Agenda item 7.2
For information

COUNCIL

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IRELAND: REPORT OF NATIONAL IMPLEMENTATION PLANS MEETING THE OBJECTIVES OF NASCO RESOLUTIONS AND AGREEMENTS.

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1. Introduction

1.1 Objectives of the national management strategy

1.1.1 National objectives

Irish Government policy is *"*To conserve the inland fisheries resource in its own right and to facilitate exploitation of the resource on an equitable and sustainable basis*"*.

This policy goal is to be achieved through the strategic objectives of**:**

- Ensuring the effective conservation, primarily through the relevant State agencies, of inland fish habitats and stocks;
- Encouraging the sustainable development, through appropriate investment and support within resource constraints, of the commercial and recreational fishing resources; and
- Delivering effective and value for money management of the inland fisheries service.

It is the Irish Government's strongly held view that our salmon stock is a national asset, which must be conserved and protected, as well as being exploited as a resource, by us all on a sustainable and shared basis. As a result, a delicate balancing exercise is necessary between the needs of the coastal and inland communities who depend on fishing resources for their livelihood and the recreational users, including tourists, who each pursue the salmon for their own end. The Irish Government believes that this fundamental principle is in keeping with overall European Union policy regarding the development of rural areas as well as the key principle of the Directive 92/43/EEC, which is that sustainable use of the resource, including exploitation, should be achieved.

There is strong and increasing scientific evidence that wild salmon stocks in many rivers in the North Atlantic have decreased significantly in the last decade. Salmon habitats and stocks are under threat from a variety of adverse environmental and water quality pressures both at sea and in rivers and estuaries. These pressures, along with over-exploitation of salmon stocks, pose a significant threat to the long-term sustainability of this natural resource. While there remains a surplus of salmon returning to Irish rivers, the Government has accepted the scientific advice that reductions in the overall fishing effort in the home-water fisheries are required in order to sustain and rebuild salmon stocks nationwide.

For this reason, current Government policy has been designed to bring spawning escapement up to the level of the scientifically advised conservation limits as soon as possible. The Irish Government has, since 2002, promoted the application of quotas on commercial fishing and bag limits on angling to achieve catch reductions as the best instrument available to realise

the objective of restoration of salmon stocks. This policy has delivered significant overall catch reductions.

In keeping with this policy, when setting the commercial salmon quotas for the 2006 season, the Minister entered a firm commitment to fully align the exploitation of salmon, both at national and district levels, on the scientific advice by 2007 so as to fulfil national requirements and international obligations.

The Irish Government has introduced an extensive range of measures in recent years to manage the home water salmon fisheries. Very considerable resources are devoted by the Irish authorities to the ongoing development of scientific advice and management measures for this fishery. Improvements, which the Irish Government acknowledges need to be pursued to ensure that its salmon management regime continues to comply with international legislation and best practice into the future, are planned both in terms of the scientific work and the management action.

1.1.2 Irelands international obligations - NASCO

Ireland, as part of the EU, is also a signatory to the NASCO Convention. The primary management objective of NASCO is:

'to contribute through consultation and co-operation to the conservation, restoration, enhancement and rational management of salmon stocks taking into account the best scientific advice available'.

In 1998, the North Atlantic Salmon Conservation Organisation (NASCO, 1998) to which the EU is a Contracting Party on behalf of member States, adopted the "precautionary approach" to fisheries management (as outlined in FAO, 1995, 1996). The NASCO Agreement on the Adoption of the Precautionary approach states, that

'*an objective for the management of salmon fisheries is to provide the diversity and abundance of salmon stocks'*

or in other words to maintain both the productive capacity and diversity of salmon stocks. NASCO provides interpretation of how this is to be achieved. Management measures should be aimed at maintaining all stocks above their Conservation Limits by the use of management targets. Socio-economic factors could be taken into account in applying the Precautionary Approach to fisheries management issues although it is imperative that the risk of stocks falling outside or remaining outside safe biological limits are evaluated and balanced against the socio-economic objective. The precautionary approach is an integrated approach that requires, *inter alia*, that stock rebuilding programmes (including as appropriate, fishery management actions, habitat improvements and stock enhancement) be developed for stocks that are below Conservation Limits.

