

SALMON STOCKS AND FISHERIES IN ENGLAND AND WALES, 1999

Preliminary assessment prepared for ICES, April 2000



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FOREWORD

This is the third 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 National Salmon and Trout Fisheries Centre (NSTFC) of the Environment Agency. We feel that it is important that each annual report should stand alone and that it should not be necessary to refer back to previous reports for background information. This inevitably means that there will be some descriptive information in this report which is the same as previous years.

The main purposes of the report are to provide early feedback to managers and fishermen on the status of stocks and fisheries in England and Wales and to supply this information to the International Council for the Exploration of the Seas (ICES). The information submitted to ICES is used, in turn, to provide advice to the North Atlantic Salmon Conservation Organisation (NASCO). The objectives of NASCO are to contribute to *'the conservation, restoration, enhancement and rational management of salmon stocks'*. In particular, they are 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 2000 is given at Annex 2. However, for this report, the pertinent requests relating to events in 1999 are to:

provide an overview of salmon catches and landings, including unreported catches, and catch and release, and production of farmed and ranched salmon;

describe the events of the 1999 fisheries and the status of the stocks;

evaluate the effects on stocks of significant management measures introduced since 1991;

provide age specific stock conservation limits, where possible for individual river stocks;

provide a compilation of microtag, finclip and external tag releases; and

provide a compilation of egg collections and juvenile releases.

NASCO has previously indicated that they 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.

It must be noted that much of the data relating to 1999 are provisional and will not be finalised until complete catch data are obtained and records can be fully validated. Final data will be provided in the Agency's annual publication of the Salmonid and Freshwater Fisheries Statistics and their annual Salmon Action Plan progress reports (Annex 3), which will be published later in the year.

EXECUTIVE SUMMARY

- This report presents a preliminary assessment of the state of salmon stocks and fisheries in England and Wales in 1999 to assist ICES in providing scientific advice to NASCO and to provide early feedback to fishery managers. (Foreword)
- New national byelaws were introduced in April 1999 to protect early-run salmon; these will be reviewed after five years. (Sections 1.2.1 and 1.2.2)
- The declared salmon catch for 1999 (including released fish) is provisionally estimated to be 172.9 t, comprising 124.9 t by nets and fixed engines and 48.0 t by rods. The total retained catch (excluding released fish) was 151.9 t, of which 27.0 t was by rods. (Section 2.1.1)
- The number of licences issued for nets and fixed engines fell by a further 11% in 1999, although the number of days fished by netsmen increased compared with 1998 in the North East, North West and South West Regions. (Section 1.2.1 and 1.2.3)
- The net catch, which is dominated by the North East Region, was 36% higher than that in 1998, but remained below the previous 5yr mean. (Section 2.1.1)
- The catch per unit of fishing effort (CPUE) for net fisheries was well above the previous 5yr mean in the North East Region, but was below the 5yr mean in Wales and the North West Region. (Section 2.2.1)
- The number of salmon rod licences issued fell by 8%, while the number of days fished by anglers fell by 21%; it is estimated that there was a greater reduction in the number of days fished before 16 June (~40%) than after this date (~10%). (Section 1.2.2 and 1.2.4)
- The rod catch (including released fish) was 31% below the previous 5yr mean, and the lowest in the last 50 years. Rod catches of grilse in 1999 were lower than in 1998 in all Regions, except Midlands, and 36% below the previous 5yr mean overall. Rod catches of multi-sea-winter (MSW) salmon in 1999 were better than those in 1998 in a number of Regions, but were well below the 5yr mean in all Regions with the exception of North East Region. (Section 2.1.1)
- The CPUE for the rod fisheries was below the previous 5yr mean for all Regions except the North East, where there was a 39% increase. (Section 2.2.2)
- The proportion of salmon released by anglers has continued to increase. In 1999, provisional estimates indicate that 44% of salmon caught by anglers were released following capture, compared with 10% in 1993. (Section 2.1.2)
- The total unreported and illegal catch of salmon by all methods in 1999 is estimated to have been about 35 tonnes, approximately 20% of all fish killed. (Section 2.3)
- Exploitation rates in most of the monitored rod fisheries in England and Wales in 1999 were below the average of the previous 5yr mean. (Section 2.7)
- Data from counters and traps in England and Wales in 1999 show that runs into freshwater were generally below the average of the previous 5 mean. (Section 3.2)
- Spawning escapement was above the conservation limits (including provisional limits) in 14 rivers (20%), between 50% and 100% of the limits in 18 rivers (26%) and less than 50% of the limits in 37 rivers (54%). Despite the improvements in MSW salmon runs in 1999, the majority of salmon stocks in England and Wales continue to be in a depleted state. (Section 3.1)
- The estimated number of salmon eggs artificially spawned from broodstock taken from the wild has declined from just over 5 million in 1990 to about 1.1 million in 1997. (Section 4)
- 94,000 hatchery-reared salmon parr and 1,300 wild salmon smolts were marked and released in England and Wales in 1999 for assessment or enhancement investigations; a total of 1,190 adult salmon were tagged for assessment or radio tracking studies. (Section 4)

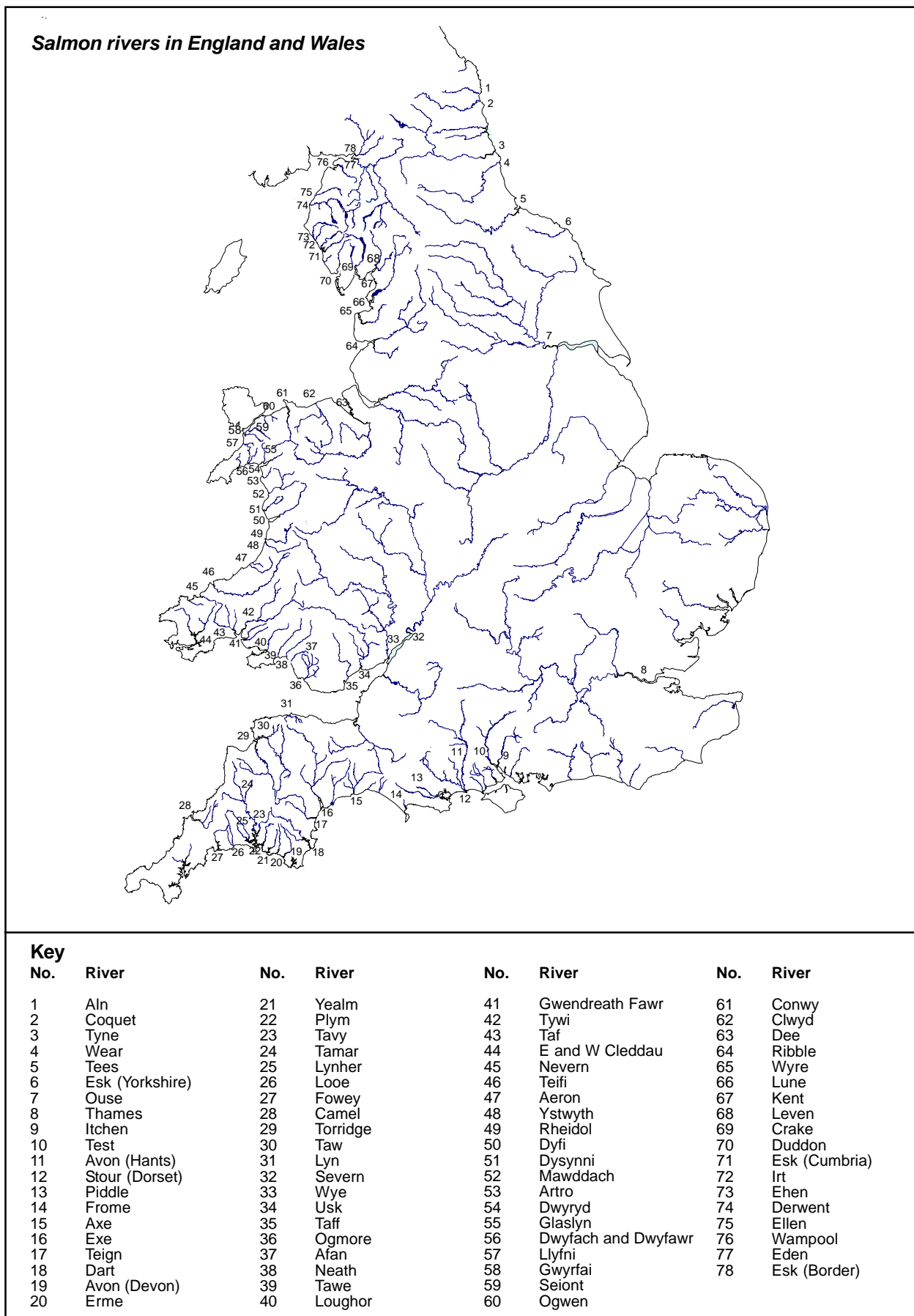


Figure 1. Map of England and Wales showing the main salmon rivers

REPORT ON SALMON FISHERIES IN 1999

1. Gear and effort

1.1 Gear

Brief descriptions of all the nets and fixed engines used in England and Wales are included in Annex 4. 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 1999 are listed in Table 2.

There were no recorded changes in the types of gear used for the capture of salmon in England and Wales in 1999. However, the experimental use of a T-net in the southern area of the Northumbria coastal fishery (NE Region) continued; T-nets were not previously operated in this area and this was first authorised in 1998.

1.2 Effort

The most significant change in fishing effort in 1999 resulted from the introduction of a national byelaw to protect early-running 'spring' salmon. The byelaw came into force on 15 April 1999, and so there was thus some early season netting and angling for salmon prior to this date. Details of the restrictions imposed on net and rod fisheries are provided in Sections 1.2.1 and 1.2.2 below.

Levels of exploitation of migratory salmonids by both rods and nets in England and Wales are regulated principally 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, for most net fisheries, the number of licences is limited by Order (Table 2).

The regulatory measures provide an overall limit on the 'allowable' fishing effort. However, within these restrictions there will be annual variations in the amount that both netsmen and anglers actually fish (the 'utilised' effort), due to factors such as prevailing weather conditions (e.g. sea conditions or river flow) and local perceptions about the abundance of returning stocks. In addition, the first sale price of salmon 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 both rod and net licences have increased. These factors and unwillingness on the part of some anglers to practice compulsory catch-and-release may also have affected the take-up of licences and the fishing effort.

For rod fisheries, river flow is a key factor affecting angler effort; England and Wales experienced higher than average rainfall in 1999. Figure 2 shows the monthly river flows for 13 rivers in England and Wales expressed as a percentage of the monthly long-term average; flows were low in February, July and November but were at or above average in the rest of the year.

Table 1. Numbers of rod licences (1994-99) and net and fixed engine licences (1983-99) issued in England and Wales

Year	Rod licences		Net and fixed engine licence type				Combined drift/T net	Total net licences
	Short-term	Annual	Gill	Sweep	Hand-held	F.E.		
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	10,737	19,124	120	109	178	30	26	437

Notes: Rod short-term licences are for 1 or 8 days; annual licences are valid from the date of issue to 31 March following; the rod licence data for 1999 are provisional.
 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 (FE) include: T-nets, J-nets, stop (compass) nets, putcher ranks, traps, weirs, cribs (coops) and fishing baulks.
 Combined drift/T net licences (issued in Northumbria (northern area)) have been included in the gill net, but not the F.E. totals.
 East Anglian coastal nets (targeted primarily at sea trout) have been excluded.

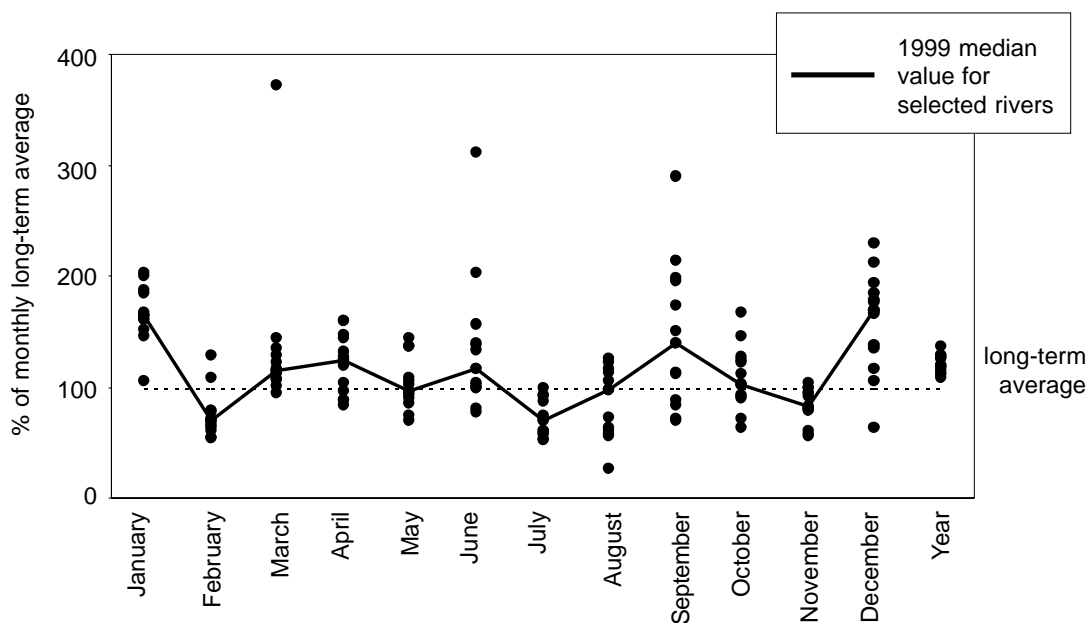


Figure 2. Monthly river flows in 1999 for 13 rivers in England and Wales expressed as a percentage of the monthly long-term average. (EA data processed by Institute of Hydrology)

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 footnote to Table 1 and Annex 4). The numbers of netting licences issued for gill nets, sweep nets, hand-held nets and fixed engines have continued to decline 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 a further 11% in 1999 (Table 1 and Figure 3). Overall, the number of net licences issued between 1983 and 1999, has decreased by an average of about 3% per year (total decrease, 48%).

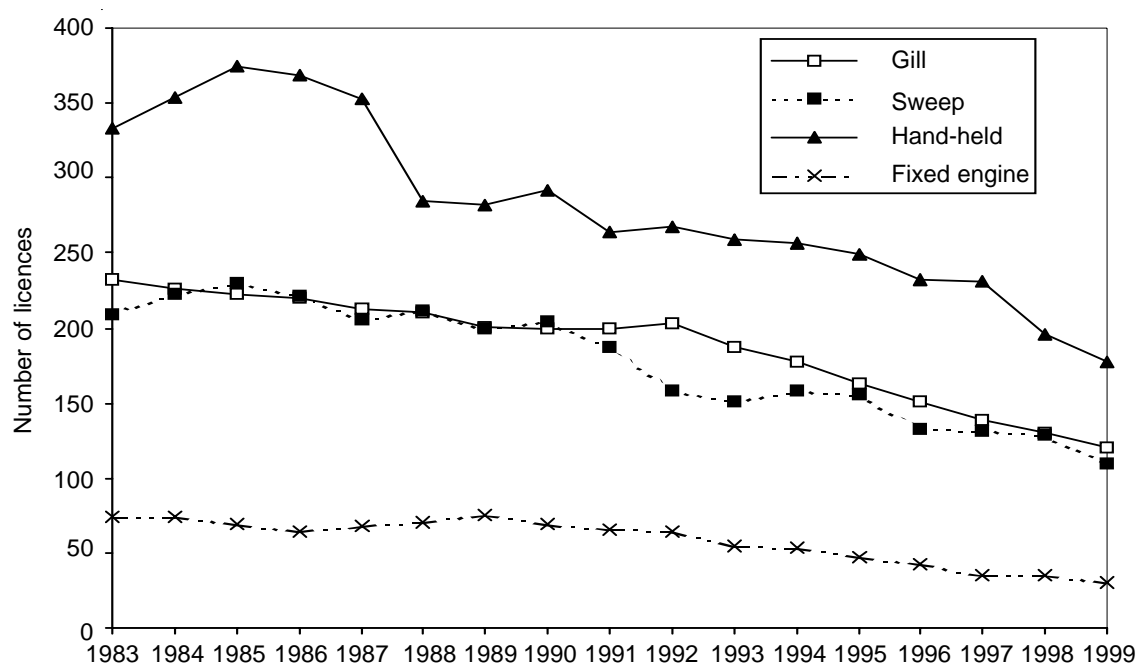


Figure 3. Numbers of salmon net and fixed engine licences issued in England and Wales, 1983-99

Under the national measures to protect spring salmon, netmen are banned from killing, and in most cases fishing for, salmon before 1 June; there are derogations which allow fishing in some areas where netting is predominantly for sea trout, on the basis that any salmon caught are returned alive (see Table 2).

