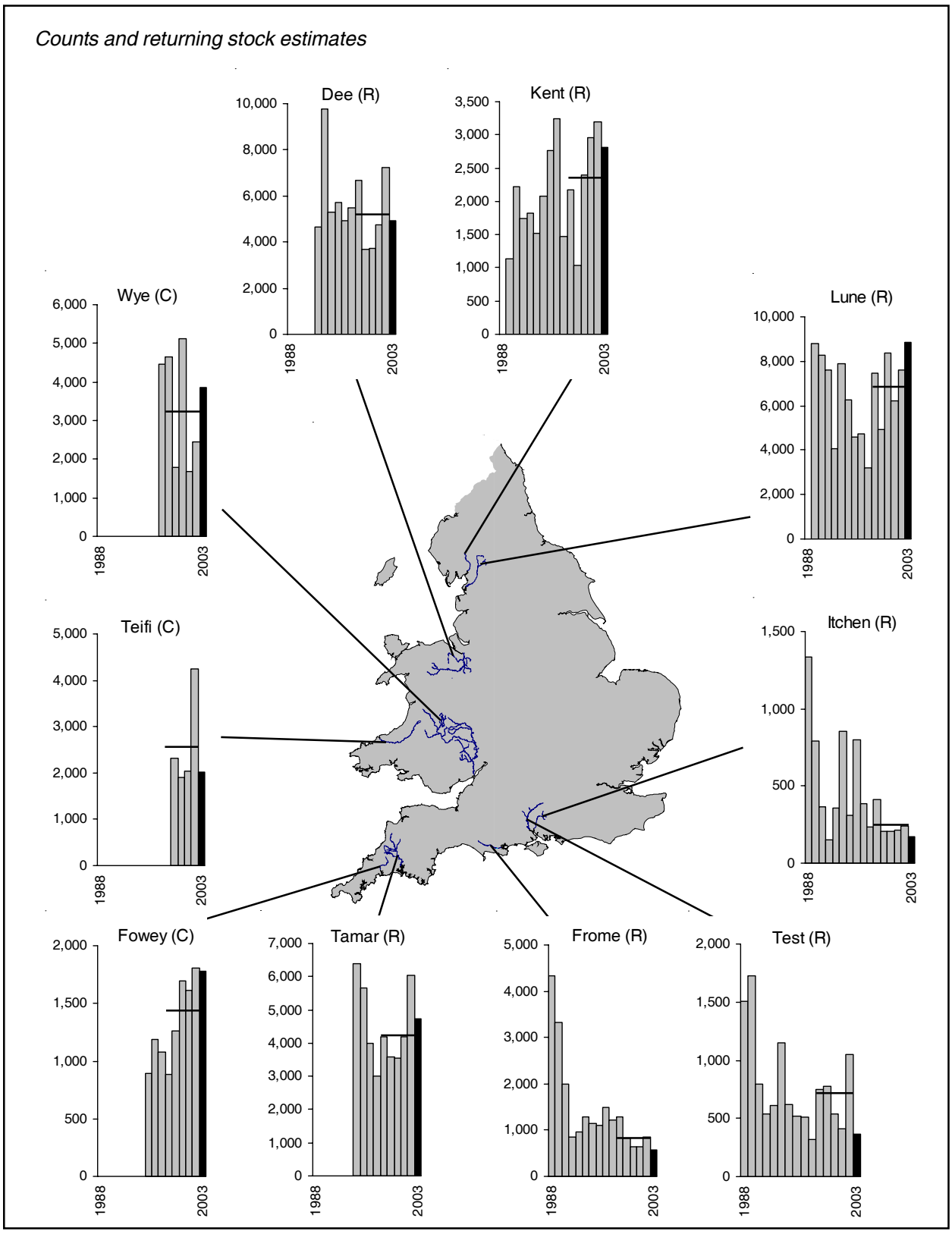


Figure 12. Counts (C) and returning stock estimates (R) for selected salmon stocks in England and Wales. The histograms display all available data for the years 1988 to 2003, together with the five-year mean for the period 1998-2002 (displayed as a horizontal line). Note that the histograms are not drawn to the same scale. Data for 2003 are provisional. Data for River Wye are partial hydroacoustic counts.

Although salmon have been returning strongly to some historically polluted rivers (e.g. Tyne, Wear, Ogmore), there is concern about chronic environmental degradation in others, mainly in rural areas, caused by changing land use practices, especially agriculture and forestry. Issues of particular concern are siltation resulting from soil erosion, pesticides from sheep dip chemicals, acidification and changes in river flows. The relative importance of these effects vary around the country, but clusters of high pesticide levels have been found in Welsh upland streams, and acidification is still extensive in the uplands of Wales and the North West. Salmon runs in the chalk rivers of Southern Region have declined since the 1980s, but the reasons for this are not clear. The extent and nature of soil erosion impacts are being investigated and national water abstraction licence legislation is under review. Attempts to restore salmon to the Thames continue to be frustrated by sewage discharges and storm-water problems in the estuary and prolonged low flows restricted fish passage in 2003.

Changes in the British climate are predicted to become more pronounced (Hulme *et al*., 2002) and the most likely changes are for higher temperatures, wetter winters, drier summers and more extreme events of flooding and drought. Changes in climate are global and the increased natural mortality of salmon at sea in recent years is also believed to be linked to climate change. Thus climate change impacts are experienced by salmon in both marine and freshwater environments.