1.1.3 Irelands consideration of ICES advice

ICES provide advice to NASCO for the management of fisheries in the North Atlantic (Report of the Advisory Committee on Fisheries Management 2005) particularly the mixed stock fisheries of West Greenland and Faroes. General advice is also provided for homewater fisheries as follows:

- Stocks should be maintained above Conservation Limits
- The only fisheries for salmon should be on river stocks that are shown to be above Conservation Limits
- For stocks below Conservation Limits catches should be reduced to increase the probability of meeting the CL.
- Due to the different status of individual stocks within regions, mixed stock fisheries present particular threats to stock status.

1.1.4 Irelands consideration of obligations under the EU Habitats Directive

Council Directive 92/43/EEC (on the conservation of natural habitats and of wild flora and fauna) states that:

"If a species is included under this Directive, it requires measures to be taken by individual member states to maintain or restore them to favorable conservation status in their natural range".

The North Atlantic salmon (*Salmo salar* L.) has been included as one of the species covered by the Directive. From an Irish perspective, there are currently 32 Irish salmon rivers listed which fall specifically under the directive (Appendix II). However, in applying the Directive consideration must be given to all of the populations and not just specifically to these 32 rivers.

The conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within its territory (also defined) and this *conservation status* will be taken as 'favourable' when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis…"

The directive specifically allows for provision to be made for management measures for salmon, if their conservation status so warrants, including the prohibition of certain means of capture or killing, whilst providing for the possibility of derogations on certain conditions.

1.2 Current salmon fishery management regime

The Irish Government has introduced an extensive range of measures in recent years to manage the home water salmon fisheries. Very considerable resources are devoted by the Irish authorities to the ongoing development of scientific advice and management measures for this fishery. Improvements, which the Irish Government acknowledges need to be pursued in order to ensure that its salmon management regime continues to comply with international

legislation and best practice into the future, are planned both in terms of the scientific work and the management action.

Responsibility for management of the salmon fishery in Ireland lies with the Department of Communications, Marine and Natural Resources (DCMNR) and is administered through the seven Regional Fisheries Boards (East, South, South West, Shannon, West, North West and North). The Boards enforce fisheries legislation and carry out inspection at sea and on inland waters. This surveillance is further enhanced by dedicated naval surveillance co-ordinated through the Central Fisheries Board. Each region is further sub-divided into Districts for administrative and management purposes; there are 17 salmon fishery Districts. Restructuring of the boards structures and the establishment of a National Inland Fisheries Authority are proposed for 2007 and beyond.

The National Salmon Commission (NSC) was established under the 1999 Fisheries (Amendment) Act, to assist and advise the DCMNR on conservation, management protection and development and to recommend schemes including tagging of salmon, Total Allowable Catches (TACs) and quotas. The NSC is advised by its Standing Scientific Committee (SSC) also established under the 1999 Fisheries (Amendment) Act (No. 35, 55c) to "advise and assist the National Salmon Commission on all technical and scientific matters in relation to the performance of the Commissions functions". Since 2000, the SSC has provided catch advice on a national and district basis (Ó Maoiléidigh, *et al* 2004).

The Foyle salmon fishery is administered by the Foyle, Carlingford and Irish Lights Commission (Loughs Agency), which is a North/South body, established under the British/Irish Agreement Acts. For the purposes of fisheries statistics, the nominal commercial catch of the River Foyle is designated 50% Ireland and 50% UK (N. Ireland).

1.3 Nature and extent of salmon resource

The 17 separate salmon fisheries districts in Ireland comprise a varying number of salmon rivers (from only 1 individual river to 30 separate rivers). There are 148 designated salmon rivers in total, including large tributaries. Conservation limits have been established for all rivers and aggregated into District conservation limits. Compliance with the District conservation limits is measured against the estimated spawning stock in each district on average for the previous 5-year period and the district catch advised is the catch which provides at least a 75% probability that there will be a simultaneous attainment of the conservation limit in each river in a given district.