A number of net fisheries in England and Wales are being (or have been) phased out because they exploit salmon returning to several rivers (i.e. mixed stock fisheries). Licence numbers are being reduced as fishermen retire from the fisheries. Progress with those phase-outs that were incomplete in 1998 is summarised in the text table below:-

Fishery	Netting method	Start of phase out	Number of nets		Reduction
			before start	1999	%
North East Coast	drift nets	1993	142	72	49%
Anglian coast	coastal nets	1996	59	50	15%
River Usk	drift nets	1997	8	8	0%
River Dwyfawr	seine nets	1997	2	0	100%
River Ogwen	seine nets	1997	2	2	0%

Arrangements have also been made to reduce netting effort in the following fisheries by compensating netsmen not to fish for the periods shown:

Fishery	Method	Period without netting	Funding agency
River Tavy	seine nets	1 July – 7 August) South West Water plc) and) Environment) Agency
River Tamar	seine nets	8 August – 31 August	
River Lynher	seine nets	8 August – 31 August	
River Fowey	seine nets	1 June – 15 June (salmon only)	
Cumbrian coast	drift net (3 out of 4 nets only)	complete season	Derwent Owners Association.
Avon and Stour (Christchurch Harbour)	seine nets	86 of the 87 fish caught were released	Wessex Salmon Rivers Trust and Tesco's

1.2.2 Allowable effort in rod fisheries

There are no statutory restrictions on the numbers of rod licences that may be issued.

The new national measures to safeguard spring salmon 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.

No other compulsory restrictions were imposed on rod fisheries in 1999. Voluntary restrictions on methods and fishing areas are known to be imposed by fishery owners and angling associations, but there is no national record of these.

1.2.3 Utilised effort in net fisheries

Table 2 presents data on utilised effort for salmon net fisheries in England and Wales in 1999. In comparison to 1998, the numbers of days/tides fished decreased in Wales (down 7%) and Midland Region (down 34%) but increased by between 11% and 17% in the North West, North East and South West. These increases were unexpected, considering the additional restrictions imposed by the national measures and the compensation arrangements operating in some fisheries. This therefore suggests that conditions were more suitable for fishing during the summer months in 1999 than in 1998.

The proportion of the allowable effort that was utilised varied considerably between fisheries and was highest on average for the North East Region (46%). It is virtually impossible for most fisheries to utilise 100% of the allowable effort and, in practice, factors such as weather conditions, tide heights and availability of fishing stations will constrain the overall effort. In the north east coast fishery, for example, it has been suggested that a maximum of about 75% of the allowable effort could be used in the summer months under normal weather conditions (Anon., 1997).

In all Regions except the Midlands (River Severn), the percentage of available effort utilised by net fisheries was around 10% higher in 1999 than in the preceding year. This reflects the changes observed above and the introduction of the national measures; since conditions are generally more favourable for fishing during the summer, closure of the fisheries early in the season was expected to result in a higher proportion of the remaining allowable effort being used.

Table 2. Allowable and utilised effort for the salmon net fisheries in England and Wales in 1999

Region	River/ Fishery	Method	No. Lics	NLO	Days available	Allowable effort net. days	Utilised effort		% utilised	Av. utilised effort day/lic	
							net. days	net. tides			
NE	N Coastal (N)	Drift & T	26	X	112	2,912)					
	N Coastal (N)	Drift	21	X	80	1,680)	2,155		46	45	
	N Coastal (N) ¹	T	1		112	112)					
	N Coastal (S)	Drift	18	X	80	1,440	807		56	44.8	
	N Coastal (S) ¹	T	1		112	112	46		41	46	
	Y Coastal	Drift	7	X	80	560	276		49	39.4	
	Y Coastal ¹	T or J	11		112	1,232	403		33	36.6	
	NE Region			85			8,048	3,687		46	
SW	Avon & Stour	Seine	4	6	57	228	129		56	32.2	
	Poole Harbour ²	Seine	0	1	0	0	0		0	0	
	Exe	Seine	11	18	82	902	262		29	23.8	
	Teign ¹	Seine	6	10	121	726	126		17	21	
	Dart ¹	Seine	13	18	110	1,430	512		36	39	
	Camel	Drift	6	7	100	600	89		15	14.8	
	Tavy ³	Seine	5	5	94	470	53		11	10.6	
	Tamar ⁴	Seine	14	15	90	1,260	487		38	34.7	
	Lynher ⁴	Seine	5	5	101	505	112		22	22.4	
	Fowey ^{1,5}	Seine	2	2	131	262	26		10	13	
	Taw/Torridge	Seine	14	14	53	742	588		79	42	
	Lyn ²	FE	0	n/a	0	0	0		0	0	
	SW Region			80			7,125	2,384		33	
	Mids	Severn	Putchers	7		76	532	486		91	69
Severn		Seine	4	4	119	476		80	12	14	
Severn		Lave	24	n/a	119	2,856		549	14	16	
Midlands Region			35			3,864	486	629	24		
Wales	Usk	Putchers	1		92	92	92		100	92	
	Usk	Drift	8	X	68	544		450	59	40	
	Tywi ¹	Seine	5	9	110	550		330	43	47	
	Tywi ¹	Coracles	4	12	110	440		195	29	35	
	Taf ¹	Coracles	1	1	110	110		17	11	12	
	E/W Cleddau	Compass	8	6	98	784		149	14	13	
	Nevern ¹	Seine	1	1	109	109		5	3	4	
	Teifi ¹	Seine	1	4	109	109		26	17	19	
	Teifi ¹	Coracles	10	11	109	1,090		325	21	23	
	Dyfi ¹	Seine	3	3	109	327		151	33	36	
	Mawddach	Seine	2	2	98	196		76	28	27	
	Glaslyn	Seine	1	1	98	98		43	31	31	
	Dwyfawr	Seine	0	X	0	0		0	0	0	
	Ogwen	Seine	2	X	98	196		57	20	20	
	Conwy	Seine	2	3	98	196		52	19	18	
	Dee	Trammel	4	2	60	240		263	78	47	
	Dee	Seine	12	8	60	720		668	66	40	
Welsh Region			65			5,801	92	2,899	36		
NW	Ribble	Drift	6	6	78	468		232	35	28	
	Lune	Haaf	25	26	78	1,950		1,364	50	39	
	Lune	Drift	8	10	78	624		255	29	23	
	Lune	Seine	1	1	78	78		53	48	38	
	Kent	Lave	8	8	78	624		126	14	11	
	Leven	Lave	6	6	78	468		298	45	35	
	S & W Cumbria ⁶	Drift	1	4	78	78		18	17	13	
	Eden & Esk	Haaf	114	155	116	13,224		4,071	22	26	
	NW Region			169			17,514	6,417		26	

Notes: National Spring salmon byelaws implemented 15 April, therefore, all net fisheries closed from this date up 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 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: X Denotes reducing NLO - fishery being phased out as existing licensees leave the fishery.

¹ Sea trout fisheries - exempted from national byelaws (all salmon caught before 1 June to be released).

² Not fished.

³ Buy-out 1 July to 7 August.

⁴ Buy-out 8 August to 31 August.

⁵ Buy-out 1 June - 15 June.

⁶ Partial or complete buy-out operating in 1999

1.2.4 Utilised effort in rod fisheries

The numbers of licences purchased for salmon and migratory trout angling (annual and short-term) between 1994 and 1999 are shown in Table 1; the data for 1999 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 has fallen by 20% over this six year period and the number of annual licences has fallen by 28%. The number of short-term (one day and eight day) licences issued has remained relatively consistent, but the proportion they represent of the total has increased from about 29% in 1994-5 to about 36% in 1996-9.

Table 3 shows the total number of rod days fished by anglers in each of the regions in each year from 1994 to 1999. Overall, most of the salmon and sea trout angling has taken place in Wales (38%) and the North West Region (27%) and there was relatively little angling for these species in Anglian, Thames and Southern Regions (total 1%). However, in all Regions except Thames, there was a substantial reduction in the number of days fished compared with the average of the previous five years, with a 27% reduction overall. This reflects both the reduction in the number of licences issued and the introduction of the national measures in 1999. Much of the reduction in fishing effort is likely to have been before 16 June, the period when catch-and-release was compulsory. A market research survey conducted by the Agency, suggest that about a quarter of days fished in 1999 were before 16 June, compared with a third in 1998. This equates to a fall of about 40% in the number of days fished before 16 June, compared with an estimated 10% reduction from 16 June to the end of the season.

Table 3. Total declared number of rod days fished (where provided) for each Region, 1994-99

Total days	NE	Thames	Southern	SW	Mids	Wales	NW	Total
1994	36,283	333	2,446	41,232	14,564	119,223	79,678	293,759
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 (provisional)	31,474	311	1,957	24,708	7,034	69,620	50,398	185,502
Mean (1994-98)	37,661	245	2,299	35,937	13,778	95,618	68,841	254,379
% change:								
1999 on 1998	-18	+115	-7	-21	-39	-19	-22	-21
1999 on 5-year mean	-16	+27	-15	-31	-49	-27	-27	-27

1.3 Catch limits

No national catch limit regulations apply to salmon fisheries in England and Wales, but a number of restrictions have been introduced under local byelaws. In some instances, aspects of these restrictions have been partially superseded by the new national measures. Details of the bag limits currently in force are listed below:

Region	River	Salmon Bag Limit			Other constraints
		per day	per week	per season	
Thames	Thames	2			
South West	Taw	2	3	10) No fish > 70 cm to be retained after August 1st
	Torridge	2	2	5	
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		

2. Catches and CPUE

2.1 Catches

The provisional catch statistics for 1999 are based upon returns received up until 18 February 2000. 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. There are expected to be a small number of late rod returns, but based on previous years' experience the increase in the declared catch will be very small. The catch returns for the nets and fixed engines are also not expected to change significantly.

2.1.1 Catches in 1999

Provisional net, rod and total catches for each Region for 1999 are presented in Table 4. In summary, for England and Wales, the confirmed salmon catches in 1998 and the provisional catches in 1999 were:

Method	1998	1999 (provisional)
Nets and fixed engines	25,179 (84.7 t)	34,159 (124.9 t)
Rods (inc. released fish)	17,109 (59.0 t)	12,131 (48.0 t)
Total caught	42,288 (143.7 t)	46,290 (172.9 t)
Total retained	36,917 (125.2 t)	40,997 (151.9 t)

The total catch by nets and fixed engines in 1999 (Table 5, Figure 4) was 36% greater than in 1998, but 24% down on the average for the previous 5 years. These figures are dominated by the north east coast fishery which has accounted for between 57% and 79% of the national annual catches during this period (79% in 1999). Because of the variability in catches from year to year, care must be taken in comparing figures for a single year. A more reliable picture of catch trends may therefore be obtained by comparing data aggregated over a period of years. Between 1994-96 and 1997-99, there has been a substantial decline in the net catches in all Regions; the greatest reductions have occurred in the South West (61%) and the North West (55%) with slightly smaller reductions in the Midlands (49%), North East (43%) and Wales (34%). It is notable that although the north-east coast fishery is being phased out, greater reductions have occurred in most other areas. This may reflect the better status of the main river stocks in the north east compared with other Regions.

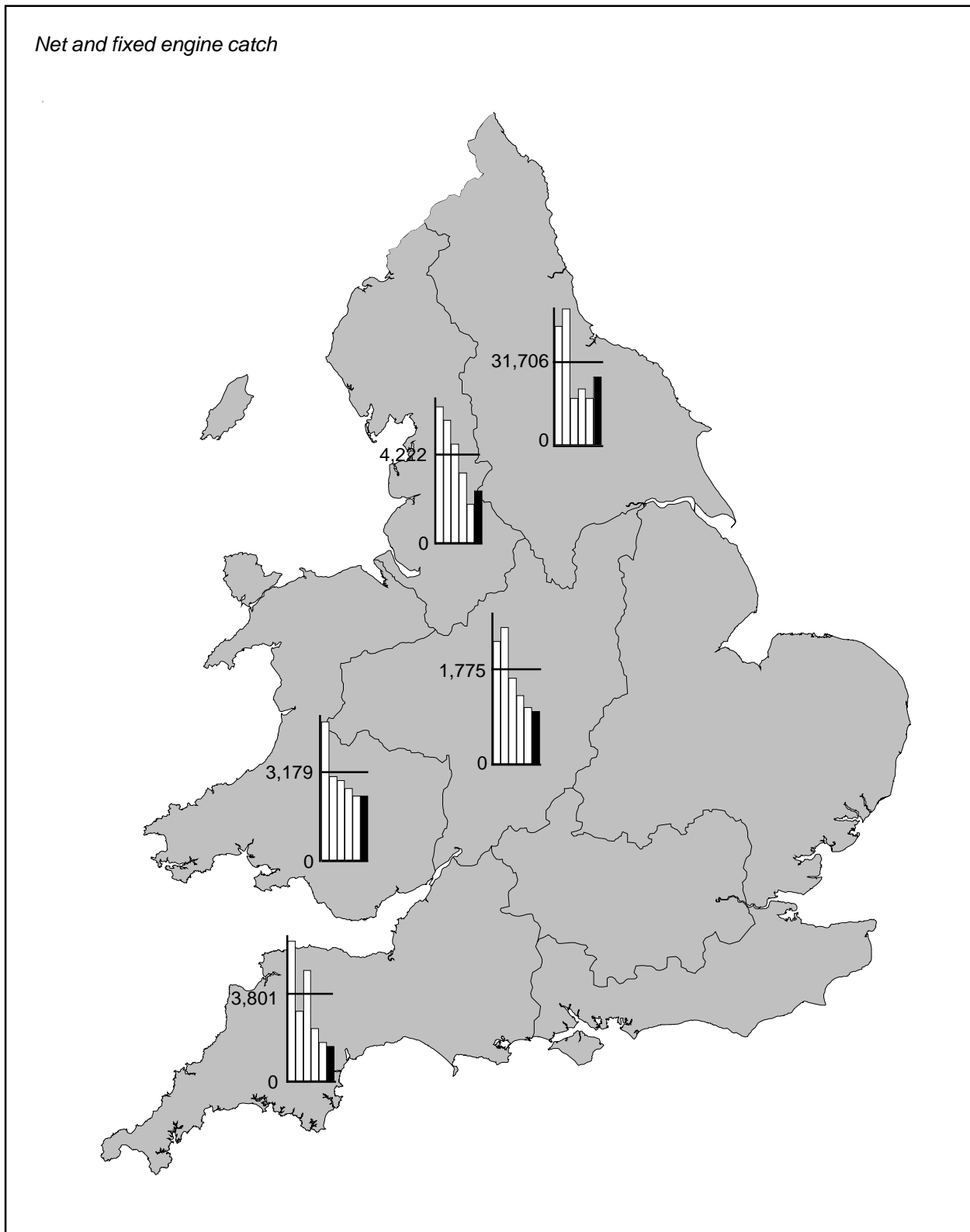


Figure 4. Regional declared salmon net and fixed engine catches. The histograms display data for the six years 1994 to 1999, together with the five-year mean for the period 1994-1998 (displayed as a horizontal line, with the mean value indicated against the y-axis). Note that the histograms are not drawn to the same scale. Data for 1999 are provisional.

Table 4. Provisional salmon catch statistics for England and Wales - 1999 season

Region	Net catch		Rod catch		Total catch	
	No.	Weight (kg)	No.	Weight (kg)	No.	Weight (kg)
North East	26,833	96,411	2,657	12,161	29,490	108,572
Anglian	6	22	-	-	6	22
Thames	-	-	1	3	1	3
Southern	0	0	251	917	251	917
South West	1,603	5,165	1,833	6,284	3,436	11,449
Midlands	989	4,223	184	883	1,173	5,106
Welsh	2,341	9,345	3,094	12,226	5,435	21,571
North West	2,387	9,744	4,111	15,479	6,498	25,223
Total	34,159	124,910	12,131	47,953	46,290	172,863

Table 5. Summary of declared regional salmon and grilse net and fixed engine catches, 1994-99

Year	Region							
	NE	Anglian	Southern (a)	SW	Mids	Wales	NW	Total
1994	46,554	3	4	6,437	2,321	4,995	6,143	66,457
1995	53,210	5	0	3,251	2,588	3,039	5,566	67,659
1996	18,581	3	0	5,093	1,608	2,931	4,464	32,680
1997	21,922	0	0	2,466	1,282	2,628	3,161	31,459
1998	18,265	3	0	1,759	1,074	2,300	1,778	25,179
1999 (provisional)	26,833	6	0	1,603	989	2,341	2,387	34,159
Mean (1994 - 1998)	31,706	3	1	3,801	1,775	3,179	4,222	44,687
% change:								
1999 on 1998	+47			-9	-8	+2	+34	+36
1999 on 5-yr mean	-15			-58	-44	-26	-43	-24

Key: (a) From 1992, the River Itchen seine net was fished for scientific purposes only; salmon caught in this fishery were tagged for release.