3.2.2 Juvenile salmonid monitoring programme

The Agency monitors both the stocks and fishery performance in those rivers where the annual catch is >50 salmon. The juvenile programme started in 2002, and aims to identify spatial differences and temporal trends in the juvenile salmon population. It samples 380 quantitative sites each year to identify temporal trends in abundance, and 3030 sites are sampled semi-quantitatively once every five years to identify spatial variation in the juvenile population. The sampling programme has been designed (number of sites samples and periodicity) to detect an annual change if it is >20% below or >25% above, and differences between sub-catchments of 45%, with 5% significance and a 20% probability that the difference is real. The habitat at all sites will be assessed using the model HABSCORE (Milner *et al*., 1998), which will enable the detectable difference of the spatial surveys to be increased by a further 1.1 – 22.1%, depending on life stage sampled. HABSCORE also provides reference conditions against which the size of the population at any site can be compared.

3.3 Survival indices

No data are available to evaluate long-term trends in marine survival for salmon stocks in England and Wales. Marine survival estimates for the River Corrib (Ireland), River Bush (Northern Ireland) and River North Esk (Scotland) are shown in Table 22. These data confirm patterns seen elsewhere in the North Atlantic, which indicate that marine survival can be quite variable between stocks and between years, but has generally decreased since 1987.

3.4 The ICES assessment of the status of salmon stocks in England and Wales

3.4.1 Description of the assessment methodology

Each year, the ICES North Atlantic Salmon Working Group makes an assessment of the status of the salmon stocks in the Northeast Atlantic (NEAC area) as a basis for advising managers. A key part of this assessment is the estimation of the pre-fishery abundance (PFA) of all NEAC stocks. The PFA of salmon from countries in the NASCO-NEAC area is defined as the number of fish alive in the sea on January 1st in the first sea winter. ICES uses estimates of PFA for the period 1970 to the present to investigate the effect of fisheries and other natural and anthropogenic factors on stocks. ICES has also used these estimates to develop a forecast of PFA for coming seasons in order to advise on management actions.

Table 22. Estimated survival of wild smolts (%) to return to homewaters (prior to coastal fisheries) for index rivers in the UK and Ireland (from Anon., 2003a)

Smolt migration year	Ireland River Corrib		UK (N. Ireland) River Bush*	UK (Scotland) River North Esk		
	1SW	2SW	1SW	1SW	2SW	3SW
1987	16.6	0.7	35.1	13.9	3.4	0.1
1988	14.6	0.7	36.2	-	-	-
1989	6.7	0.7	25.0	7.8	4.9	0.1
1990	5.0	0.6	34.7	7.3	3.1	0.2
1991	7.3	1.3	27.8	11.2	4.5	-
1992	7.3	-	29.0	-	-	-
1993	10.8	2.0	-	-	-	-
1994	9.8	1.4	27.1	17.2	2.3	0.1
1995	8.4	0.1	n/a	11.5	5.1	0.1
1996	6.3	1.2	31.0	10.7	3.5	0.2
1997	12.7	0.8	19.8	10.3	6.3	0.1
1998	5.5	1.1	13.4	-	-	-
1999	5.8	0.7	16.5	-	-	-
2000	9.4		10.1	5.1	2.3	
2001	5.5		12.4	9.0		
Mean (5 year)	7.6	0.6	17.2	8.7	5.0	
Mean (10 year)	8.2	0.8	21.8	11.0	4.1	

* *Based on microtagging, corrected for tagging mortality.*

Forge Weir fish trap - River Lune

The model that ICES uses to estimate PFA for NEAC countries first estimates the returns of salmon to freshwater, and then back-calculates the numbers of fish that must have been alive in the sea to generate these returns. The numbers of returning fish are estimated using the catch data for each country, which are raised to take account of non-reported catches and exploitation rates for 1SW and MSW fish. These values are then further raised to take account of catches in the distant water fisheries and natural mortality between January 1st in the first sea winter and their return to homewaters. Ranges of values are used for some of the input data in order to obtain a measure of the uncertainty in the PFA estimates. In order to run the NEAC PFA model, each country requires time-series (beginning in 1971) of catch in numbers, non-reporting rates and exploitation rates for 1SW and MSW salmon.

For England & Wales, nominal catches have been derived from the catch returns submitted by netsmen and anglers and split into 1SW and MSW categories using two different methods (Section 2.5). Over the period 1992-2003, monthly age-weight keys derived from salmon caught in the River Dee trap have been used to estimate the age composition of all rod-caught fish where a weight and date of capture have been provided. This has then been scaled up to the total catch (rods and nets combined) on a pro-rata basis. In earlier years (1971-91), the age composition of the total catch has been estimated using the mean weight of the fish caught and the mean weight of 1SW and MSW salmon recovered in tagging programmes. Estimates of unreported and illegal catches have been made on the basis of consultation with regional fisheries personnel and according to the approach described in Section 2.3.

As the contribution of farmed and ranched salmon to national catches in the NEAC area is generally low (<2% in most countries, see Section 2.6), the occurrence of such fish is ignored in assessments of the status of national stocks. However, a large proportion of the fish taken in England and Wales are caught in the north east coast fishery and are destined for Scottish rivers, and these are deducted from the England and Wales returning stock estimate and added to that for eastern Scotland. This proportion is estimated to have declined from 95% of the north east net catch in the early part of the time-series to 75% more recently and to around 60% in 2003. This reflects both the steady improvement in the status of the stocks in northeast England and the phase out of the fishery in 2003 (Section 2.1.3). The latter resulted in a major overall reduction in the fishery, with the majority of the remaining netsmen now fishing close inshore using T-nets. Previous tagging studies have shown that these inshore nets exploit a much higher proportion of local fish.