A biological assessment of the sea age of the catch has not been possible since 1988. The average percentage of multi-sea winter salmon for the period 1980 to 1988 (7.53%) is used to provide the number of MSW salmon in more recent catches so the current status of MSW salmon is virtually unknown except for a small number of instances where consistent rod catch data are available or where counts are available. In general, it is believed that this component of the stock has been declining at an even higher rate than the 1SW component but a comprehensive assessment is required. It is estimated that catches of over 600,000 1 Sea Winter (1SW) and over 70,000 2SW and multi-sea winter salmon (MSW) were made in the early 1970's. The most recent data indicate catches of only 150,000 1SW salmon and approximately 10,000 2SW and MSW fish. These are amongst the lowest points in the time series.

The Irish catch of salmon comprises predominantly of wild salmon (greater than 98%) derived mainly from naturally spawned juveniles from a finite number of Irish rivers. However, it is important to enumerate the number of farmed escapees and the number of ranched salmon in the catches, particularly on a local level, as increases in the proportion of these fish can mask declines in wild salmon returns and there is some concern regarding the admixing of these components with wild stocks.

1.4 Overview of fisheries and management approach

In Ireland, while there are some completely private ("several") fisheries where the rights to fish are inherited, the majority of fishermen must have a state licence (commercial or recreational) to fish. In 1997 the number of public commercial fishing licences issued was capped at the 1995 level i.e. 775 public drift net licences, 464 draft net licences and 132 licences for other commercial fishing methods. This cap on licences did not include private or special local area licences (56 drift net licences, nine draft net licences and four other-method licences). In the case of commercial fishermen the licence entitles them to fish only within the district where the licence is issued and only within the season and with the fishing gear permitted. A public or special area local licence is not an inherited right and must be applied for annually. Provided the applicant held a licence for the previous season and has fished at least one of the previous three seasons (and has no convictions for fisheries offences) these licences will be renewed.

The principal fishing methods used to catch salmon in Ireland are drift nets, draft nets, snap nets and rod and line. Only the drift nets are operated outside estuaries and therefore conform to the definition of salmon mixed stock fisheries; these nets accounted for 70.5% of the total national salmon catch in 2004 (Table 1). The number of fishermen (i.e. employed in the fishery) is estimated from the ratios of numbers licensed to numbers employed in Whelan and O'Connor (1974).

From the early 1960s to the mid 1970s, the drift net catch increased rapidly, following the introduction of synthetic, and then monofilament, nets. This was probably responsible for the simultaneous decline in the draft net catch and resulted in the proportion of the catch taken by drift nets increasing from 20% to 70% during this period, while the proportion taken by draft nets declined from 50% to 20%.

Table 1 Summary information on fishing methods employed to catch salmon in Ireland in 2005 (excluding Lough Foyle area half catch)

Fishing method	No. Licences issued	Estimated number of fishermen	% of total catch in 2005
Drift nets	877	2,400	70.5%
Draft nets	518	1,700	11.7%
Snap nets	139	375	2.1%
Traps, bag nets, pole nets, loop nets, head weir	12	32	>1%
Rod	28,738	<28,738	15.6%

Since 1990, reported catches by all methods have remained relatively stable at around 600t, which is about one third of the peak catch (2216t) recorded in 1975. Over this period, the proportion of the total catch taken by drift nets has varied between about 65% and 75%.

1.5 Enforcement

Protection

The Central Regional Fisheries Board protection staff coordinated the protection and conservation programme operated by the Regional Boards, the Naval Service, the Gardaí Síochána and the Air Corps. The Naval Service, as well as providing patrol days, also provide training for Fishery Officers in sea survival, fire fighting and as coxswains. The Garda Síochána supplied personnel to partake in naval service patrols as back up to Fisheries Officers.