The rod catches for recent years are shown in Table 6 and Figure 5. The figures in the final section of Table 6 have been corrected for under-reporting by the application of a standard correction factor (see Section 2.3.1). The rod catches in 1999 were lower than in 1998 in all Regions and down 29% overall; catches were also substantially down on the previous five-year average in all Regions except the North East. Comparison of the data for 1997-99 with that for 1994-96 indicates that rod catches have declined in most Regions. The reduction has been between 26% - 36% in the Southern, North West, South West and Welsh Regions but 58% in the Midlands. In the North East, however, the catches have increased by 21% between these two periods.

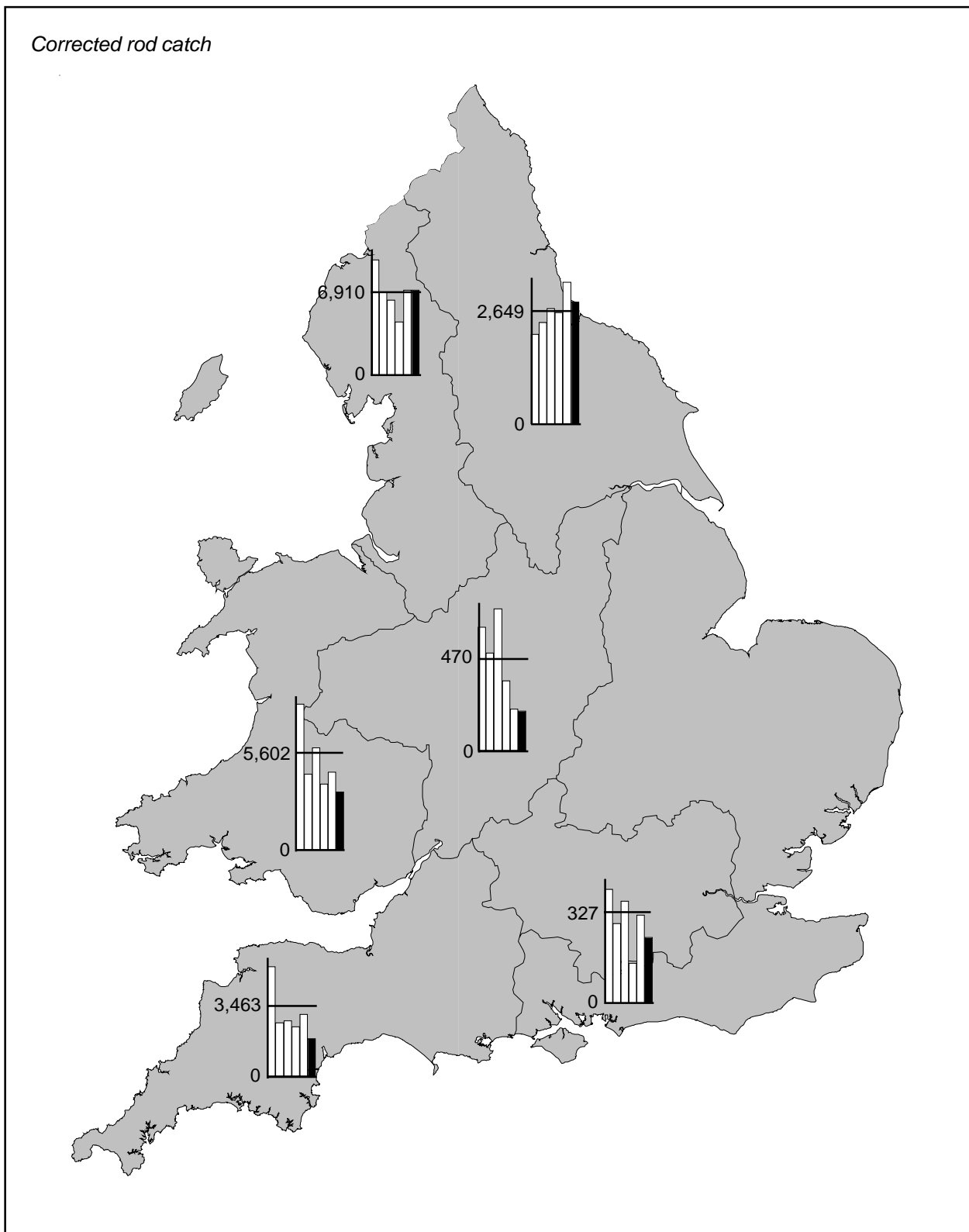


Figure 5. Regional salmon rod catches corrected for under-reporting (see Table 6). The histograms display data for the six years 1994 to 1999, together with the five-year mean for the period 1994-1998 (displayed as a horizontal line, with the mean value indicated against the y-axis). Note that the histograms are not drawn to the same scale. Data for 1999 are provisional.

Table 6. Summary of declared and corrected regional salmon and grilse rod catches, 1994-99 - including details of fish caught and released and fish caught and killed

Year	Region							
	NE	Thames	Southern	SW	Midland	Welsh	NW	Total
Declared total catch (including fish caught and released)								
1994	1,939	11	432	5,213	555	7,901	8,840	24,891
1995	2,201	13	302	2,554	442	4,146	6,348	16,006
1996	2,514	34	384	2,681	643	5,468	5,720	17,444
1997	2,445	2	150	2,372	312	3,622	4,144	13,047
1998	2,941	0	366	2,919	186	4,325	6,359	17,096*
1999 (provisional)	2,657	1	251	1,833	184	3,094	4,111	12,131
Declared catch (fish released)								
1994	322	0	69	745	36	802	1,253	3,227
1995	555	7	83	526	32	593	1,393	3,189
1996	732	25	88	510	57	684	1,332	3,428
1997	797	1	107	586	30	480	1,131	3,132
1998	1,037	0	222	1,077	31	979	2,019	5,365
1999 (provisional)	1,337	1	137	871	65	1,099	1,783	5,293
Declared catch (fish caught and retained)								
1994	1,617	11	363	4,468	519	7,099	7,587	21,664
1995	1,646	6	219	2,028	410	3,553	4,955	12,817
1996	1,782	9	296	2,171	586	4,784	4,388	14,016
1997	1,648	1	43	1,786	282	3,142	3,013	9,915
1998	1,904	0	144	1,842	155	3,346	4,340	11,731
1999 (provisional)	1,320	0	114	962	119	1,995	2,328	6,838
Corrected total catch (adjustment made for under-reporting: x 1.1)								
1994	2,133	11	432	5,734	611	8,691	9,724	27,336
1995	2,421	13	302	2,809	486	4,561	6,983	17,575
1996	2,765	34	384	2,949	707	6,015	6,292	19,147
1997	2,690	2	150	2,609	343	3,984	4,558	14,337
1998	3,235	0	366	3,211	205	4,758	6,995	18,769
1999 (provisional)	2,923	1	251	2,016	202	3,403	4,522	13,319
Mean (1994 - 1998)	2,649	12	327	3,463	470	5,602	6,910	19,433
% change:								
1999 on 1998	-10		-31	-37	-1	-28	-35	-29
1999 on 5-yr mean	+10		-23	-42	-57	-39	-35	-31

* Include 13 fish of unknown Region of capture.

Most 1999 figures are returns to 18 February 1999; data for the Rivers Wye, Test and Itchen are based upon owners returns and have not been corrected.

2.1.2 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 encouraged by the Agency and other organisations. Details of fish caught and released are published for each major salmon river in England and Wales in the annual catch statistics; the data are summarised in Table 7. In 1999, provisional data indicate that 44% of the salmon caught by rods were released following capture, a proportion that has increased from 10% in 1993 (the first year for which such data are available). In each of the years up to 1998, a smaller proportion of the catch was released before the beginning of June than later in the year. This will cease to apply in the future following the introduction of the mandatory catch and release measures for fish caught before 16 June. In 1999, 80% of the fish caught before 1 June were released. The new measures came into force on 15 April, so a proportion of the fish caught prior to that date were killed.

Table 6 includes a summary of fish caught and retained by anglers in England and Wales and these data are presented in Figure 6; in 1999, this amounted to 6,838 fish (27.0 tonnes).

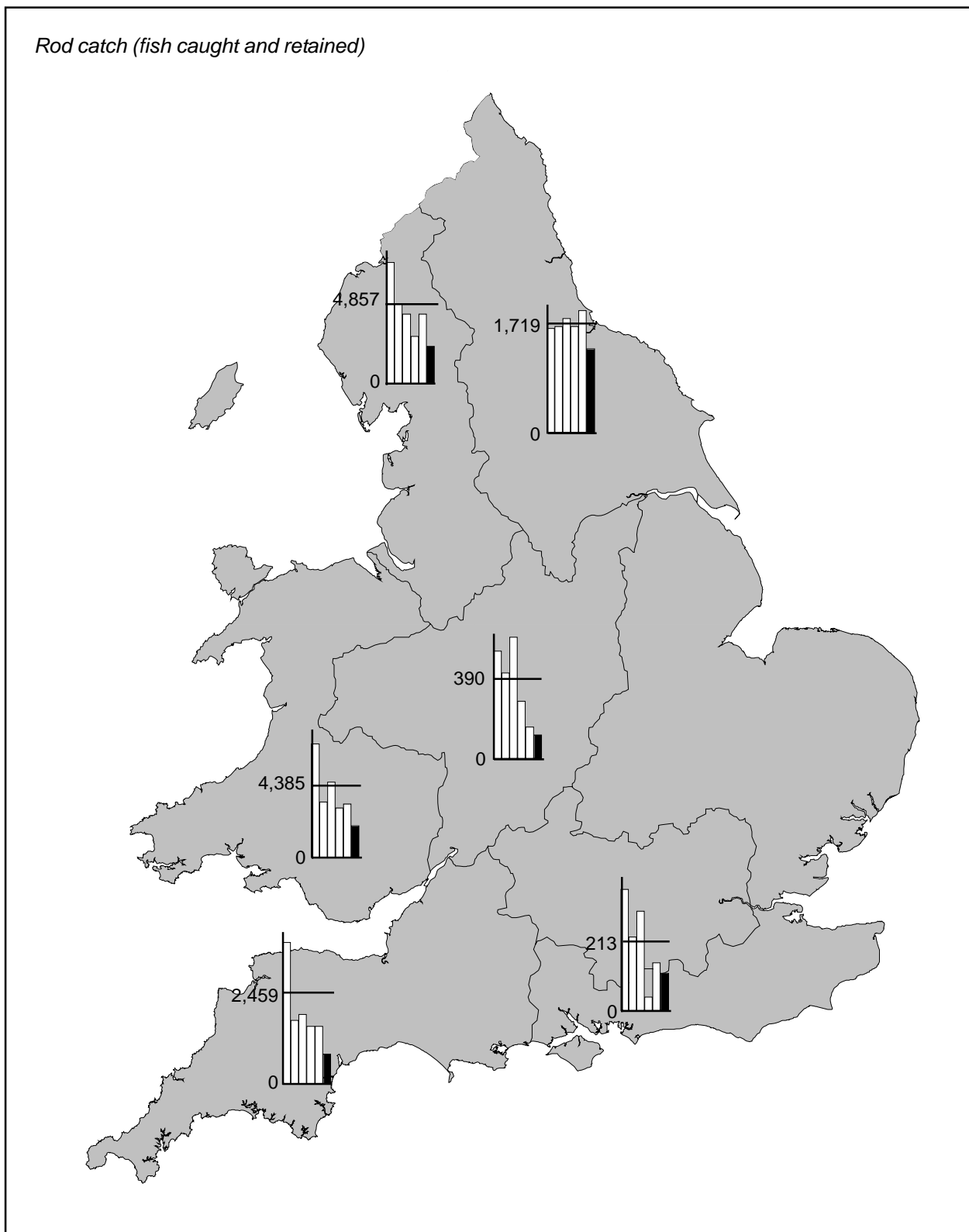


Figure 6. Regional rod catch (fish caught and retained). The histograms display data for the six years 1994 to 1999, together with the five-year mean for the period 1994-1998 (displayed as a horizontal line, with the mean value indicated against the y-axis). Note that the histograms are not drawn to the same scale. Data for 1999 are provisional.

Table 7. Number and proportion of declared salmon rod catch released by anglers, 1993-99

Year	No. salmon released	% of declared rod catch
1993	1,448	10.3
1994	3,227	13.0
1995	3,187	19.9
1996	3,428	19.7
1997	3,132	24.0
1998	5,116	31.3
1999*	5,293	43.6

*Provisional values

Under the new national measures, a small number of net fisheries (primarily targeted at sea trout) are allowed to operate prior to 1 June, provided any salmon caught prior to that date are released. Thus, low levels of catch and release also apply for net fisheries. In 1999, a total of 32 salmon were reported to have been caught and released, all of these in the Welsh Region (4 from the Tywi, 1 from the Taf, 24 from the Teifi and 3 from the Dyfi).

2.1.3 Long term catch trends

Figure 7 shows the declared net catch for England and Wales since 1956 and distinguishes the catch in the NE coast fishery from that in all other areas. The catch in the NE coast fishery increased rapidly in the late 1960s with the introduction of synthetic nets and has comprised well over 50% of the total net catch in England and Wales in most subsequent years; a phase-out of the drift net fishery began in 1993. The catch in the other net fisheries has been declining since the late 1960s and in 1998 fell to its lowest level in the past 40 years; the 1999 figure was very slightly higher than that in 1998. The decline reflects the steady reductions in both fishing effort and stock size.

The declared rod catch of salmon has been declining gradually since the late 1960s (Figure 8). This trend probably underestimates the true rate of decline in catches because reporting rates have improved and catch data for the past six years are the most complete in the time series. Although angling effort appears to have declined by about 37% since 1994 (Table 3), we do not know how this relates to the level of fishing activity in earlier years.

2.1.4 Spring salmon catches

There are well-publicised and ongoing concerns about the decline in the numbers of early-running multi-sea-winter (MSW) 'spring' salmon. The contribution of MSW salmon to catches, in recent years, is covered in Section 2.4. The proportion of the catch taken before 1 June (commonly taken as 'spring' fish) for the period 1989-99 is presented in Table 8, for both rod and net fisheries. In 1999, introduction of the national measures resulted in a large reduction in the proportion of the net catch taken before June (from a five-year average of 6.7% to 0.3%), representing the catch during the short period early in the year before the measures were introduced. For rods, the proportion of the catch taken before June rose to 8% in 1999 (from 4.5% in 1998); as already indicated, the majority of these fish were released. On average, in recent years (1994-98), about 11% of the rod catch has been taken before June 1 compared with 7% of the net catch.

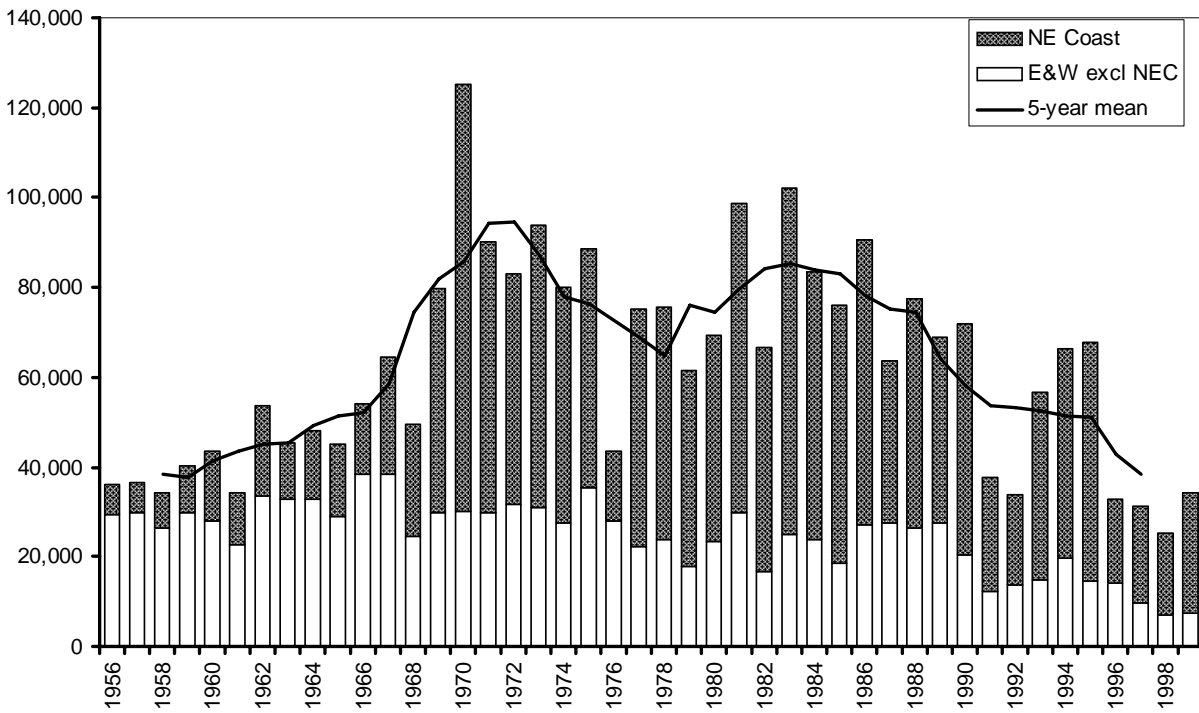


Figure 7. Total declared salmon net and fixed engine catch for England and Wales 1956-99, with a five-year running mean; shaded area indicates the catch in the north-east coast fishery.