Exploitation rates in England and Wales in 1998-99 are available from a number of monitored fisheries given in Section 2.7.1. National exploitation rates have then been estimated by deriving a time-series of 'standard fishing units' employed in the salmon fisheries for the period 1970 to the present. These are calculated from the numbers of licences issued (Section 1.2.1) weighted by their relative catching power which is estimated from historic CPUE data. The annual exploitation rates are then estimated by adjusting the estimate for 1998-99 according to the changes in the number of standard fishing units employed. Finally, ICES has agreed to apply a natural mortality rate of 3% per month in back-calculating the PFA of salmon in the sea, on the basis of studies undertaken on a range of stocks (Anon., 2002).

Whilst this model is acknowledged as containing a number of uncertainties, it currently provides our best interpretation of available information on salmon stocks at a national level. Efforts are being made to improve the input data and we hope that progress in that direction is apparent in this and previous annual reports.

3.4.2 Results of the pre-fishery abundance assessment

The output from the ICES-NEAC model for England and Wales is summarised in Figure 13(a) to (e). The model endeavours to provide an interpretation of what the available catch and effort data may tell us about changes in the status of the total national stock of salmon over the past three decades. It is important to note that the overall trends may not reflect the patterns of change in any individual river. Indeed, it is well known that while many river stocks in England and Wales have declined substantially in the past 30 years, there are others, like the Tyne and Wear, that have shown great improvements; the model aims to sum all of these trends. Furthermore, the model is likely to provide a more reliable picture of the medium-term trends than of the year-to-year variations, and it is almost certainly unable to take account of many such short-term fluctuations.

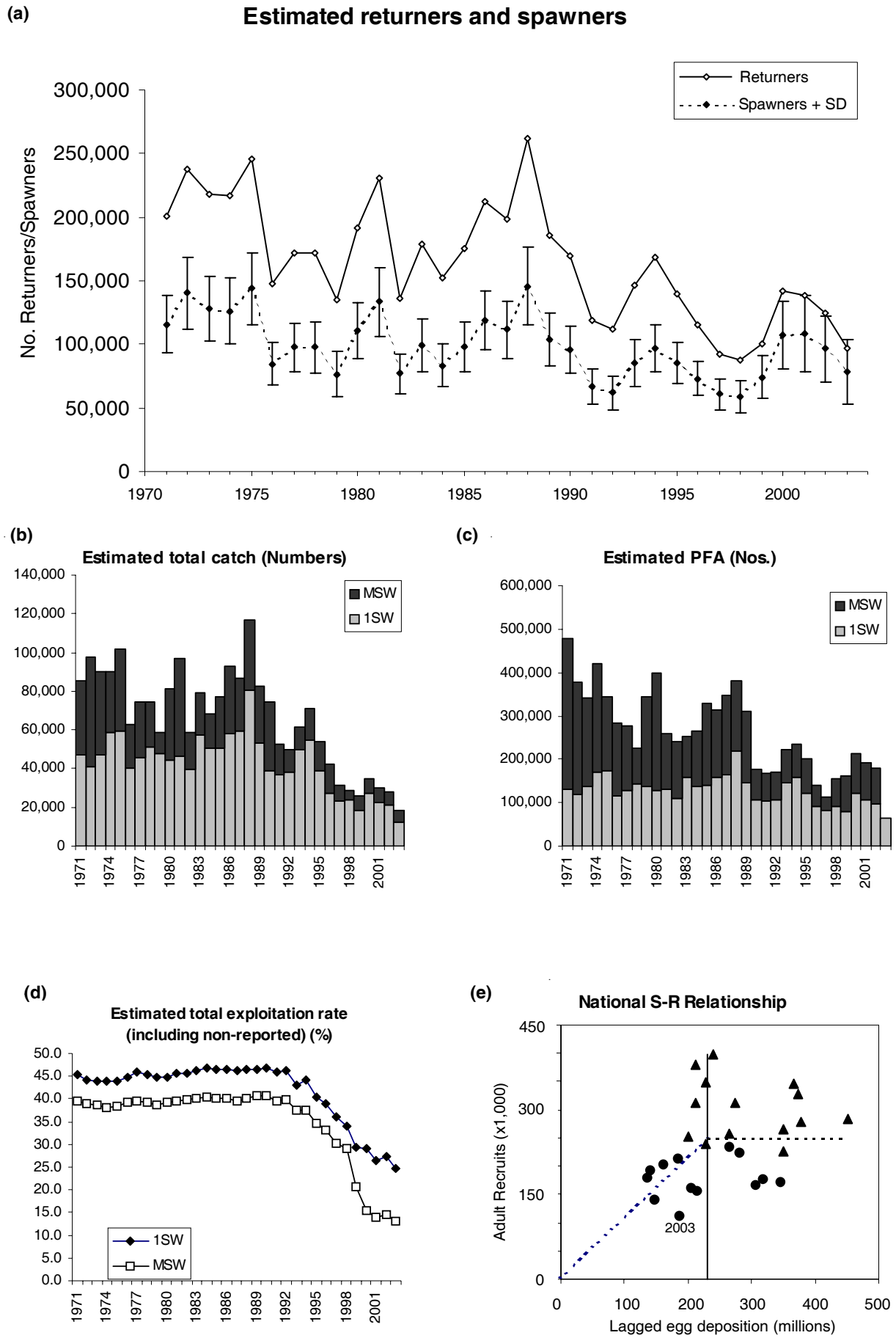
The model output suggests that the overall PFA of salmon from England and Wales has declined by just over 50% from the 1970s to the present time (Figure 13c, in which no estimate is available for MSW fish in 2003). The majority of this decline has been in the non-maturing (i.e. potential multi-sea-winter) component of the PFA, which is thought to have declined by about 70%, whilst the maturing (i.e. potential grilse) component has declined by about 30% (in 2003, the estimated PFA of maturing fish was the lowest in the time series). The results also suggest that there was a marked decline in PFA around 1990, which is consistent with the general perception of a decrease in the marine survival for many stocks around the North Atlantic at about this time.