Boards Large Patrol Vessels

Details of the LPV, Naval and Air Corps Operations during 2005 are as follows:

Sea Patrols

	Days on Patrol	No. of Licence Checks	Length of Net Seized (Yards)	Prosecutions & Warnings
Bradán Beatha	160	455	3550	8
Cosantóir Bradán	156	506	4300	11
Naval Service	64	160	3300	2
Total	380	1121	11150	21

Air Corps Patrols

Number of Flights	14
Number of Sightings	443

The above figures reflect an increase on 2004 of:

7% in the number of sightings
9% in the number of days on patrol

The Garda Síochána Provided a total of 64 patrol days in support of the above programme

2. Status of stocks

2.1 Status of aggregated national stocks

Wild salmon production nationally (i.e. returns to the coast) was highest from 1970 and 1975, peaking at approximately 1.8 million 1SW salmon in 1975 (Figure 1).

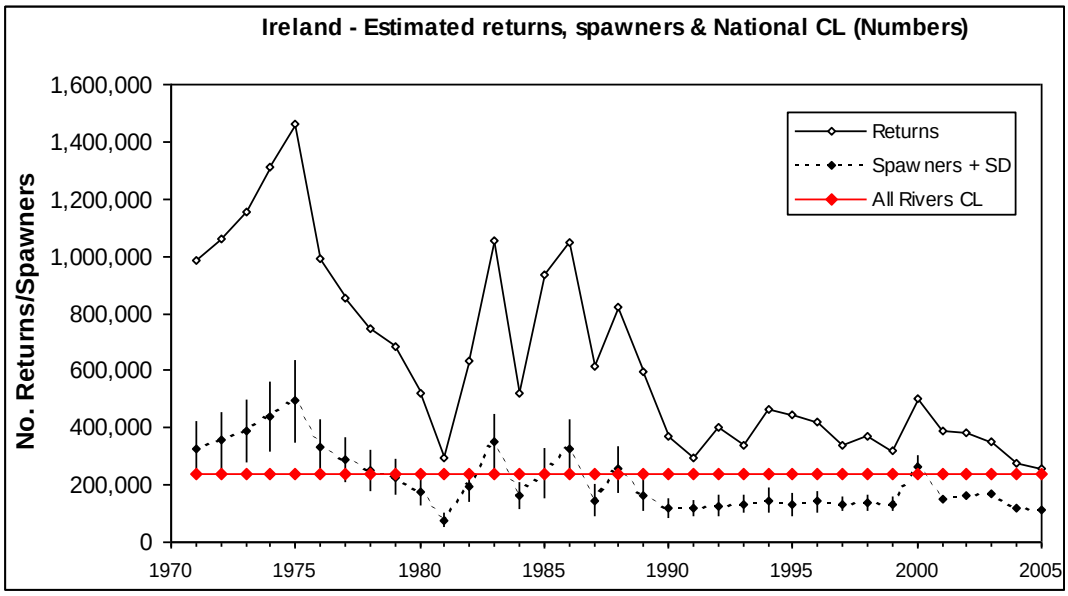


Figure 1 Estimated returns of salmon to the coast, spawning stock after fisheries and Conservation Limit for all individual rivers stocks combined.

From 1975, salmon production decreased significantly, with some recovery during the 1980's. However, since 1990, the national production has been much lower with on average just over 400,000 salmon being produced. There is now less than a third of the fish returning to the coast compared to the 1970's. The spawning stock has fluctuated in the same way as the overall returns with the highest spawning stock recorded for the 1970's. Despite meeting the national Conservation Limit in 25 of the previous 35 years, since 1981, the aggregated spawning stocks have fluctuated around the Conservation Limit, with periods during the 1990's where it consistently failed to achieve the spawning requirement. It is currently estimated that on average, between (2001 and 2005) only 70% of the aggregated one–sea winter (1SW) Conservation Limits was being attained. The estimated Irish 1SW spawning stock in all rivers in 2005, based on district catch statistics, was 157,870 fish.

2.2 Status of aggregated district stocks

District catch advice is predicated on the attainment of the 1SW salmon conservation limits only, as these comprise the vast bulk of the mixed stock fishery catch. Risk assessment of the catch advice process in 2004 have resulted in catch advice for 2005 being predicated on a

75% chance of meeting conservation limits in all rivers simultaneously in each district, taking into account variation in run size over the past five years.