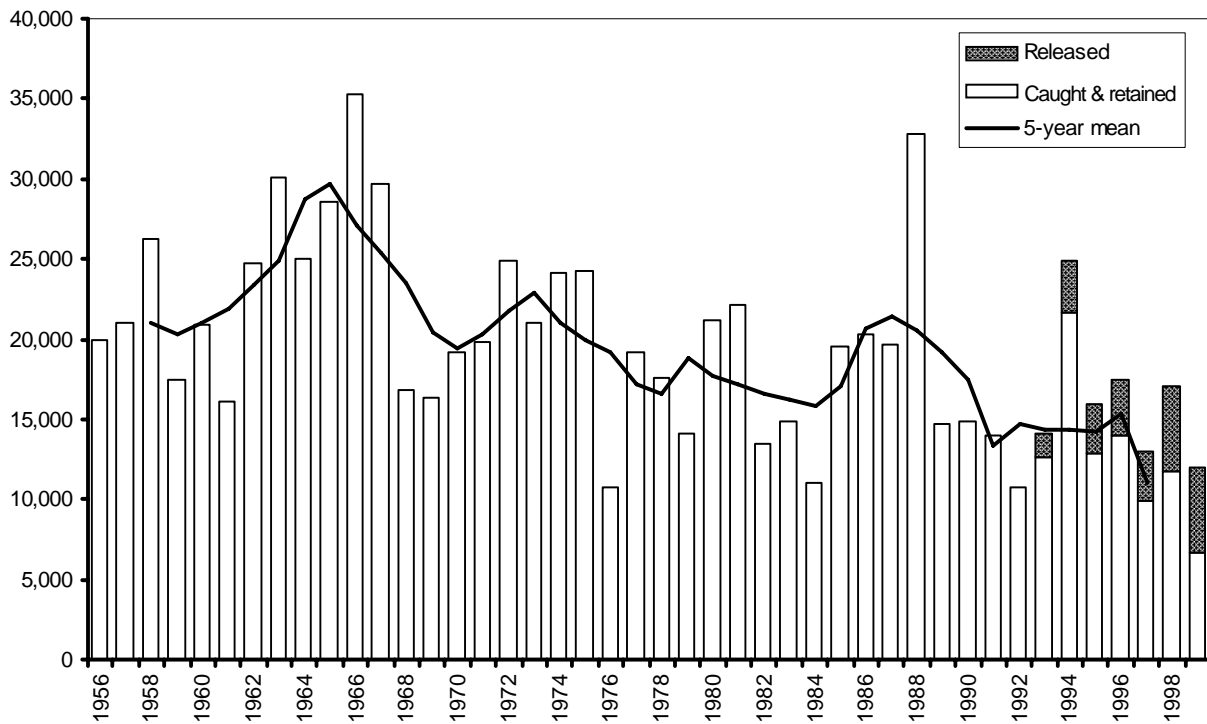


Figure 8. Total declared salmon rod catch for England and Wales 1956-99, with a five-year running mean; shaded area indicates fish caught and released.

Table 8. Number and proportion of declared salmon net and rod catch taken before and after 1 June, 1989-99

Year	Net catch				Rod catch (including released fish)			
	Numbers			%	Numbers			%
	< 1 June	> 1 June	Total	< 1 June	< 1 June	> 1 June	Total	< 1 June
1989	4,737	64,131	68,868	6.9	3,163	11,398	14,451	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
Mean (1994-98)	2,997	41,687	44,684	6.7	1,898	15,491	17,388	10.9

* Provisional values

Note: Compulsory catch and release in force from 15 April to 16 June (63 days) in 1999

2.2 Catch per unit effort (CPUE)

It is recognised that much of the reason for changes in catches is the variation in the time anglers and netmen spend fishing. Catch per unit of fishing effort (CPUE) therefore provides an alternative measure of the success of fisheries, and of the relative status of stocks, to the declared catch data. For net fisheries in England and Wales, regional CPUE data have been collated using the number of days fished (or in Wales, the Midlands and the North West the number of tides fished) as a measure of the amount of fishing undertaken by each licence holder. Rod CPUE data (catch per licence day) are now reported annually 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 1999, compared with previous years, are shown in Table 9 and Figure 9. It should be noted, however, that these data do not take any account of the differing fishing methods employed in the various Regions, or of any changes in the relative proportions of different gears used. In addition, CPUE is likely to vary within the season. Thus cautious interpretation is required.

In 1999, the CPUE for nets and fixed engines in Wales and the NW Region were below the mean of the previous five years. In contrast, the CPUE for the NE Region was well above the five-year mean. For net fisheries in the NW Region, catch rates were well below the five-year mean, as in 1998, suggesting in-season availability of fish might have been particularly low. A trend analysis (B_{crit}) of CPUE for the net fisheries in the three Regions for which there are time series of data (NE, NW and Wales) shows no significant overall trends over the past five years ($B_{crit} = 0.03$, $p = 0.72$) or 10 years ($B_{crit} = 0.01$, $p < 0.82$). This suggests that there has been no consistent trend in the availability of salmon to these net fisheries (or in their catchability). However, it is also possible that measures to reduce fishing effort have tended to result in the least efficient netmen leaving the fisheries. This would tend to mask the effects of reduced availability on the CPUE. (The B_{crit} analysis is explained in Annex 2).

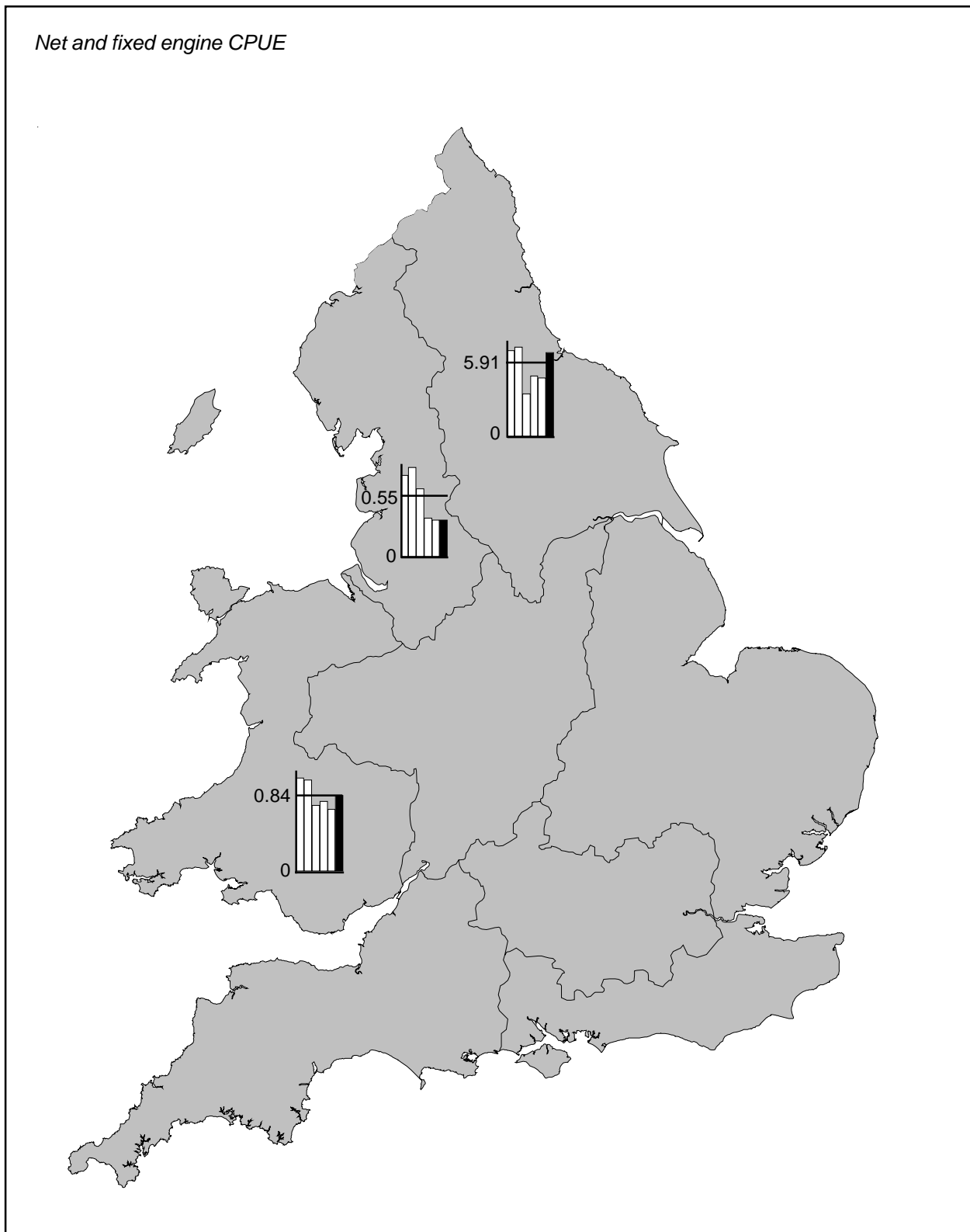


Figure 9. Regional CPUE data for net and fixed engine salmon fisheries. The histograms display data for the six years 1994 to 1999, together with the five-year mean for the period 1994-1998 (displayed as a horizontal line, with the mean value indicated against the y-axis). Note that the histograms are not drawn to the same scale. Data for 1999 are provisional.

Table 9. Regional CPUE data for net and fixed engine salmon fisheries, 1988-99

Data expressed as catch per licence-day (catch per licence-tide for Midlands, Wales and NW)

Year	Region					
	NE	Southern	SW	Midlands (a,b)	Wales (b)	NW (b)
1988	5.49	10.15	No data	No data	-	-
1989	4.39	16.8	“	“	0.90	0.82
1990	5.53	8.56	“	“	0.78	0.63
1991	3.2	6.40	“	“	0.62	0.51
1992	3.83	5.00	“	“	0.69	0.40
1993	6.43	No fishing	“	“	0.68	0.63
1994	7.53	“	“	“	1.02	0.71
1995	7.84	“	“	“	1.00	0.79
1996	3.74	“	“	“	0.73	0.59
1997	5.30	“	0.59	“	0.77	0.35
1998	5.12	“	0.78	0.25	0.69	0.32
1999	7.28	“	0.67	0.36	0.83	0.37
Mean (1994 - 1998)	5.91	-	0.69	-	0.84	0.55

Key: (a) Seine nets and lave nets only.
 (b) Catch per licence tide.

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 10 and Figure 10 for the period 1994 to 1999. It should be noted, however, that these figures include returns from some anglers who fish primarily for sea trout. The mean number of salmon caught per 100 days fished varies from 1.4 for the Thames Region to 8.0 for the North West Region. The rod CPUE for 1999 was below the average for the previous five years in all regions with the exception of North East Region; the decline was particularly marked in Southern Region, where rod CPUE was 50% below the 5-year mean. In the North East Region, rod CPUE was 39% up on the 5-year mean, suggesting in-season availability of fish might have been particularly high.

A trend analysis of the rod CPUE data for all Regions shows no consistent overall trend over the past 7 years, the period for which data are available ($B_{crit} = 0.01$, $p = 0.65$). As in the net fisheries, it is possible that anglers have changed their fishing practices in response to declining stocks and this may have masked the effects on the CPUE.

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, best ‘guess-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 a similar approach has been used for catches in 1998 and 1999.

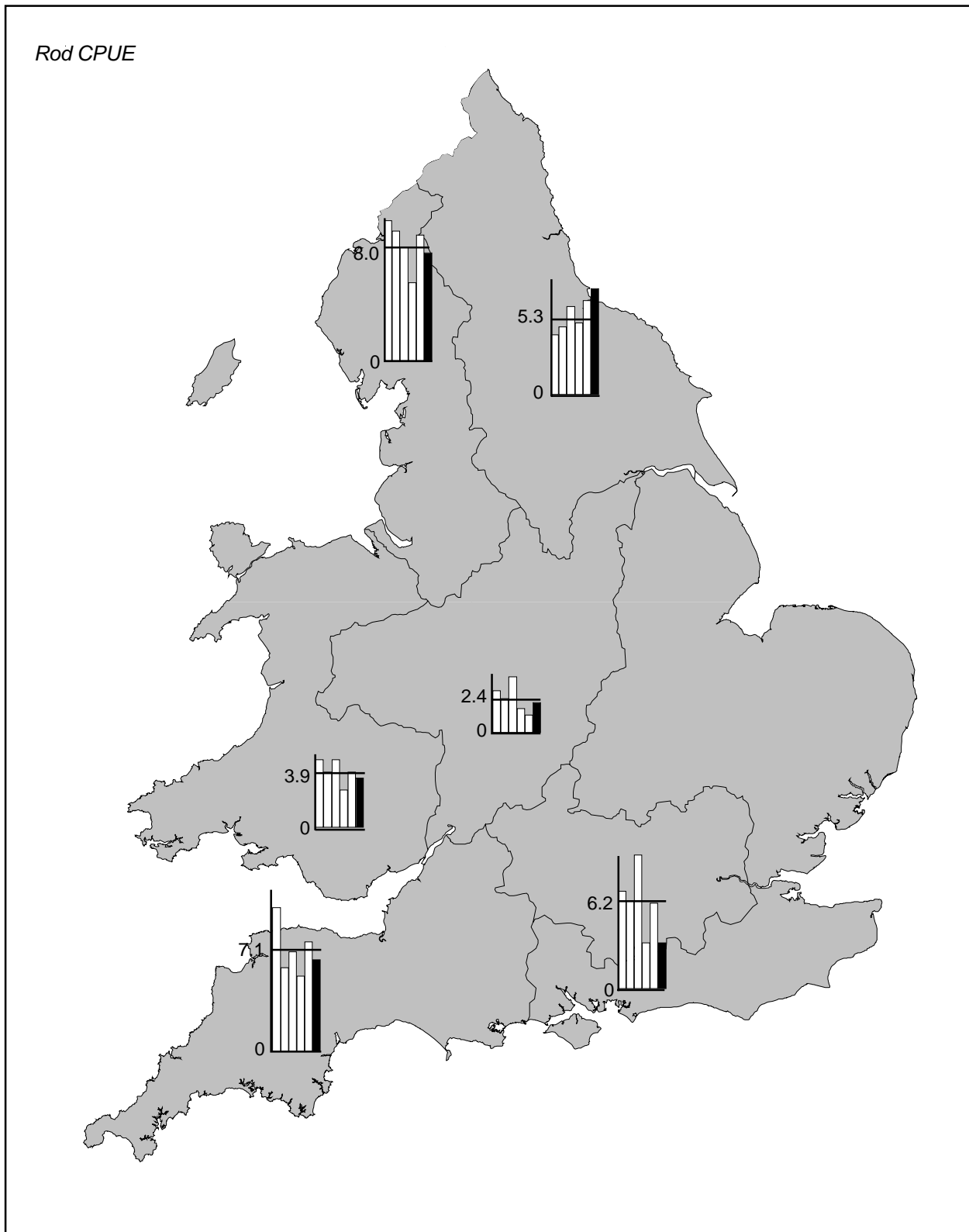


Figure 10. Regional rod catch of salmon per 100 days fished. The histograms display data for the six years 1994 to 1999, together with the five-year mean for the period 1994-1998 (displayed as a horizontal line, with the mean value indicated against the y-axis). Data for 1999 are provisional.