The estimated number of salmon returning to England and Wales (prior to exploitation in homewater fisheries) and the total spawning escapement show similar trends to the PFA (Figure 13a), although the declines are less marked due to the reductions in net exploitation both in distant water and homewater fisheries, and in rod fisheries. Thus, returning fish are estimated to have declined by about 35% between the 1970s and the present time, and the spawning escapement by about 30%. However, as with the PFA, the decline in MSW components has been at least twice that of 1SW components. Figure 13a indicates that there was a slight improvement in the return and spawner numbers in 2000 and 2001, however these have declined in 2002 and 2003, with estimates for 2003 among the lowest in the time series.

The results also provide an estimate of the total catches in England and Wales, including the non-reported and illegal catches (Figure 13b), and the consequent overall trends in exploitation (Figure 13d). Exploitation probably remained at around 40% for most of the 1970s and 1980s but has been roughly halved in the last decade with the measures taken to control both legal and illegal fisheries.

Figure 13e shows the relationship between the numbers of spawners (the lagged egg deposition, expressed as millions of eggs) for the national stock and the subsequent production in the next generation (the recruits = PFA). As expected, production (recruits) appears to have been reduced in years of poor spawner abundance (low egg deposition), but there is also evidence of lower recruitment at all levels of egg deposition since 1990 (dots) compared with earlier years (triangles). This possibly reflects an increase in marine mortality at about this time. The particularly low level of egg depostion estimated for 2003 is indicated, though note previous comments on the uncertainties in rod catch data representing spawning escapement in this year.

Figure 13 (a - e). Summary output from the ICES-NEAC PFA model - Summary of Fisheries and Stock description for UK (England & Wales).



4. Microtag, fin clip and external tag releases

Details of all marking and tagging of salmon undertaken in England and Wales in 2003 are included at Annex 5.

In 2003, 60,000 hatchery-reared salmon parr and smolts and 6,200 wild salmon smolts were microtagged and adipose fin-clipped and released in England and Wales to assess levels of exploitation and marine survival and to investigate the efficacy of enhancement programmes. A further 51,000 hatchery parr and smolts and 1600 wild smolts were marked with adipose fin clips, and almost 20,000 were given other external tags or marks (elastomer & PIT tags). More than 2,000 adult salmon were tagged for the assessment of returning stocks or in conjunction with the use of radio tags in behaviour studies.

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GLOSSARY OF TERMS AND ABBREVIATIONS USED IN THIS REPORT

This glossary has been extracted from various sources, but chiefly the EU SALMODEL report (Anon., 2003b) and the Agency's SAP reports (p.6).

Adult Salmon after the middle of the first sea-winter, after which the main categorisation is by sea-age, measured in sea-winters (e.g. two sea winter, or 2SW).

Abstraction Taking water, either permanently or temporarily, from a water source (river, stream, spring, pond, lake or groundwater).

Anadromous fish Fish, born in freshwater, that migrates to sea, to grow and mature, and then returns to fresh water as adults to spawn (e.g. salmon, sea trout).

By-catch The capture of non-targeted fish.

Catchment The area of land draining to a defined point.

Dissolved oxygen The amount of oxygen dissolved in water, one of the features that is used to classify water quality.

Distant-water fisheries Fisheries in areas outside the jurisdiction of the country of origin. With respect to the NASCO convention, this specifically refers to the fisheries under the jurisdiction of the Faroe Islands and Greenland.

EC Directive A type of legislation issued by the European Community, which is binding on Member States and sets standards and results to be achieved.

Escapement Salmon or sea trout that survive to spawn after exploitation.

Exploitation Removal of fish from a stock by fishing.

Fishery The area where it is, or may be, lawful to fish and where the resource is exploitable.

Fry Young salmonids that have hatched out in the current year, normally in May for salmon and trout, at the stage from independence on yolk sac as the primary source of nutrition up to dispersal from spawning areas.

Grilse Adult salmon that have spent only one winter feeding at sea before returning to freshwater to spawn; normally only applied to salmon in homewaters.

Homewater fisheries Fisheries within the jurisdiction of the countries of origin (within 12 miles).

MAFF The former Ministry of Agriculture, Fisheries and Food; incorporated in June 2001 into the Department for Environment, Food and Rural Affairs (Defra).

Management target A desirable stock level or level of fishing activity which may be used as a reference point to achieve management objectives.

Microtag A coded wire tag 1.1 mm long and 0.25 mm diameter, inserted into the nasal cartilage (snout) of fish and detectable in live fish, but only readable after removal.

Multi-Sea-Winter (MSW) salmon Adult salmon returning to spawn after two or more years feeding at sea.

NLO – Net Limitation Order Mechanism within the Salmon and Freshwater Fisheries Act whereby the competent authority may apply to limit the number of nets fishing a public fishery.

Parr Juvenile salmonid in the stage following fry until its migration as a smolt or, for non-migratory forms, until it becomes an adult. Salmon parr are normally 8 – 16 cm long and have parr-marks (dark vertical bars) on the sides of the body.

Post-smolt Young salmon, at the stage from leaving the river until the middle of its first winter in the sea.

Precautionary approach A concept enshrined in Principle 15 of the Rio Declaration of the UN Conference on Environment and Development, which states: "In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

Pre-fishery abundance (PFA) The numbers of salmon estimated to be alive in the ocean from a particular stock at a specified time (1st Jan for Faroes fishery; 1st Aug for West Greenland fishery).