As the aggregated salmon stock is made up of a large number of discrete river specific populations it is more important to examine the patterns and information at least on a district and preferably on a river by river basis. Only 4 districts are meeting their Conservation Limits consistently (Cork, Kerry, Connemara, Ballinakill). Less than 50% of the Conservation Limit is being attained in 5 districts (Sligo, Shannon, Waterford, Dublin, Drogheda). The remaining districts have consistently met over 50% of the Conservation Limit but less than 100% on average. Even in districts that did meet their Conservation Limits, some individual rivers did not. Recent data suggests that four of seven rivers in Cork did not meet their Conservation Limits, four of nine rivers in Kerry, two rivers in Connemara, four of five rivers in Ballinakill, three of five rivers in Bangor, four of six rivers in Ballyshannon and five of 10 rivers in Letterkenny.

In order to allow a 75% chance or greater of meeting the conservation limit in 2005, the SSC advised that the maximum harvest by all methods (commercial and recreational) for all districts combined should be no more than 122,541 one-sea winter salmon. Following consultations between the DCMNR, the National Salmon Commission and the Central and Regional Fisheries Boards, a commercial fishing TAC of 139,900 was allocated in 2005. When combined with a potential rod catch of 27,500 salmon this is equivalent to a potential maximum harvest of 167,400 salmon or 37% higher than the scientific advice. This level of harvest provides about a 50% chance of meeting the conservation limit nationally, but ranges from 0% to 100% depending on the district.

However, the commercial fishery has been reduced from 212,000 fish in 2002 with TACs of 182,000 in 2003, 162,000 in 2004, and 139,900 in 2005. The SCC did not provide scientific advice on a maximum harvest for 2006 as the main thrust of their advice was to operate fisheries on single stocks above Conservation Limits in estuaries and rivers only. However, as guidance on the precautionary catch in each District was provided and as a result a commercial TAC of 91,000 salmon was set for the 2006 season. The reductions in the district fisheries have as much as possible been aimed at those districts which were furthest below their conservation limit.

2.3 Status of individual river stocks

Twenty-one Irish stocks were classified according to NASCO guidelines in a recent appraisal as being "threatened with loss" ((NASCO, CNL05/45). Based on updated analysis at least 49 Irish salmon populations may actually be threatened with loss. It is also likely that this is an underestimate as no data are available for approximately 80 small rivers without counters or where the rod catch was insufficient to carry out an assessment. The salmon populations in at least nine rivers have been consistently achieving and exceeding Conservation Limits, including the Bandon, Kerry Blackwater, Feale, Erriff, Owenmore/Owenduff in Mayo, Laune, Moy, Easky, and Drowes. Characteristically, these are clean, large rivers with complex population structure i.e. early run fish, late run fish, early maturing fish, late maturing fish, wide smolt age distribution etc.

2.4 Scientific advice

Scientific advice is provided in the context of meeting both National and International obligations outlined in Section 1 above. In this regard the only situation where both can be met is where fisheries take place on stocks that are exceeding Conservation Limits, with the catch being limited to or less than the number of fish in excess of these Conservation Limits. Given the low level of stock generally, it is not currently possible to manage existing mixed stock fisheries (i.e. drift nets and some draft nets) such that only those stocks meeting their Conservation Limits will be caught and that only the number of fish in excess of the Conservation Limits for these stocks will be harvested.

The Standing Scientific Committee advises:

- The overall exploitation in most districts should be immediately reduced, so that Conservation Limits can be consistently met.
- Furthermore, due to the different status of individual stocks within the stock complex, mixed stock fisheries present particular threats to the status of individual stocks.
- Thus, the most precautionary way to meet national and international objectives is to operate fisheries on river stocks that are shown to be within precautionary limits i.e. those stocks that are exceeding their Conservation Limits.
- Fisheries operated in estuaries and rivers are more likely to fulfil these requirements.