Table 10. Rod CPUE - number of salmon caught per 100 days fished for regional rod fisheries, 1994-99

Year	Region						
	NE	Thames	Southern	SW	Midlands	Wales	NW
1994	4.1	0.0	6.8	9.9	2.9	4.7	9.6
1995	4.7	3.1	6.0	5.8	2.4	3.8	8.9
1996	6.0	3.2	9.2	6.9	3.9	4.7	7.8
1997	5.0	0.6	3.1	5.2	1.7	2.6	5.3
1998	6.5	0.0	5.9	7.5	1.3	3.9	8.6
1999 (provisional)	7.3	0.3	3.1	6.3	2.1	3.5	7.4
Mean (1994 - 1998)	5.3	1.4	6.2	7.1	2.4	3.9	8.0
% change:							
1999 on 1998	+12		-47	-16	+62	-10	-14
1999 on 5-year mean	+39		-50	-11	-14	-11	-8

2.3.1 Under-reporting by licence holders

For net fisheries in England and Wales, the rate of reporting is generally considered to be high in most Regions and this has been supported by the findings of two studies. In North East England, under-reporting in the coastal fishery has 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 Environment 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). For this report, a figure of 8% has been used for the level of under-reporting of the national net catch.

For the purpose of setting conservation limits under their Salmon Action Plan guidelines (see Section 3 and Annex 3), the Environment Agency have estimated that declared salmon rod catches since 1994 should be increased by 10% to allow for under-reporting of the legal rod catch across England and Wales (Table 6). This has been based on a study of catch returns made following reminders (Environment Agency, 1998). Exceptions to this apply for the River Wye in Wales and the Southern Region (Rivers Test and Itchen) for which the fishery owners' returns are regarded as more accurate. No scaling factor has been applied for catches in these rod fisheries to allow for under-reporting.

2.3.2 Illegal catches by unlicensed fishermen

By their nature, illegal catches are very difficult to quantify accurately. However, assessments can be made on the basis of enforcement activities. Consultation with Environment Agency regional fisheries personnel was used as the basis for an updated assessment in February 1998 and this provided 'guess estimates' of illegal catches in coastal waters and within rivers and estuaries. These estimates of illegal catches, expressed as a percentage of the regional declared catch, ranged from 5% to 18% for different Regions. For this report, a figure of 12% has been used to estimate the total illegal catch for England and Wales.

2.3.3 Under-reporting and illegal catch estimate for 1999

On the basis of the above estimates, the non-reported and illegal catch for England and Wales in 1999 is estimated at about 35 tonnes, which represents approximately 20% of the total weight of salmon caught and killed.

2.4 Other sources of non-catch fishing mortality

Non-catch fishing mortality (NCFM) 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 caused by: fish that are removed from the gear by predators; fish that fall out of the net; fish that escape and die later; and dead or dying fish that are released or discarded.

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 gilling nets, and predation losses may be significant in the NE Coast fishery, which is close to a large grey seal colony.

No data are available on the NCFM during normal angling activities. The use of catch-and-release, however, is likely to result in some fish dying as a result of being exhausted or damaged; studies suggest that such losses should be less than 20%, and can be minimal if fish are handled carefully.

2.5 Composition of catches

2.5.1 Age composition of net catches

It has not previously been possible to provide precise figures on the proportions of one-sea-winter (1SW) and multi-sea-winter (MSW) salmon in all regional net fisheries, because some netsmen have not been required to report the sizes of individual fish caught and few scale samples have been collected. However, data collection procedures have now been standardised for all fisheries (except the North East), and this will permit age composition of catches to be reported in the future.

Catches in some net fisheries are reported as 'grilse' or 'salmon' based upon weight splits. Such data are available for 1999 for the North East, North West and Midlands Regions and Wales and are shown in the text table below. Where the reporting systems have been consistent these data provide an indication of changes in the age-composition of the catches. For the North East Region, 'salmon' made up 35% of the catch in 1999, similar to 1998 (34%) but below the long-term average of 42% (1965-98).

	Grilse (< 8 lbs)	%	Salmon (> 8 lbs)	%	Total
NE	17539	65	9294	35	26833
NW	1472	62	915	38	2387
Midlands	443	45	546	55	989
Wales	1162	49	1179	51	2341

A large number of 1SW fish are classed as 'salmon' by this method and the proportions are affected by changes in the mean weight of fish of different ages. It should be noted, however, that the proportion of 'salmon' recorded in 1999 will probably 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.

2.5.2 Age composition of rod catches

Insufficient scale samples have been collected and read to provide reliable estimates of the relative contributions of 1SW and MSW fish in the rod catches in many Regions of England and Wales. Monthly age/weight keys for salmon from the River Dee trap for the period 1992-99 have therefore been used to estimate the age composition of catches for principal salmon rivers (Table 11). These estimates were derived from the declared catches where a weight and date of capture have been provided.

In 1999, six of the principal salmon rivers listed at Table 11 (Tyne, Hampshire Avon, Taw, Torridge, Severn and Wye) had over 50% MSW salmon in the rod catch (including released fish). This is higher than in either 1998 (2 rivers) or 1997 (5 rivers). Of the remaining rivers, nine had between 25% and 49% MSW salmon in the rod catch (6 in 1998) and 26 had less than 25% MSW salmon. These changes reflect both an increase in MSW and a decrease in 1SW salmon catches compared with the previous years.

Table 11. Proportions of 1SW and MSW salmon in provisional declared 1999 rod catches, including fish released (Data not corrected for incomplete returns).

Region	River	No. grilse	%	No. MSW	%
NE	Coquet	281	75	92	25
	Tyne	867	49	904	51
	Wear	222	85	40	15
Southern	Itchen	79	86	13	14
	Test	100	63	59	37
SW	Hants Avon	7	17	33	83
	Frome	61	53	53	47
	Exe	348	80	86	20
	Teign	53	74	18	26
	Dart	52	75	18	25
	Tavy	33	97	1	3
	Tamar	154	65	84	35
	Lynher	31	94	2	6
	Fowey	74	93	6	7
	Camel	131	91	13	9
	Taw	122	44	154	56
	Torridge	14	39	21	61
	Lyn	93	87	15	13
Midlands	Severn	64	35	117	65
Wales	Wye	84	25	245	75
	Usk	309	60	207	40
	Ogmore	75	92	6	8
	Tywi	258	77	75	23
	Tawe	54	84	10	16
	Taf	58	86	9	14
	E & W Cleddau	28	85	5	15
	Teifi	376	76	119	24
	Dyfi	81	88	11	12
	Mawddach	109	77	33	23
	Ogwen	51	95	3	5
	Conwy	78	90	9	10
	Dee	232	60	152	40
	NW	Ribble	497	79	132
Lune		820	81	187	19
Kent		199	88	27	12
Leven		5	100	0	0
Irt		38	90	4	10
Ehen		74	96	3	4
Derwent		559	86	41	14
Eden		618	71	252	29
Border Esk		339	83	69	17

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.

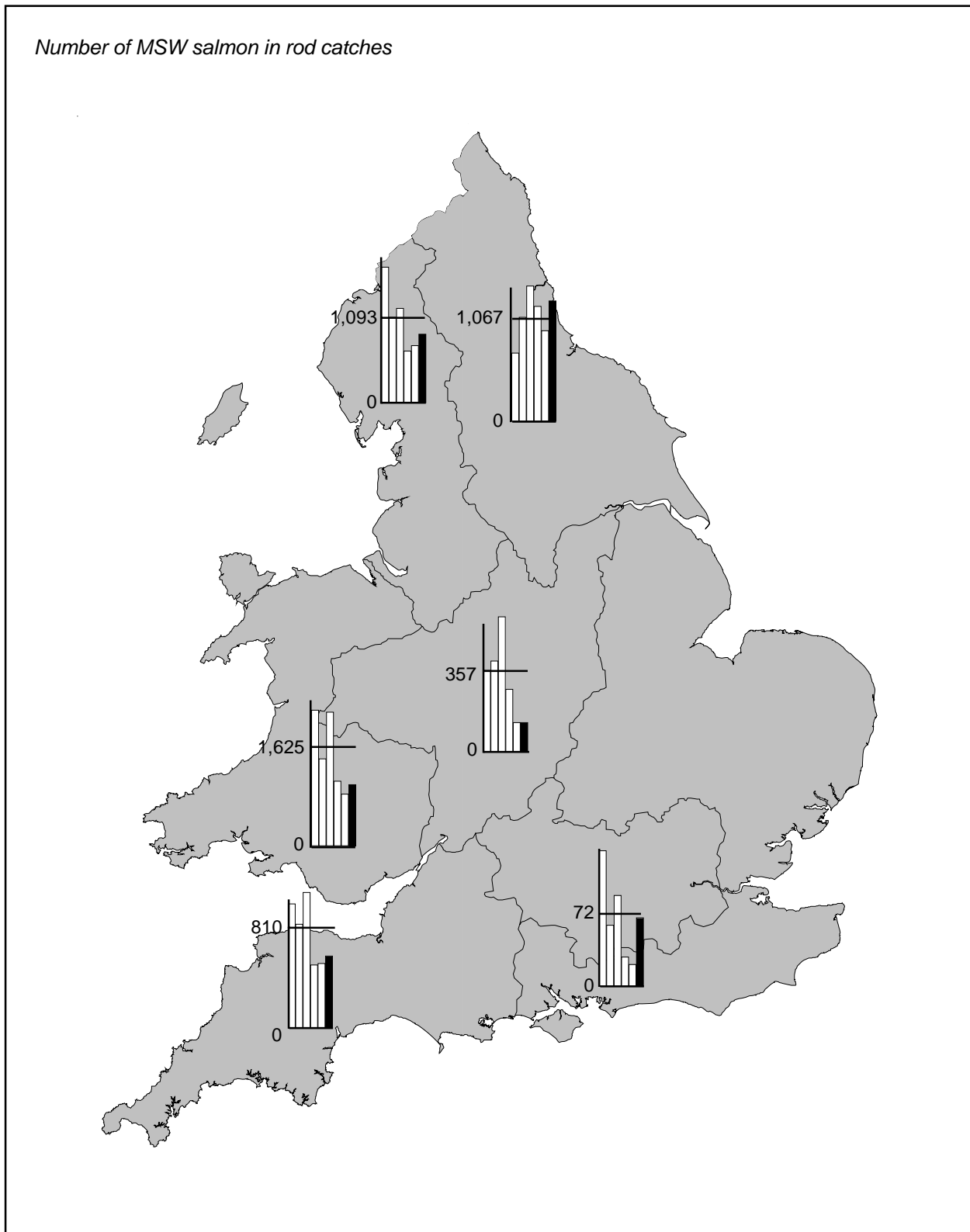


Figure 11. *Estimated number of MSW salmon in regional rod catches. The histograms display data for the six years 1994 to 1999, together with the five-year mean for the period 1994-1998 (displayed as a horizontal line, with the mean value indicated against the y-axis). Note that the histograms are not drawn to the same scale. Data for 1999 are provisional.*

The estimated numbers of 1SW and MSW salmon, and the proportion of MSW fish, in regional rod catches (including fish caught and released) over the period 1994 to 1999 are provided in Table 12 and Figure 11.

The numbers of MSW salmon taken by rods in 1999 was similar to or greater than the numbers in 1998 in all Regions and overall the catch was up 21%, although it remained well below the five-year mean (21% down). This is despite the estimated 40% reduction in number of days fished before 16 June (Section 1.2.4) and thus the substantial reduction in fishing effort for early-running MSW fish. In proportional terms the 1999 MSW catch was also well above that in 1998 in most Regions, and MSW salmon comprised 30% of the catch nationally, compared with 17% in 1998; this partly reflected the poor grilse catch (see below). Catches in the NE Region are likely to have been affected by the phase-out of the coastal drift net fishery; in the other Regions there has been an overall downward trend in the MSW catches over the past 6 years ($B_{crit} = -0.08$, $p = 0.95$).

By contrast, rod catches of grilse in 1999 were well below those in 1998 in all Regions except Midlands, which reported a very similar grilse catch to 1998, and were down 40% overall. The reduction in fishing effort after 16 June was modest (~10%, Section 1.2.4) and thus does not appear to have contributed substantially to the reduced catches observed. (Most grilse are caught in the summer months). Catches were also well below the mean of the previous five years in all Regions except NE, and were down by 35% overall. In most regions the decline in the numbers of grilse taken by rods relative to the five-year mean, was in the range 30-46%; in the North East there was a small increase. There has been a very significant overall downward trend in the grilse catches in all Regions (excluding NE) over the past 6 years ($B_{crit} = -0.11$, $p = 0.99$).

Table 12. 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, 1994-99 (including fish caught and released)

Numbers														
Year	Region												All Regions	
	NE		Southern		SW		Midlands		Wales		NW		Grilse	MSW
	Grilse	MSW	Grilse	MSW	Grilse	MSW	Grilse	MSW	Grilse	MSW	Grilse	MSW		
1994	1,414	719	289	143	4,708	1,026	251	360	6,360	2,331	7,983	1,741	21,005	6,320
1995	1,339	1,082	237	65	1,949	860	84	402	3,070	1,491	5,881	1,102	12,560	5,002
1996	1,360	1,405	287	97	1,833	1,116	104	603	3,728	2,287	5,064	1,228	12,376	6,736
1997	1,501	1,189	118	32	2,092	517	58	285	2,865	1,119	3,899	659	10,533	3,801
1998	2,295	940	342	24	2,679	532	69	136	3,863	895	6,261	734	15,509	3,261
1999	1,676	1,247	179	72	1,422	594	71	131	2,339	1,065	3,651	871	9,338	3,980
Mean (1994-98)	1,582	1,067	255	72	2,652	810	113	357	3,977	1,474	5,818	1,093	14,397	5,024
% change:														
1999 on 1998	-27	+33	-48	+200	-47	+12	+3	-4	-39	+19	-42	+19	-40	+21
1999 on 5-year mean	+6	+17	-30	0	-46	-27	-37	-63	-41	-34	-37	-20	-35	-21
Percentage MSW														
Year	Region												All	
	NE		Southern		SW		Midlands		Wales		NW		Regions	
1994	34		33		18		59		27		18		23	
1995	45		21		31		83		33		16		28	
1996	51		25		38		85		38		20		35	
1997	44		21		20		83		28		14		27	
1998	29		7		17		66		19		10		17	
1999	43		29		29		65		31		19		30	
Mean (1994-98)	40		22		23		76		29		16		26	

2.6 Origin of catches

2.6.1 Reared fish

There is currently no ranching in England and Wales and only one small salmon cage-rearing facility. This facility is believed to be primarily run for research purposes (e.g. feed trials). The contribution of farmed and ranched fish to the catches is therefore thought to be negligible. In a number of catchments juvenile salmon are stocked from hatcheries for mitigation or enhancement purposes. NASCO now routinely ask for information on the numbers of eggs taken from wild salmon for artificial rearing. The purpose of this is to provide an estimate of the proportion of the natural egg deposition that has been taken for management purposes.

Annex 5 provides a summary of these data for the period 1990 to 1999. Full details of the numbers of fish stocked in these programmes, and the stage of release, are included, on a catchment by catchment basis in the Salmonid and Freshwater Fisheries Statistics published annually by the Agency. In most instances, when they return as adults these fish cannot 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 6).

2.6.2 Salmon from other countries

Based upon studies conducted in the 1980s, approximately 80% of the salmon caught in the North East Coast Fishery in England and Wales are estimated to be returning to rivers in Scotland; this represents ~ 21,500 fish in 1999. 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 from other countries being taken in England and Wales.

2.7 Exploitation rates

2.7.1 Homewater exploitation

Exploitation rates have been estimated for fisheries on certain rivers in England and Wales for which reliable counts are available (Table 13 and Figure 12). The levels of exploitation in 1999 were below the average of the previous five years in five rod fisheries for which data are available. This suggests that the decreased rod catches of grilse, observed in many rivers in 1999, was at least partly explained by less favourable angling conditions and decreased fishing effort, and a lower exploitation rate, and was not entirely a result of a decrease in the numbers of fish. Exploitation rates are available for two net fisheries, the Dee and the Lune. In the latter case the net exploitation rate in 1998 and 1999 was only about half that in previous years.

Table 13. Estimated exploitation rates (%) for selected fisheries in England and Wales, 1988-99 (rates apply only to fish caught and retained).

Year	River Fishery	Region												
		Southern		SW			Welsh			NW				
		Test rods	Itchen rods	Frome rods	Tamar rods	Fowey rods	Dee rods 1SW MSW	Dee rods	Dee nets	Taff rods	Leven rods	Kent rods	Lune rods	Lune nets
(c)	(c)	(a)			(b)	(b)								
1988		39	33	9										
1989		29	47	7								22	44	
1990		36	47	10								30	36	
1991		26	43	8			6 (d)	10 (d)				27	30	
1992		25	29	9			14	18	15	5		33	30	
1993		33	39	11			11	15	11	6	27	21	30	
1994		32	39	13			15	21	22	5	28	35	35	
1995		28	25	9			7	11	18	4	37	24	27	
1996		23	36	13			9	11	17	3	45	23	24	
1997		14	14	7	7		8	9	17	1	26	25	29	
1998		13	9	9	10	14	10	10	15			24	14	
1999		9	13	n/a	9	7	11	9	21	12		25	21	14
Mean (1994 - 1998)		24	35	10	8	14	10	12	18	3	34	26	26	
% change:														
1999 on 1998		-61	-64		-8		+13	-10	+43			-13	0	
1999 on 5-yr mean		-63	-63		10		+13	-28	+21			-20	-46	

Key: (a) Data based on IFE counter at Wareham, and supplied courtesy of IFE.