Production The assimilation of nutrients to produce growth in a population over a given period.

Radio tag An electronic transmitter which emits radio frequencies and is attached to a fish to enable its position to be determined in freshwater.

Recruits The abundance of fish measured at a particular point in the life cycle, e.g. at the juvenile stages, the smolt stage, at the stage of recruitment to the fishery, or as returning spawners.

Reference point An estimated value derived from an agreed scientific procedure and/or model which corresponds to a state of the resource and/or of the fishery and can be used to assess stock status or inform management decisions.

Run The number of adult salmon ascending, or smolts descending, a river in a given year. The main smolt run takes place in spring, whereas adult salmon runs may occur in spring, summer, autumn or winter.

Salmonid A fish belonging to the family *Salmonidae*, which includes the Atlantic salmon (*Salmo salar*), trout (*Salmo trutta*), charr (*Salvelinus alpinus*) and rainbow trout (*Oncorhynchus mykiss*).

Sea trout Anadromous form of the trout (*Salmo trutta*) after the post-smolt stage; the brown trout, *Salmo trutta*, remains in freshwater throughout its life

Smolt At a particular stage of their development, salmon parr undergo physiological changes, they become silver in appearance and migrate to sea, and are known as smolts. Salmon smolts are typically 12 - 16 cms long.

Smolt age The number of winters that a salmon remained in freshwater prior to emigration as a smolt (this does not include the winter in which the egg was laid).

Spring salmon Multi-sea-winter salmon which return to freshwater early in the year, usually before the end of May.

Stock A management unit comprising one or more salmon populations, which may be used to describe those salmon either originating from or occurring in a particular area. Thus, salmon from separate rivers are referred to as "river stocks".

Stocking The intentional release of fish into an ecosystem.

Sustainable use The use of a biological resource in a way and at a rate that does not lead to the long-term decline of its potential to meet the needs and aspirations of present and future generations. Sustainable is not meant to imply that abundance is constant.

ANNEX 1. Additional information

North Atlantic Salmon Conservation Organisation

The North Atlantic Salmon Conservation Organisation (NASCO) was established in 1984 following calls for international co-operation on the management of salmon stocks. It is an international body with the objective of contributing through consultation and co-operation to the conservation and rational management of salmon stocks taking account of the best available scientific evidence. NASCO therefore seeks scientific advice on the status of salmon stocks and fisheries and their management from the International Council for the Exploration of the Sea (ICES) (Annex 2). The Contracting Parties to the NASCO Convention are: Canada; Denmark (in respect of the Faroe Islands and Greenland); European Union; Iceland; Norway; the Russian Federation; and the USA. Much of the business of the organisation is conducted by three regional Commissions: the North American Commission; the North East Atlantic Commission; and the West Greenland Commission. One of the main functions of these Commissions is to propose regulatory measures for fisheries of one Party to the NASCO Convention which exploit salmon originating in the rivers of other Parties. The main fisheries of relevance for the management of European stocks are those operated on the west coast of Greenland and within Faroese waters. In 1998, NASCO adopted the Agreement on the Adoption of a Precautionary Approach; this requires that more caution be exercised when information is uncertain, unreliable or inadequate, and that the absence of adequate scientific information is not to be used as a reason for postponing or failing to take conservation and management measures.

International Council for the Exploration of the Sea

The International Council for the Exploration of the Sea (ICES) provides biological information and advice on a wide range of fish stocks in order to help fisheries managers maintain viable fisheries within sustainable ecosystems. Information is compiled and assessments are conducted by Working Groups, which are comprised of national experts on the specific fish stocks. The Working Group reports are passed to the Advisory Committee on Fisheries Management (ACFM) for peer review and to prepare the advice to managers. The advice may take many forms, but in general it involves: assessments of stock dynamics; evaluation of the status of the stocks; projections of various stock parameters into the future; and management options. For Atlantic salmon, ICES provides advice relating to the list of questions posed by NASCO (Annex 2). The assessment of salmon stocks and their fisheries presents particular problems to the ICES scientists both because of the highly migratory nature of the fish and because they comprise a large number of distinct river stocks which must, to some extent at least, be managed separately.

The Environment Agency's catch return system

The Environment Agency and its predecessor the National Rivers Authority have operated a national catch return system since 1995. The first national catch reminder was issued to anglers (regardless of whether a return had already been made) in January 1995, in respect of the 1994 season. For 1995, the reminder was brought forward to November, closer to the end of the fishing season in most regions. The reporting and reminder system has been subject to a number of difficulties, not least the problem of collating licence counterfoils from over 17,000 outlets and inputting details onto a database in time for the November reminder. In 2001, improvements to the database enabled more effective targeting of reminders. These improvements also made possible the issue of a second reminder (sent to all anglers who had not sent in a return by 11 January); this was undertaken nationwide for the first time early in 2002, in respect of catches for the 2001 season. This was continued in 2003 for the 2002 season, and it is hoped to routinely issue second reminders in future years, in line with NASCO recommendations, in order to reduce the level of unreported catch.