(b) Data derived from mark recapture experiment.

(c) Includes rod caught fish retained for broodstock.

Note: Estimates for Dee and Lune net fisheries are based on declared catches and are minimum estimates.

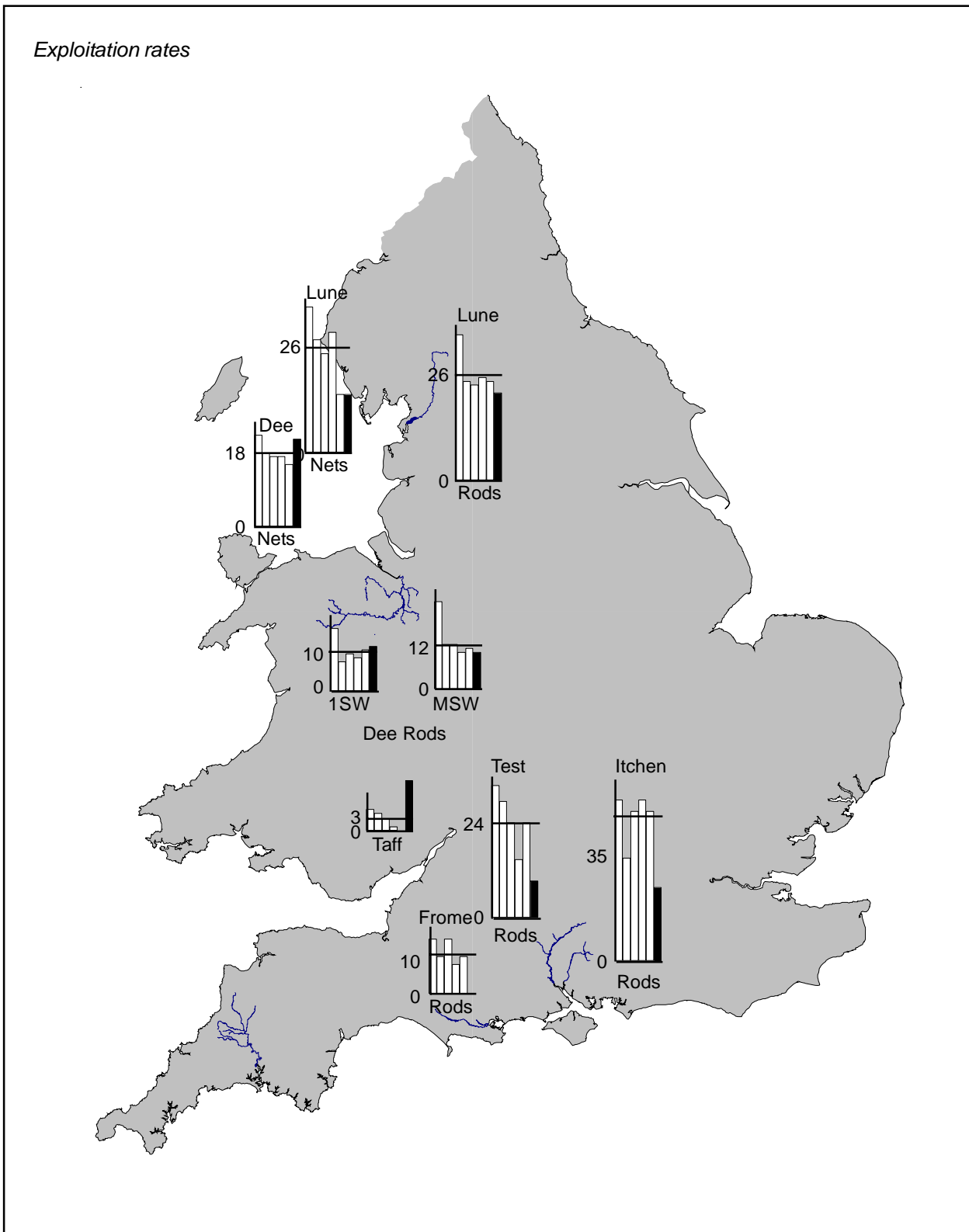


Figure 12. *Exploitation rates (%) for selected rod and net salmon fisheries in England and Wales. Where available, the histograms display data for the six years 1994 to 1999, together with the five-year mean for the period 1994-1998 (displayed as a horizontal line, with the mean value indicated against the y-axis). Data for 1999 are provisional. Note also that estimates for the Dee have been split by age class (1SW and MSW), all other estimates are combined for all ages.*

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 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. Prior to recent negotiated reductions in the quota for this fishery, the estimated exploitation rates on the MSW component of English and Welsh stocks was estimated to be in the region of 10 to 20%. However, following recent significant quota reductions, current levels of exploitation on MSW fish have probably fallen to very low levels.

Faroes

The Faroes fishery exploits both ISW 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%). Since 1991, the Faroes salmon quota has been bought out, and only a small research fishery has operated; the current levels of exploitation are therefore negligible.

Ireland

Discussions are currently underway between scientists from CEFAS, the Agency and the Irish Marine Institute to agree estimates of exploitation in the Irish drift net fishery for selected English and Welsh stocks. Provisional estimates of the levels of exploitation, prior to the introduction of new fisheries regulations in 1997, vary substantially between stocks in different Regions and from year to year. Exploitation rates were low (~1%) for stocks in the North East of England, higher (at around 5 to 10%) for rivers on the west coast and in Wales, but highest (perhaps 10 to 20%) for stocks from south coast rivers. Provisional data suggest that levels of exploitation may have been reduced following the introduction of the new measures in Ireland.

Other homewater fisheries

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

Marine by-catch

The potential catch of salmon post-smolts in industrial fisheries continues to be a matter of concern and efforts are being made through ICES to investigate this issue.

No new data are available on the possible effects of sandeel fisheries on salmon post-smolts. However an area in the fishing grounds off the Firth of Forth and the Grampian Coast has been closed to sandeel fishing from April to August. This would principally be to protect certain bird species, but it might also benefit stocks of salmon and sea trout.

REPORT ON STATUS OF STOCKS IN 1999

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 requirements of ICES and NASCO and the need to manage and conserve individual river stocks. Provisional conservation limits have been set for all principal salmon rivers (Table 14) and these are being refined as Salmon Action Plans are prepared (Annex 3).

Conservation Limits demarcate undesirable spawning stock levels. Below the conservation limit the number of adult fish produced in the next generation will be significantly reduced. It is therefore the level below which stocks should not be allowed to fall. It is currently defined by ICES and NASCO as the spawning stock level that produces maximum sustainable yield (synonymous with maximising the surplus recruits or the gain over a number of years).

Compliance of the spawning escapement with the conservation limits is not normally assessed for individual years but in three-year blocks. Compliance is based upon rules relating to 'episodes' (periods of years) when the escapement falls below the limit (Environment Agency, 1998). These rules state that episodes may last no longer than two years, and that there should be a clear gap between episodes of at least two years. Failure cannot distinguish between a real deterioration in the egg deposition and a chance (1-in-20 year) false alarm, and so the circumstances have to be investigated to determine which was the more likely explanation and corrective action taken if necessary. A river classed as failing would remain classified as such until a reassessment, for a subsequent three-year period, showed a pass. Recent history of English and Welsh SAP rivers is shown in Table 15, in which the timing of each three-year block is determined by the particular Salmon Action Plan.

Conservation limits 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 exceeding its conservation limit does not mean that there will be no need for any management action. Similarly, the fact that a stock may fall below its conservation limit 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.

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

Table 14. Conservation Limits (CL) and % of CL attained in 1997-1999 for the principal salmon rivers of England and Wales (all results are provisional)

River	Accessible wetted area hectares	Conservation limit eggs/100m ²	Conservation limit eggs (millions)	1999 egg deposition (millions)***			Proportion of conservation limit attained (%)		
				1SW	MSW	All	1997	1998	1999
							All	All	All
** Coquet	144	316	4.5	-	-	5.3	159.3	130.9	116.9
* Tyne	542	289	15.7	-	-	33.3	156.8	173.5	212.5
** Wear	232	336	7.8	-	-	4.1	37.7	62.2	52.4
* Tees	620	330	20.5	0.6	3.2	3.8	4.3	19.8	18.5
* Esk-Yorks	40	417	1.7	0.2	0.0	0.3	52.2	27.5	15.6
Total			50.1			46.7	72.7	84.7	93.2
** Test	80	425	3.4	-	-	2.2	23	57.0	65.4
** Itchen	69	234	1.6	-	-	0.4	31	62.7	26.6
Total			5.0			2.7	25.3	58.8	52.8
** Avon-Hants	360	237	8.5	-	-	2.6	13.1	21.6	30.5
Piddle	25	194	0.5	0.2	0.0	0.2	21.8	11.8	35.7
** Frome	90	223	2.0	-	-	4.0	146.6	187.1	199.6
Axe	57	247	1.4	0.1	0.0	0.2	6.0	8.7	10.8
* Exe	205	343	7.0	-	-	6.1	131.7	140.5	86.6
* Teign	98	315	3.1	-	-	0.8	59.8	61.0	27.0
* Dart	132	297	3.9	-	-	0.7	45.4	41.4	17.9
Avon-Devon	18	294	0.5	0.1	0.0	0.2	44.3	50.1	31.4
Erme	10	300	0.3	0.1	0.0	0.1	31.8	19.3	43.4
Yealm	8	297	0.3	0.0	0.0	0.0	56.6	143.6	12.7
Plym	17	436	0.8	0.1	0.0	0.1	51.6	42.9	18.7
* Tavy	68	287	2.0	-	-	0.9	66.1	127.2	44.8
** Tamar	197	293	5.8	6.4	2.5	9.0	128.0	176.1	155.4
** Lynher	29	294	0.9	0.4	0.0	0.4	60.1	124.2	50.2
Fowey	34	430	1.5	0.7	0.1	0.7	83.0	77.6	48.9
Camel	37	338	1.2	1.3	0.2	1.5	183.5	192.2	119.2
Taw	174	323	5.6	1.7	2.8	4.5	56.9	98.9	79.6
Torrige	155	291	4.5	0.2	0.5	0.7	18.9	32.6	15.1
Lyn	27	556	1.5	0.9	0.2	1.0	113.8	103.0	68.8
Total			51.2			33.7	71.1	89.7	65.7
* Severn	898	190	17.1	1.0	8.3	9.2	104.3	54.5	54.18
Total			17.1			9.2	104.3	54.5	54.2
** Wye	1402	245	34.5	1.7	11.6	13.3	39.7	33.7	38.5
* Usk	407	350	14.2	6.8	9.2	16.0	86.8	105.4	112.3
* Taff & Ely	84	257	2.2	1.3	0.3	1.6	15.9	29.5	77.3
Ogmore	35	253	0.9	0.6	0.1	0.7	81.5	84.5	75.7
Afan	17	450	0.8	0.1	0.0	0.1	15.7	24.6	7.7
Neath	37	419	1.6	0.4	0.3	0.7	15.1	35.4	45.0
* Tawe	76	312	2.4	0.5	0.3	0.7	35.4	37.5	31.3
Loughor	35	289	1.0	0.1	0.0	0.1	7.1	6.8	9.4
* Tywi	500	314	15.7	5.0	3.0	8.0	40.4	55.9	50.8
* Taf	90	256	2.3	1.2	0.2	1.4	61.5	39.9	62.7
* E&W Cleddau	110	232	2.6	0.4	0.2	0.5	28.2	30.6	21.1
* Teifi	296	401	11.9	8.2	4.4	12.6	100.9	95.8	105.9
Aeron	35	417	1.4	0.1	0.0	0.1	2.2	0.6	4.3
Ystwyth	46	397	1.8	0.2	0.0	0.2	24.0	28.8	10.0
Rheidol	50	426	2.1	0.2	0.1	0.3	21.0	17.8	13.5
* Dyfi	179	311	5.6	-	-	2.4	45.4	62.4	43.8
* Dysinni	-	-	0.9	-	-	0.1	21.6	30.9	5.9
** Mawddach	57	312	1.8	-	-	1.6	76.4	83.3	90.6
Artro	9	423	0.4	0.0	0.0	0.0	9.5	17.6	7.5
* Dwyryd	9	246	0.2	-	-	0.3	228.8	229.6	114.4
* Glaslyn	25	242	0.6	-	-	0.2	107.4	57.3	30.9
** Dwyfawr	33	322	1.1	-	-	0.3	48.5	28.2	28.0
** Seiont	21	288	0.6	-	-	0.5	123.7	155.4	86.9
** Ogwen	24	449	1.1	-	-	1.4	208.7	271.3	133.2
* Conwy	50	171	0.9	-	-	1.1	168.0	197.8	128.2
* Clwyd	84	312	2.6	-	-	1.5	20.6	97.0	58.2
** Dee	617	248	15.3	3.3	9.9	13.2	91.1	105.6	86.3
Total			126.3			78.9	59.0	65.9	62.5

Table 14. continued - Conservation limits and % of CL attained in 1997-1999

River	Accessible wetted area hectares	Conservation limit eggs/100m ²	Conservation limit eggs (millions)	1999 egg deposition (millions)***			Proportion of conservation limit attained (%)		
				1SW	MSW	All	1997	1998	1999
							All	All	All
* Ribble	351	242	8.5	5.3	1.5	6.8	25.7	94.9	79.8
Wyre	46	264	1.2	0.1	0.0	0.1	5.5	34.4	4.9
** Lune	423	280	11.8	8.9	2.1	10.9	50.7	123.3	92.3
Kent	42	399	1.7	1.6	0.3	1.9	136.5	351.2	111.1
** Leven	46	249	1.1	-	-	0.3	35.8	43.9	22.7
** Crake	16	243	0.4	-	-	0.1	11.7	63.7	25.8
Duddon	11	402	0.4	0.2	0.0	0.2	30.5	103.9	39.2
Esk	14	401	0.6	0.9	0.2	1.0	50.4	153.8	181.0
Irt	20	317	0.6	0.2	0.0	0.3	87.6	150.7	46.3
* Ehen	41	283	1.2	-	-	0.5	83.1	243.7	42.5
* Calder	13	326	0.4	-	-	0.1	122.6	98.8	20.5
Derwent	135	369	5.0	6.3	1.6	7.9	137.0	173.4	157.7
Ellen	17	322	0.5	0.1	0.0	0.1	5.8	60.6	15.8
* Eden	688	300	20.6	-	-	12.6	73.5	86.4	61.1
Esk-Border	144	440	6.3	5.4	2.0	7.3	166.4	158.7	115.9
Total			60.5			49.9	76.1	119.2	82.6
Total			310.2			221.1	68.5	82.5	71.3

** Refined conservation limit identified in Final Salmon Action Plan (SAP)

* Refined conservation limit identified in draft or published SAP Consultation Document or Local Environment Agency Plan
Remaining conservation limits and compliance estimates are provisional only and require refinement through river specific inputs

*** Estimates include eggs contributed by rod released fish (Assuming 80% 'post-release' survival to spawning)

3.1.2 Spawning escapement in 1999

Table 15 and Figure 13 indicate wide variation in the levels to which conservation limits were met in 1999. There are few obvious regional trends, although spawning escapement tended to be below the limits in the rivers in North West England, South Wales and in the south coast chalkstream catchments (with the exception of the Frome). A number of rivers, such as the rivers Wear and 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.

Spawning escapement was above the conservation limits (including provisional levels) in 14 rivers (20%) in 1999; between 50% and 100% of the limits in 18 rivers (26%) and less than 50% of the limit in 37 rivers (54%). This reflects a further deterioration in stocks compared with 1998, when spawning escapement was above the conservation limits in 19 rivers (28%), between 50% and 100% of the limits in 17 rivers (25%), and less than 50% of the limits in 33 rivers (48%). Despite the improvements in MSW runs in 1999, the majority of salmon stocks in England and Wales continue to be in a depleted state.

The provisional nature of the conservation limits should be noted. 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. Currently, the Salmon Action Plan guidelines do not take account of this, and limits for such rivers may need to be refined in the future.

There are 37 rivers in England and Wales for which refined conservation limits have been set and for which egg deposition has been estimated for a series of years (Table 15). Compliance assessments (see section 3.1.1) for these stocks indicate that 26 (70%) have shown compliance failure over the most recent three year assessment period (shaded blocks). The compliance failures are fairly evenly distributed in different Regions.

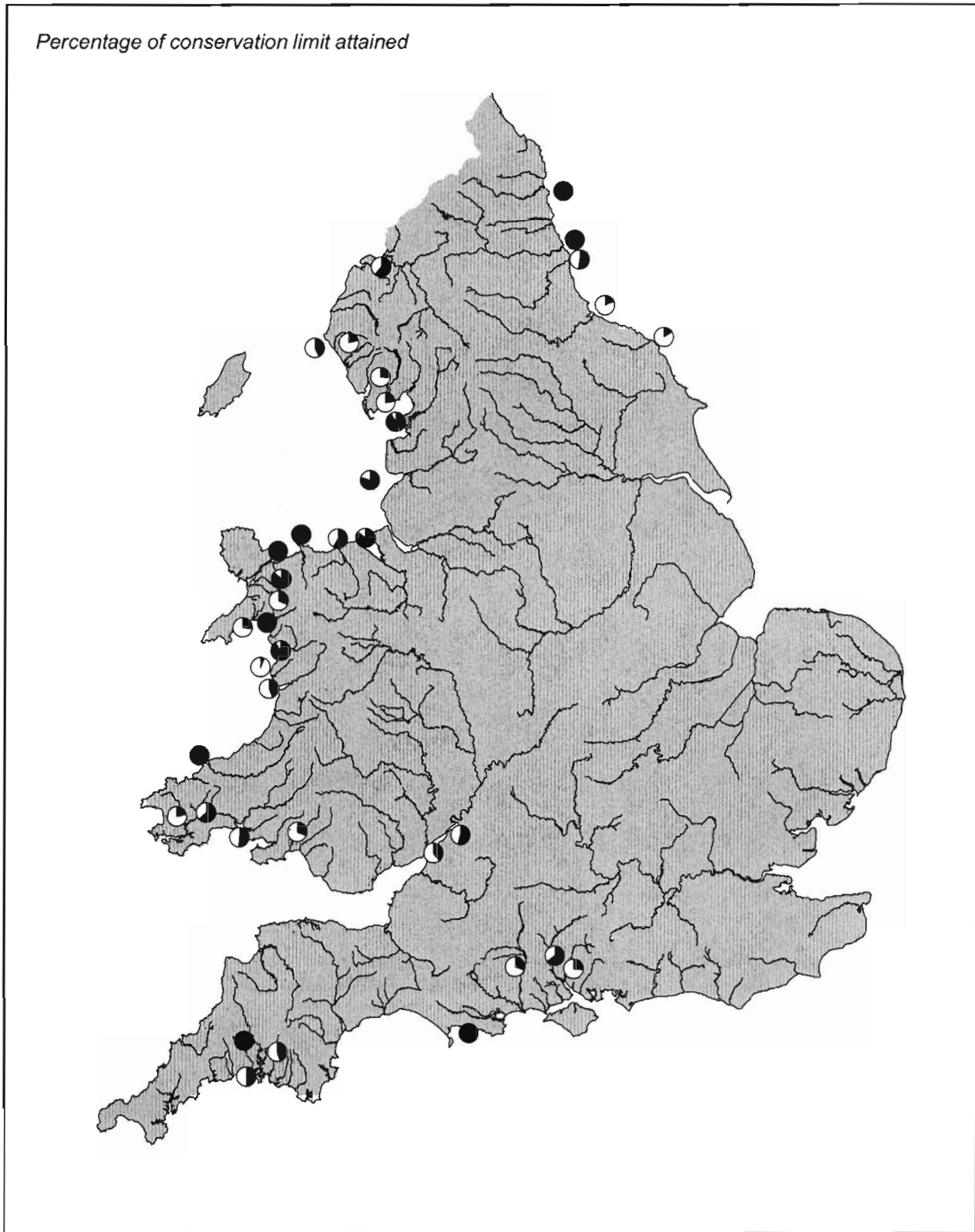


Figure 13. Pie charts for individual rivers for which refined limits have been set (Table 15) showing the % of the conservation limit attained in 1999. A black circle indicates that the target was met or exceeded

Table 15. Conservation limits and egg deposition estimates for principal salmon rivers, 1994-99. Shaded blocks indicate compliance failure based on 3 year assessment periods (see Section 3.1.1)

Region	River	Conservation limit eggs (millions)	Total egg deposition (millions)					
			1994	1995	1996	1997***	1998***	1999***
NE	** Coquet	4.54	4.88	4.24	4.96	7.24	5.95	5.31
	* Tyne	15.65	18.07	20.26	27.73	24.54	27.15	33.25
	** Wear	7.81	3.21	4.06	4.70	2.94	4.85	4.09
	* Tees	20.46	1.59	3.03	1.12	0.87	4.06	3.78
	* Esk-Yorks	1.66	2.12	0.57	0.25	0.87	0.46	0.26
Southern	** Test	3.40	1.37	1.08	1.19	0.77	1.94	2.22
	** Itchen	1.63	0.56	1.64	0.68	0.50	1.02	0.43
SW	** Avon-Hants	8.53	2.16	2.75	5.21	1.12	1.84	2.60
	** Frome	2.00	2.53	2.56	3.06	2.93	3.74	3.99
	* Tavy	1.97	2.82	0.97	0.78	1.30	2.51	0.88
	** Tamar	5.77	13.60	13.92	10.71	7.39	10.16	8.97
	** Lynher	0.86	1.31	0.23	0.27	0.52	1.07	0.43
Midlands	* Severn	17.06	31.40	33.04	43.78	17.80	9.30	9.25
Wales	** Wye	34.50	15.27	15.97	31.89	13.70	11.64	13.27
	* Tawe	2.36	1.91	1.61	0.79	0.84	0.89	0.74
	* Tywi	15.70	19.73	11.19	11.49	6.34	8.78	7.98
	* Taf	2.31	2.94	0.53	0.91	1.42	0.92	1.45
	* E&W Cleddau	2.56	1.26	0.55	0.45	0.72	0.78	0.54
	* Teifi	11.89	16.02	6.70	18.96	11.99	11.38	12.59
	* Dyfi	5.57	6.40	3.69	5.56	2.53	3.47	2.44
	* Dysinni	0.88	0.38	0.05	0.17	0.19	0.27	0.05
	** Mawddach	1.77	3.00	1.29	1.44	1.35	1.47	1.60
	* Dwyrhyd	0.23	0.76	0.55	0.52	0.52	0.52	0.26
	* Glaslyn	0.61	0.76	0.83	0.52	0.65	0.35	0.19
	** Dwyfawr	1.07	1.13	0.45	0.50	0.52	0.30	0.30
	** Seiont	0.61	0.90	0.70	0.70	0.75	0.94	0.53
	** Ogwen	1.07	2.93	2.01	1.56	2.24	2.91	1.43
	* Conwy	0.85	2.69	2.45	2.54	1.43	1.68	1.09
* Clwyd	2.62	3.33	1.34	0.94	0.54	2.54	1.52	
** Dee	15.30	11.80	14.64	12.97	13.94	16.16	13.20	
NW	* Ribble	8.49	6.89	2.45	4.37	2.18	8.06	6.78
	** Lune	11.80	10.10	8.80	9.20	6.00	14.60	10.93
	** Leven	1.14	0.71	0.64	0.37	0.41	0.50	0.26
	** Crake	0.40	0.26	0.29	0.16	0.05	0.25	0.10
	* Ehen	1.16	2.11	1.80	1.38	0.96	2.82	0.49
	* Calder	0.41	0.30	0.35	0.37	0.50	0.41	0.08
	* Eden	20.63	33.52	25.99	22.06	15.17	17.82	12.60

* Refined conservation limit identified in Draft Salmon Action Plans or LEAP documents.

** Refined conservation limit identified in Final Salmon Action Plan.

*** Estimates include eggs contributed by rod released fish (assuming 80% 'post-released' survival to spawning).

For the North West and Midlands Regions and Wales the egg deposition in 1999 was estimated to be towards the lower end of the range observed in the past 6 years for most rivers. In South and West Regions estimated egg deposition was, on average, around the middle of the range and in the North East Region it was towards the upper end of the range.

3.2 Measures of abundance/escapement

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 returning stock estimates, are presented in Table 16 and Figure 14.

The available measures of adult stock abundance in 1999 showed no consistent pattern relative to levels in 1998. However, with few exceptions, the 1999 values were below the averages for the previous five years (1994-98). This further confirms the indications from the rod catch data that salmon stock abundance in England and Wales was relatively poor in 1999. The counts in Table 16 also show significant downward trends on southern rivers (Tamar, Frome, Test and Itchen) over the past five years ($B_{crit} = -0.15$, $p = 0.98$) and 10 years ($B_{crit} = -0.11$, $p > 0.99$). The counts on the rivers in the north and west (Lune, Leven, Caldey, Kent and Dee) also show a significant overall downward trend over the past 10 years ($B_{crit} = 0.05$, $p = 0.98$) but not over the past 5 years.

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, driven 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 catches in the chalk rivers of Southern Region have suffered simultaneous decline in recent years, but the full reasons for this are not yet clear. The extent and nature of soil erosion impacts are being investigated and national water abstraction licence legislation is under review.

Table 16. Available information on status of regional salmon stocks

Stage: Region:	Smolts		Adults		SW		Wales		NW										
	NE	S	NE	Coquet	Thames	Southern	Itchen	Frome	Tamar	Fowey	Dee	RSE ²	Lune	RSE ¹	Kent	Leven	Calder	Caldew	
River:	Wear	Test [#]	Test [#]	Thames [#]	Thames [#]	Test	Test	Itchen	Frome	Tamar	Fowey	Dee	RSE ²	Lune	Kent	Leven	Calder	Caldew	
Method:	Run estimate	Run estimate	Run estimate	T	T	RSE ¹	RSE ¹	RSE ¹	C	C	C	RSE ²	RSE ¹	C(>4lb)	C(>4lb)	C(>4lb)	C(>4lb)	T	
1987																			
1988	63426		1507			1336	4093						8785		1137				
1989	52894		1730	91		791	3186						8261		2216				
1990	28282		790	63		367	1880						7591		1736	667*			
1991	19959		538	36		152	805						5567		1816	394			
1992	36690	11967	614	247		357	900						10852		1526	469			
1993	-	7131	1249	259		852	1182						9757		2072	562			1590
1994	55259	3381	775	143		374	1078			6343			9236		2762	329	379		1417
1995	40576	6853	647	163		880	1016			5623			6111		2762	329	212		1289
1996	15338	4712	623	122		437	1353			3975			6080		3246	387	224		889
1997	-	7229	361	27		246	1157			2813			4371		1473	233	n/a		1106
1998	-	14672	898	6		453	1210			3132			7457		801	40	n/a		1022
1999	-	4138	987	35		213	763*			2691			5739		1022*	n/a	n/a		1022
Mean (1994-98)	37058	7369	661	92		478	1163			4377			6651		2071	310	272		1258

Key to methods: T = adult trap

C = adult salmon count

C(>4lb) = Adult count (fish greater than 4 lb in weight)

RSE¹ = returning stock estimate (validated count + catch below counter)RSE² = returning stock estimate (mark/recapture estimate)

* Denotes incomplete record.

Denotes stock supported by large-scale stocking from hatchery programme.

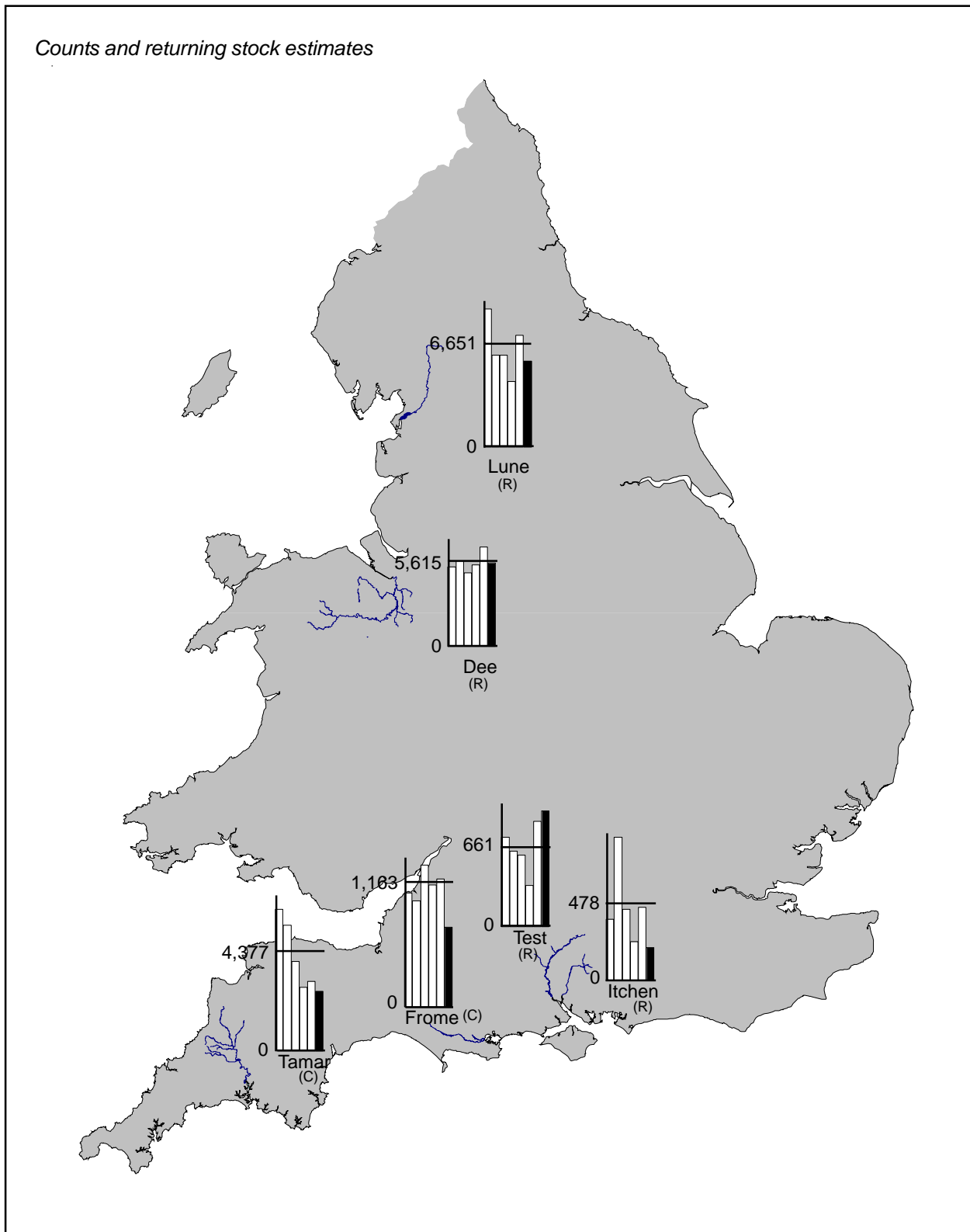


Figure 14. Counts (C) and returning stock estimates (R) for selected salmon stocks in England and Wales. The histograms display data for the six years 1994 to 1999, together with the five-year mean for the period 1994-1998 (displayed as a horizontal line, with the mean value indicated against the y-axis). Note that the histograms are not drawn to the same scale. Data for 1999 are provisional.

3.3 Survival indices

No data are available to evaluate long-term trends in marine survival for stocks in England and Wales at the current time. Marine survival estimates for the River Corrib (Ireland), River Bush (Northern Ireland) and River North Esk (Scotland) are shown in Table 17. These data confirm patterns seen elsewhere in the North Atlantic which indicate that marine survival can be quite variable between stocks and between years. In the North East Atlantic most stocks experienced low marine survival for smolts emigrating in 1989 and 1990, and for some stocks, this pattern has continued in the 1990s.

Table 17. Estimated survival of wild smolts (%) to return to homewaters (prior to coastal fisheries) for index rivers in the UK and Ireland (from Anon., 1999)

Smolt migration year	Ireland River Corrib		UK (N. Ireland) River Bush	UK (Scotland) River North Esk	
	1SW	2SW	1SW	1SW	2SW
1987	12.0	1.0	35.1	13.9	3.4
1988	12.4	0.5	36.2	-	-
1989	5.3	1.0	25.0	7.8	4.9
1990	4.4	0.6	34.7	7.3	3.1
1991	5.6	0.1	27.8	11.2	4.5
1992	5.9	-	29.0	-	-
1993	9.0	0.8	-	-	-
1994	7.8	0.7	27.1	17.2	2.3
1995	6.7	n/a	n/a	11.5	5.1
1996	4.1	n/a	31.0	10.7	3.2
1997	n/a	n/a	n/a	10.3	n/a
Mean (1993-97)	6.9	0.8	29.1	12.4	3.5

4. Microtag, fin clip and external tag releases

Details of all marking and tagging of salmon undertaken in England and Wales in 1999 are included at Annex 6.