Summary of Regulatory Measures agreed by NASCO for the West Greenland Salmon Fishery

Year	Allowable catch (tonnes)	Comments/other measures
1984	870	
1985	-	Greenlandic authorities unilaterally established quota of 852t.
1986	850	Catch limit adjusted for season commencing after 1 August.
1987	850	Catch limit adjusted for season commencing after 1 August.
1988-1990	2520	Annual catch in any year not to exceed annual average (840t) by more than 10%. Catch limit adjusted for season commencing after 1 August.
1991	-	Greenlandic authorities unilaterally established quota of 840t.
1992	-	No TAC imposed by Greenlandic authorities but if the catch in first 14 days of the season had been higher compared to the previous year a TAC would have been imposed.
1993	213*	
1994	159*	
1995	77	
1996	-	Greenlandic authorities unilaterally established a quota of 174t.
1997	57	
1998	Internal consumption fishery only	Amount for internal consumption in Greenland has been estimated in the past to be 20t.
1999	Internal consumption fishery only	Amount for internal consumption in Greenland has been estimated in the past to be 20t.
2000	Internal consumption fishery only	Amount for internal consumption in Greenland has been estimated in the past to be 20t.
2001	28 – 200	Under an *ad hoc* management programme the allowable catch will be determined on the basis of CPUE data obtained during the fishery.
2002	20 - 55 +	Under an *ad hoc* management programme the allowable catch will be determined on the basis of CPUE data obtained during the fishery.
2003	Internal subsistence consumption fishery only	Amount for internal consumption in Greenland has been estimated in the past to be 20t.

Note: Information supplied courtesy of the North Atlantic Salmon Conservation Organisation.
*Key: * Quotas were bought out.*
+ Start of five-year, annually-renewable by-out (subsistence fishery only remains).

Summary of Regulatory Measures agreed by NASCO for the Faroese Salmon Fishery

Year	Allowable catch (tonnes)	Comments/other measures
1984-1985	625	
1986	-	
1987-1989	1790	Catch in any year not to exceed annual average (597t) by more than 5%.
1990-1991	1100	Catch in any year not to exceed annual average (550t) by more than 15%.
1992	550	
1993	550	
1994	550	
1995	550	
1996	470	No more than 390 tonnes of the quota to be allocated if fishing licences issued.
1997	425	No more than 360 tonnes of the quota to be allocated if fishing licences issued.
1998	380	No more than 330 tonnes of the quota to be allocated if fishing licences issued.
1999	330	No more than 290 tonnes of the quota to be allocated if fishing licences issued.
2000	300	No more than 260 tonnes of the quota to be allocated if fishing licences issued.
2001-2003	No quota set	It is the intention of the Faroese authorities to manage the fishery in a precautionary manner with a view to sustainability, and to make management decisions with due consideration to the advice from ICES concerning status of stocks contributing to the fishery.
2004	No quota set	It is the intention of the Faroese authorities to manage the fishery on the basis of the advice from ICES concerning status of stocks contributing to the fishery in a precautionary manner with a view to sustainability and taking into account relevant factors such as socio-economic needs and other fisheries on mixed stocks.

Notes: The quotas for the Faroe Islands detailed above for the period 1984-2000 were agreed as part of effort limitation programmes (limiting the number of licences, season length and maximum number of boat fishing days) together with measures to minimise the capture of fish less than 60 cm in length. The measure for 1984/85 did not set limits on the number of licences or the number of boat fishing days Information supplied courtesy of the North Atlantic Salmon Conservation Organisation.

ANNEX 2. NASCO's request for scientific advice from ICES in 2004

1. With respect to Atlantic salmon in the North Atlantic Area:

   1.1. provide an overview of salmon catches and landings, including unreported catches by country and catch-and-release, and worldwide production of farmed and ranched salmon in 2003,

   1.2. report on significant developments which might assist NASCO with the management of salmon stocks,

   1.3. provide a compilation of tag releases by country in 2003,

   1.4. identify relevant data deficiencies, monitoring needs and research requirements taking into account NASCO's International Atlantic Salmon Research Board's inventory of on-going research relating to salmon mortality in the sea.

2. With respect to Atlantic salmon in the North-East Atlantic Commission area:

   2.1. describe the key events of the 2003 fisheries and the status of the stocks,

   2.2. evaluate the extent to which the objectives of any significant management measures introduced in the last five years have been achieved,

   2.3. further develop the age-specific stock conservation limits, where possible based upon individual river stocks,

   2.4. provide catch options or alternative management advice, if possible based on a forecast of PFA for northern and southern stocks, with an assessment of risks relative to the objective of exceeding stock conservation limits and advise on the implications of these options for stock rebuilding,

   2.5. consider the report of the Study Group on the Bycatch of Salmon in Pelagic Trawl Fisheries, provide estimates of bycatch of salmon in pelagic fisheries, and advise on their reliability.

3. With respect to Atlantic salmon in the North American Commission area:

   3.1. describe the key events of the 2003 fisheries and the status of the stocks,

   3.2. evaluate the extent to which the objectives of any significant management measures introduced in the last five years have been achieved,

   3.3. update age-specific stock conservation limits based on new information as available,

   3.4. provide catch options or alternative management advice with an assessment of risks relative to the objective of exceeding stock conservation limits and advise on the implications of these options for stock rebuilding,

   3.5. provide an analysis of any new biological and/or tag return data to identify the origin and biological characteristics of Atlantic salmon caught at St. Pierre and Miquelon,

   3.6. provide descriptions (gear type; and fishing depth, location and season) for all pelagic fisheries that may catch Atlantic salmon.

4. With respect to Atlantic salmon in the West Greenland Commission area:

   4.1. describe the events of the 2003 fisheries and the status of the stocks,

   4.2. evaluate the extent to which the objectives of any significant management measures introduced in recent years have been achieved,

   4.3. provide information on the origin of Atlantic salmon caught at West Greenland at a finer resolution than continent of origin (river stocks, country or stock complexes),

   4.4. provide catch options or alternative management advice with an assessment of risk relative to the objective of exceeding stock conservation limits and advise on the implications of these options for stock rebuilding.

Notes:

1. *In the responses to questions 2.1, 3.1 and 4.1, ICES is asked to provide details of catch, gear, effort, composition and origin of the catch and rates of exploitation. For homewater fisheries, the information provided should indicate the location of the catch in the following categories: in-river; estuarine; and coastal. Any new information on non-catch fishing mortality of the salmon gear used and on the bycatch of other species in salmon gear and of salmon in any existing and new fisheries for other species is also requested.*

2. *With regard to question 4.1, ICES is requested to provide a brief summary of the status of the North American and North-East Atlantic salmon stocks. The detailed information on the status of these stocks should be provided in response to questions 2.1 and 3.1.*

3. *In response to questions 2.4, 3.4 and 4.4, provide a detailed explanation and critical examination of any changes to the models used to provide catch advice. With respect to stock rebuilding, consider and evaluate various alternative baseline measures for use in the risk analysis.*

4. *With regard to 2.5, the Study Group on the Bycatch of Salmon in Pelagic Trawl Fisheries will facilitate further deliberations of the WGNAS on this topic.*

ANNEX 3. Description of fishing methods (nets and fixed engines) used for taking salmon and migratory trout in England and Wales

A wide variety of nets and fixed engines are used to take salmon and sea trout. The term fixed engine is an ancient one used as a general descriptor of stationary fishing gears. The following are generalised descriptions of the gear used in England and Wales (for further details see Russell *et al.*, 1995); in practice there is considerable regional variation in the precise mode of operation of specific gears and in the dimensions and mesh sizes of the nets. These characteristics have generally evolved to suit local conditions and are regulated by local byelaws.

Basket trap This is a type of fixed engine which has only been used on the river Conwy in North Wales. It consists of a metal basket set between two boulders, which is designed to catch salmon and sea trout which fall back when attempting to ascend a small waterfall.

Coastal net A loose term used to describe the nets used in the fishery off the East Anglian coast. In practice, various methods of fishing have been employed, including seine nets and drift nets.

Compass net These nets are operated from a boat held stationary against the current. A net is hung between two long poles lashed together in a V-shape and held over the side of the boat so that the net streams out underneath the boat. When a fish strikes the net, the poles are pivoted upwards with the aid of counter-balancing weights.

Coracle net These nets are only used in parts of Wales. Short lengths of trammel net are suspended between two coracles (small boats), which then drift downstream with the net strung across the current.

Crib (or Coop) These ancient fixed engines consist of stone buttresses set across a river, the gaps between the buttresses being filled by box-like traps made of either wood or metal with in-scale entrances. The River Eden cribs were built in 1133 A.D. by monks, although the Derwent cribs are of more recent construction.

Drift net A drift net consists of a sheet of netting which hangs from a floated head rope to a weighted foot rope and is designed to drift with the current or tide. Regional names include: hang, whammel, sling and tuck nets.

Haaf or heave net These one-man-operated nets are operated exclusively in the North West Region. The gear consists of a rectangular net hung from a horizontal wooden beam up to 5.5m wide. A central pole permits the netsmen to stand in the tideway holding the net facing the current with the netting streaming behind him. The net is lifted when a fish strikes the net. It is usual for several netsmen to work together line-abreast.

Lave (or dip) net Lave nets, one regional variety of similar hand-held, one-man-operated nets, consist of a large Y-shaped wooden frame supporting a net, similar in design to an angler's landing net, but measuring up to 2 m across. The netsman actively stalks fish in estuary pools or shallows at low tide.

Putchers (and Putts) Putchers are wickerwork or metal conical baskets which, when erected on stages, form putcher ranks (containing up to 800 putchers). This type of fixed engine is peculiar to the Bristol Channel and is dependent upon the high turbidity and large tidal range which occurs in

this area. Each putcher has a mouth from 1 to 1.5 m wide, tapering to a narrow point which will prevent fish of moderate size from passing through. A netting leader is often used to guide fish into the putchers. Putts are of similar design to putchers, only larger.

Seine net A seine net (also known as a draft or draw net) consists of a wall of netting with a weighted foot rope and floated head rope. One end is held on the shore while the rest is paid out from a boat to enclose an area of water between two points on the shore. The net is then retrieved and any fish enclosed drawn up onto the shore. Seine nets normally operate within estuaries, although some are also fished off coastal beaches.

Sling net The sling net is a type of drift net used exclusively on the river Clwyd in North Wales. It differs from other drift nets only in so far as the nets are permitted to carry weights (not exceeding 4 kg) at either end, designed to retard the drift.

T-net T-nets are fixed engines operated close to the shore, usually in specific berths. They comprise a 'leader', usually about 200 m in length, stretching out from the beach to a 'headpiece', which contains two traps with funnel entrances. Some fish may become enmeshed or entangled in the leader of the net, but the majority are taken, free-swimming, in the traps.

'T or J'-net 'T or J'-nets consist of plain sheets of netting on a floated head rope which hang vertically in the water by means of a weighted foot rope and are set from the shore in the shape of a 'T', 'J' or 'P'. These nets are usually operated as fixed engines, held stationary by means of weights, anchors or stakes, but can also be drifted with weights used to retard the rate of movement. Fish can only be caught in a 'T or 'J' net by becoming enmeshed or entangled in the walls of the net.

Trammel net Trammel nets are similar to drift nets but are modified by the addition of sheets of larger mesh netting on one or both sides of the net. Such nets are referred to as being 'armoured'. A fish striking a trammel net pushes the small mesh net through one of the large meshes in the adjoining net and is caught in the resultant pocket. Sometimes known locally as tuck nets.