In 1999, 94k hatchery-reared salmon parr and 1.3k wild salmon smolts were microtagged and released in England and Wales to assess levels of exploitation and marine survival and to investigate the efficacy of enhancement programmes; a further 85k hatchery parr were marked with adipose fin clips only. A total of 1,190 adult salmon were tagged for the assessment of returning stocks and in conjunction with the use of radio tags.

5. References

- ANON., 1991. Salmon Net Fisheries: Report of a review of salmon net fishing in the areas of the Yorkshire and Northumbria regions of the National Rivers Authority and the salmon fishery districts from the River Tweed to the River Ugie. MAFF and Scottish Office, 224pp.
- ANON., 1997. Report of the Technical Working Group on the English North East Coast Salmon Fishery. Report prepared by MAFF, SOAEFD and EA scientists following a meeting held at Nobel House, London on 17 December 1996.

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RUSSELL, I. C., IVES, M. J., POTTER, E. C. E., BUCKLEY, A. A. AND DUCKETT, L., 1995. Salmon and migratory trout statistics for England and Wales, 1951-1990. MAFF Direct. Fish. Res., Data Report No. 38, 252pp.

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. 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 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. The NASCO Convention requires that, in establishing regulatory measures for fisheries within their areas, the three Commissions should take account of the best available scientific advice, including advice from the International Council for the Exploration of the Sea (ICES). NASCO therefore makes an annual request for scientific advice from ICES (Annex 2).

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 compile the advice to managers. Their 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 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.

B_{crit} analysis

The B_{crit} analysis is a randomisation test developed by Rago (1993). Randomisation tests are useful for assessing changes in stock status because: they require few assumptions; the results are readily interpretable; and the sampling distribution of the test statistic can be easily approximated on a portable computer.

The B_{crit} test allows inferences to be made about the composite trend in data from multiple sites. The composite trend is estimated as a weighted average of the slope of log transformed count data versus time. In the randomisation model, the problem is stated as follows: *'Under the null hypothesis that the observations are randomly ordered within each series, what is the probability of obtaining a value of B greater than or equal to the observed B_0 ?'* This type of model has been widely applied by North American and European avian biologists.

ANNEX 2. NASCO's request for scientific advice from ICES (CNL(99)46)

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 1999.
 - 1.2 describe and evaluate methods currently used for estimating unreported catch by country and advise on improvements to these methods where appropriate.
 - 1.3 advise on the data requirements and methods for the scientific evaluation of bird and marine mammal predation on Atlantic salmon.
 - 1.4 report on significant developments which might assist NASCO with the management of salmon stocks.
 - 1.5 provide compilation of egg collections and juvenile releases and of tag releases, by country, in 1999.
 - 1.6 provide estimates of escapement from marine salmon farms by country and assess the reliability and comparability of estimates of salmon farm escapees in fisheries and stocks.

2. With respect to Atlantic salmon in the North-East Atlantic Commission area:
 - 2.1 describe the events of the 1999 fisheries and the status of the stocks.
 - 2.2 evaluate the effects on stocks and homewater fisheries of significant management measures introduced since 1991.
 - 2.3 further develop the age-specific stock conservation limits where possible based upon individual river stocks.
 - 2.4 further develop methods to estimate the expected abundance of salmon in the Commission area.
 - 2.5 determine the most appropriate stock groupings for the provision of catch options or alternative management advice.
 - 2.6 provide catch options or alternative management advice with an assessment of risks relative to the objective of exceeding stock conservation limits.
 - 2.7 provide an estimate of the by-catch of salmon post-smolts in pelagic fisheries.
 - 2.8 identify relevant data deficiencies, monitoring needs and research requirements.

3. With respect to Atlantic salmon in the North American Commission area:
 - 3.1 describe the events of the 1999 fisheries and the status of the stocks.
 - 3.2 update the evaluation of the effects on US and Canadian stocks and fisheries of management measures implemented after 1991 in the Canadian commercial salmon fisheries, with special emphasis on the Newfoundland stocks.
 - 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.
 - 3.5 identify relevant data deficiencies, monitoring needs and research requirements.

4. With respect to Atlantic salmon in the West Greenland Commission area:
 - 4.1 describe the events of the 1999 fisheries and the status of the stocks.
 - 4.2 critically evaluate, and provide sensitivity analyses of, the effects on European and North American stocks of the Greenlandic quota management measures and compensation arrangements since 1993.
 - 4.3 provide estimates of uncertainty and evaluate apparent recent changes in the proportion of continent of origin detected in the West Greenland fishery catches.
 - 4.4 provide a detailed explanation and critical examination of any changes to the model used to provide catch advice and of the impacts of any changes to the model on the calculated quota.
 - 4.5 provide age-specific stock conservation limits for all stocks occurring in the Commission area based on best available information.
 - 4.6 provide catch options or alternative management advice with an assessment of risks relative to the objective of exceeding stock conservation limits.
 - 4.7 identify relevant data deficiencies, monitoring needs and research requirements.

Notes:

1. *In response 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 by-catch of other species in salmon gear and of salmon in any new fisheries for other species is also requested.*
2. *In response 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.*

ANNEX 3. Status of Salmon Action Plans (SAPs)

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 comprises two documents:

- The Consultation Document reviews stock and fishery status (including the use of “spawning targets”), identifies factors limiting performance and lists a series of costed options to address these. This is circulated to outside interests to seek their opinion and support for the plan.
- The Final Plan follows consultation and 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.

A Ministerial Direction issued to the Agency in September 1998 requires all SAPs to be completed by the year 2002. The schedule below identifies the timetable for production of final plans on individual rivers to comply with the 2002 deadline.

Environment Agency's schedule for production of SAPs for salmon rivers in England and Wales (at 26 April 2000)

Region	Scheduled date for completion of Final SAPs - given as calendar year ending:					
	1997	1998	1999	2000	2001	2002
North East	Coquet*	Wear* Esk**	Tyne* Tees**			
Thames			Thames			
Southern	Test*	Itchen*				
South West	Tamar* Avon (Hants)*	Frome*	Taw** Torridge Lynher*	Teign Axe Dart Tavy* Camel Stour**	Exe Erme Avon (Devon) Lyn Yealm Plym Fowey Piddle	
Midlands	Severn**			Severn Estuary		
Welsh	Dee* Mawddach* Teifi** Wye*	Ogwen* Seiont* Dwyfawr* Tywi**	Clwyd** Conwy** Taf** Taff	Dyfi Tawe <i>Loughor</i> Cleddau Nevern Usk	Ogmore <i>Neath</i> <i>Afan</i> Glaslyn/Dwryrd	Rheidol <i>Aeron</i> <i>Ystwyth</i> Dysynni
North West	Eden* Leven (& Crake)* Lune*		Ehen (& Calder)**	Derwent Kent Ribble**	Duddon Wyre	Border Esk Irt Cumbrian Esk
Total	12	8	11	16	14	7

Note: Rivers in italics are those where there is no Ministerial requirement to produce a plan but where Regions have elected to do so to support Local Environment Agency Plans.

* Rivers with completed Final SAPs

** Rivers with completed SAP Consultation Documents

ANNEX 4. 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 to describe a variety of stationary fishing gears. However, it should be noted that the following are generalised descriptions (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 criteria 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, drift nets and nets pulled along the coast close to the shore (known locally as long-shoring).

Compass net These nets are operated from boats 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. Similar nets were known as stop nets on the Wye and Severn (no longer in operation).

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 have been little used in England and Wales. They 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 The 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.

Fishing baulk This gear is another ancient fixed engine which has been used in the North West Region only. It consists of two large, woven (traditionally wattle) fences supported on wooden stakes which are constructed in an estuary in the form of a right-angle. As the tide inundates the structure fish are able to move in via a hinged section, but as the tide ebbs and the water recedes, the fish are left stranded. The fishing baulk situated on the river Esk at Ravenglass is known locally as a garth. A similar fish trap operates at the mouth of the River Lyn in South West England.

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.

J-net (or P-net) The name sometimes used for the method of operating a drift net as a semi-fixed beach net, the nets being weighted to retard their drift. Set at right-angles to the beach, often with the end furthest from the shore turned back to form a hook.

Lave (or dip) net A variety of regional terms have been used to describe similar hand-held, one-man-operated nets, these include stand, bow, click and topping nets. Lave nets consist of a large Y-shaped wooden frame supporting a net, similar in design to an anglers landing net, but measuring up to 2 m across. The netsman actively stalks fish in estuary pools or shallows at low tide.

Putts and Putchers Putts and putchers are wickerwork 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 3 to 5 feet wide, tapering to a narrow point which will prevent fish of moderate size from passing through. Putts are larger and more closely woven conical baskets, which are less efficient for catching salmon, but will take smaller fish, shrimps and eels. Relatively few putts are used. A netting leader is often used also.

Seine net The seine net (also known as the 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. The sling net differs from other drift nets only in so far as the nets are permitted to carry weights (not exceeding 9 lbs) at either end, designed to retard the drift.

T-net T-nets are fixed engines operated close to the shore. 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-nets are normally fished in specific berths.

'T or J'-net 'T or J'-nets are fixed engines operated close to the shore. The 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. These are held stationary by means of weights, anchors or stakes and are set from the shore usually in the shape of a 'J' or 'P'. 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 5. UK (England and Wales) - Eggs taken and juvenile Atlantic salmon and eggs stocked (excluding private commercial sea ranching)

Blank fields indicate data not available. Shaded cells indicate relationship between eggs taken and stocked groups.

Year	Total Eggs Artificially Spawned*	Eggs Stocked (rounded to nearest 1,000)			No. Fry Stocked (rounded to nearest 1,000)			No. Parr Stocked (rounded to nearest 100)			No. Smolts (rounded to nearest 100)			
		Green	Eyed	All eggs	Unfed	Fed	All fry	0+	1 & 1+	2 or >	All parr	1	2 or more	All smolts
Grand Total	29,048,940	0	744,000	744,000	1,701,000	11,717,400	13,418,400	8,044,900	1,944,300	0	9,989,200	123,000	79,800	1,645,200
1990	5,006,195	0	20,000	20,000	109,000	1,812,000	1,921,000	331,700	201,400	0	533,100	123,000	79,800	121,200
1991	5,082,428	0	12,000	12,000	373,000	1,561,000	1,934,000	1,186,700	216,600	0	1,403,300	123,000	79,800	126,000
1992	3,572,999	0	220,000	220,000	171,000	1,830,000	2,001,000	1,203,300	391,000	0	1,594,300	123,000	79,800	183,000
1993	5,113,870	0	0	0	172,000	1,248,000	1,420,000	872,000	173,700	0	1,045,700	123,000	79,800	218,700
1994	3,576,077	0	48,000	48,000	688,000	2,024,000	2,712,000	812,300	199,100	0	1,011,400	123,000	79,800	152,500
1995	3,194,743	0	379,000	379,000	139,000	1,386,000	1,525,000	578,900	143,100	0	722,000	123,000	79,800	203,800
1996	2,403,889	0	25,000	25,000	49,000	720,000	769,000	1,127,800	143,200	0	1,271,000	123,000	79,800	127,300
1997	1,098,739	0	0	0	0	277,000	277,000	1,141,000	199,200	0	1,340,200	123,000	79,800	185,400
1998	n/a	0	2,000	2,000	0	172,500	172,500	264,800	158,200	0	423,000	123,000	79,800	124,500
1999	0	38,000	38,000	38,000	0	686,900	686,900	526,400	118,800	0	645,200	123,000	79,800	202,800

* Numbers of eggs artificially spawned estimated by back-calculation from stocking data using documented survival rates (94% to green-eyed eggs; 88% to unfed fry; 78% to fed fry; 71% to 0+ parr; 64% to 1+ parr/smolt).

Estimated number of eggs in year 'N' refers to eggs obtained by artificial methods from sea-run adults in autumn/winter period of Year 'N' / 'N + 1' (e.g. eggs recorded for 1997 were spawned during the autumn/winter period of 1996/1997).

ANNEX 6. ICES Compilation of microtag, fin clip and external tag releases

Marking Season: 1999

Country: UK (England and Wales)

	Juveniles	Hatchery	Wild	Adults	All
Microtags		94,027	1,317		95,344
External tags				1,190	1,190
Adipose clip (no CWT)		84,509			84,509
Other clips, external					
Total fish marked		178,536	1,317	1,190	181,043

Marking Agency	Age	Life stage	H/W	Stock Origin	Primary tag or mark	Number marked	Code or serial	Auxiliary clip	Release date	Place of release	River Catchment
EA North East	1+	Parr	H	Tyne	Microtag	7166	20/42/18	Adipose	Mar-99	Kielder Burn	R. Tyne
EA North East	1+	Parr	H	Tyne	Microtag	7299	20/42/19	Adipose	Apr-99	Main Rede	R. Tyne
EA North East	1+	Parr	H	Tyne	Microtag	7126	20/42/17	Adipose	Apr-99	Main S. Tyne	R. Tyne
EA Thames	1+	Smolt	H	Delphi	None	5000		Adipose	19-Mar-99	Kennet	R. Thames
EA Thames	1+	Smolt	H	Delphi	None	3721		Adipose	22-Mar-99	Kennet	R. Thames
EA Thames	1+	Smolt	H	Shannon	Microtag	10300	20/42/04	Adipose	22-Mar-99	Kennet	R. Thames
EA Thames	1+	Smolt	H	Shannon	Microtag	10150	22/42/63	Adipose	22-Mar-99	Kennet	R. Thames
EA Thames	1+	Smolt	H	Shannon	Microtag	10100	19/42/12	Adipose	25-Mar-99	Kennet	R. Thames
EA Thames	1+	Smolt	H	Shannon	Microtag	10250	23/42/10	Adipose	25-Mar-99	Kennet	R. Thames
EA Thames	2+	Smolt	H	Thames	None	2846		Adipose	1-Apr-99	Kennet	R. Thames
EA Thames	1+	Smolt	H	Delphi	None	4923		Adipose	23-Apr-99	Kennet	R. Thames
EA Thames	1+	Smolt	H	Delphi	None	296		Adipose	7-May-99	Kennet	R. Thames
EA Thames	Var	Adult	W	Thames	Floy/Radio	34	4625 - 4657	None	Jun -Nov 99	Thames	R. Thames
EA Southern	Var	Adult	W	Test	Floy/Radio	10	C000091-C0000100 green	None		Test	
EA Southern	Var	Adult	W	Test	Floy/Radio	4	B01151-B01153 white	None		Test	
EA Southern	0+	Parr	H	Test	Microtag	9850	01/42/28	Adipose	21-Dec-99	Test	
EA Southern	0+	Parr	H	Test	Microtag	45473		Adipose	Var	Test	
EA Wales	Var	Adult	W	Taff	Floy	305		None	Apr-Dec 99	Taff	
EA Wales	Var	Adult	W	Taff	Floy/CART	11		None	May-Oct 99	Taff	
EA Wales	Var	Adult	W	Dee	Floy	706	1138-1845 blue	None	Feb-Oct 99	Severn Est	
EA Wales	1+	Smolt	H	Dee	Microtag	4267	22/42/57	Adipose	01-Feb-99	Tryweryn	R. Dee
EA Wales	1+	Smolt	H	Dee	Microtag	4433	22/42/56	Adipose	03-Feb-99	Alwen	R. Dee
EA Wales	1+	Smolt	H	Dee	Microtag	6586	22/42/61	Adipose	04-Feb-99	Alwen	R. Dee
EA Wales	2+	Smolt	H	Taff	Microtag	5000	23/42/11	Adipose	19-Apr-99	Taff	
EA Wales	2+	Smolt	H	Taff	Microtag	1500	23/42/11	Adipose	20-Apr-99	Taff	
EA Wales	Var	Smolt	W	Dee	Microtag	165	01/42/22	Adipose	Apr-May 99	R. Dee	R. Dee
CEFAS	Var	Smolt	W	R. Lyd	Microtag	436	01/42/03	Adipose	Apr-May 99	R. Lyd	R. Tamar
CEFAS	Var	Smolt	W	R. Inny	Microtag	716	01/42/02	Adipose	Apr-May 99	R. Inny	R. Tamar
EA South West	1+	Smolt	H	Axe	None	5000		Adipose	May-99	Axe	
EA South West	2+	Smolt	H	Axe	None	5000		Adipose	May-99	Axe	
EA South West	1+	Parr	H	Avon/Stour	None	12250		Adipose	Mar-Nov 99	Avon (Hants.)	
EA South West	Var	Adult	W	Avon/Stour	Floy	14		None	Jun - Jul 99	Avon/Stour	
EA North West	Var	Adult	W	Eden	Floy/Radio	106	0030 - 0498	None	Mar-Nov 99	Eden	