Wade net A wade net consists of a short (~30 m) single sheet of netting which is attached to a pole at each end, and is pulled along the foreshore parallel to the beach by two men, one wading and the other on the beach. Nets are 'beached' at regular intervals, or when a fish strikes, in much the same way as a seine net.

ANNEX 4. ICES Compilation of microtag, fin clip and external tag releases

Marking season: 2003

Country: England and Wales

Totals:

Origin	Primary Tag or Mark			
	Microtag	External Mark	Adipose Clip	Total
Hatchery juvenile	59,840	17,920	50,750	128,510
Wild juvenile	6,239		1,595	7,834
Adult		2,185		2,185
Total fish marked	**66,079**	**20,105**	**52,345**	**138,529**

Marking Agency	Age	Life Stage	H/W	Stock Origin	Primary Tag or Mark	Number marked	Code or Serial	Secondary Tag or Mark	Release date	Release Location
EA North East	Various	Adult	W	Tyne	Floy tag	25	Various green/orange tags	None	Jun-Dec	Tyne
EA Thames	Various	Adult	W	Thames	Radio tag	14	SAL3 TO01-20	Floy tag	Various	Thames
EA Thames	Various	Adult	W	Thames	Floy tag	2	Yellow 00416/17	None	Various	Thames
EA Thames	S1	Smolt	H	Delphi	Elastomer	8,491		Adipose	20/02/03	Thames
EA Thames	S1	Smolt	H	Shannon	Microtag	10,090	02/42/02	Adipose	10/03/03	Thames (Kennet)
EA Thames	S1	Smolt	H	Shannon	Microtag	10,100	02/42//03	Adipose	10/03/03	Thames (Kennet)
EA Thames	S1	Smolt	H	Delphi	Microtag	9,850	01/42/49	Adipose	11/03/03	Thames (Kennet)
EA Thames	S1	Smolt	H	Shannon	Microtag	10,250	02/42/04	Adipose	12/03/03	Thames (Kennet)
EA Thames	S1	Smolt	H	Shannon	Microtag	9,550	02/42/06	Adipose	12/03/03	Thames (Kennet)
EA Thames	S1	Smolt	H	Delphi	Elastomer	5,221		Adipose	14/05/03	Thames
EA Thames	S2	Smolt	H	Shannon	Elastomer	4,208		Adipose	03/02/03	Thames (Kennet)
EA South West	Various	Adult	W	Tamar	Floy tag	97		None	Apr-Jun	Tamar
EA South West	Various	Parr	H	Axe	None	5,200		Adipose	22/01/03	Axe
EA South West	Various	Parr	H	Axe	None	2,000		Adipose	06/08/03	Axe
EA Wales	Various	Adult	W	Taff	CART tag	49	Various	Floy tag	May-Dec	Taff
EA Wales	Various	Adult	W	Taff	Floy tag	167	Green 4707-5839	None	May-Dec	Taff
EA Wales	Various	Adult	W	Dee	Floy tag	1,195	Various blue	None	Feb-Oct	Dee
EA Wales	S1	Smolt	H	Taff	Microtag	4,400	02/42/01	Adipose	07/03/03	Taff
EA Wales	S2	Smolt	H	Taff	Microtag	5,600	02/42/07	Adipose	12/03/03	Taff
EA Wales	Various	Parr	H	Mawddach	None	4,200		Adipose	16/01/03	Mawddach
EA Wales	Various	Parr	H	Conwy	None	5,200		Adipose	05/03/03	Conwy (Lledr)
EA Wales	Various	Parr	H	Conwy (Lledr)	None	4,000		Adipose	02/04/03	Conwy
EA Wales	S1	Smolt	H	Dee (Tryweryn)	None	2,500		Adipose	27/01/03	Dee (Brenig)
EA Wales	S1	Smolt	H	Dee (Tryweryn)	None	2,500		Adipose	27/01/03	Dee (Brenig)
EA Wales	S1	Smolt	H	Dee (Recon. Kelt)	None	3,200		Adipose	28/01/03	Dee (Tryweryn)
EA Wales	S1	Smolt	H	Dee	None	3,500		Adipose	31/03/03	Dee (Brenig)
EA Wales	S1	Smolt	H	Dee	None	3,500		Adipose	01/04/03	Dee (Tryweryn)
EA Wales	S1	Smolt	H	Dee	None	3,500		Adipose	02/04/03	Dee (Tryweryn)
EA North West Various	Adult	W	Eden (Caldew)		Floy tag	618	Yellow B200-900	None	Nov-Dec	Eden (Caldew)
EA North West S1	Smolt	H	Lune	None	8,250		Adipose	12/03/03	Lune (Various)	
EA North West S1	Smolt	H	Lune	None	3,200		Adipose	13/03/03	Lune (Various)	
CEFAS/EA Wales	Various	Smolt	W	Dee	Microtag	2,059	01/42/22	Adipose	Apr-May	Dee
CEFAS	Various	Smolt	W	Tamar	Microtag	4,180	01/42/48	Adipose	Apr-03	Tamar
CEFAS	Various	Adult	W	Avon (Hants)	Radio/Acoustic	18	TW5/900-990, 3922B	Floy tag	May-July	Avon (Hants)
CEFAS	Various	Smolt	W	Tees	Acoustic	6	2455, 2466, 2469, 2475, 2480, 2481	None	May	Tees
CEFAS	Various	Parr	W	Dee (Ceiriog)	PIT	1,368	DC0021….	Adipose	Sept	Dee (Ceiriog)
CEFAS	Various	Parr	W	Itchen	PIT	227	DC0021….	Adipose	Aug	Itchen