In order to manage single stock in-river fisheries, river specific stock information will be required from at least one of the following: counters, catch data, tagging studies, juvenile assessment, redd counts. These data exist for many rivers in the country and are probably sufficient to facilitate management of single stock fisheries in the short term (i.e. 1 to 2 years). However, there are a significant number of rivers, predominantly small rivers with small but important stocks, which would require some specific assessment in order to manage the stocks in the longer term.

3. Threats to stocks, and current management measures

3.1 Marine survival

The survival of salmon from smolt to adult return to the home-water coast (prior to the operation of home-water fisheries) has been estimated for a selection of Irish stocks and rivers. This marine survival is presently the lowest it has been since the assessment programme commenced in 1980 and probably since the 1970's also considering the information available for the Burrishoole River index site. Although there has been considerable fluctuation, estimates of marine survival prior to 1996 for wild stocks were generally higher compared to more recent years with survival rates in excess of 20% (i.e. 20 adult returns to the coast for every 100 smolts migrating, Figure 2).

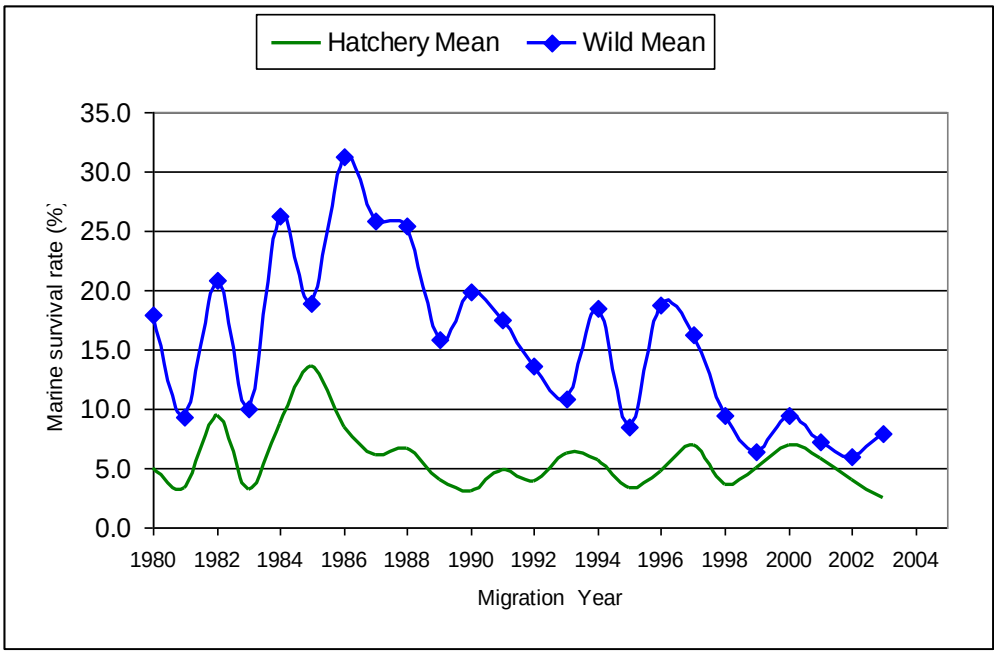


Figure 2 Marine survival (from smolt release to return to the coast) for wild and hatchery salmon.

The current estimates suggest that less than 10% of the wild smolts that go to sea from Irish rivers are surviving (i.e. less than 10 adults returning for every 100 smolts migrating). Survival rates from hatchery fish are usually lower than for wild fish. The decline is not as apparent for hatchery reared fish, although the highest survival values were also recorded in the 1980's.Marine survival is influenced by many factors (Figure 3). While the main management measures directly influencing stocks size at present relate to fisheries measures, there are real concerns relating to factors causing mortality at sea such as predation by seals, diseases and parasites, marine pollution, by-catch in other fisheries etc. However, there is insufficient empirical information to allow anything other than general advice to be given on these at this stage i.e. the more the effects each individual factor can be reduced the more salmon will return to our coasts and rivers. Clearly more investigations need to be carried out on these other factors.

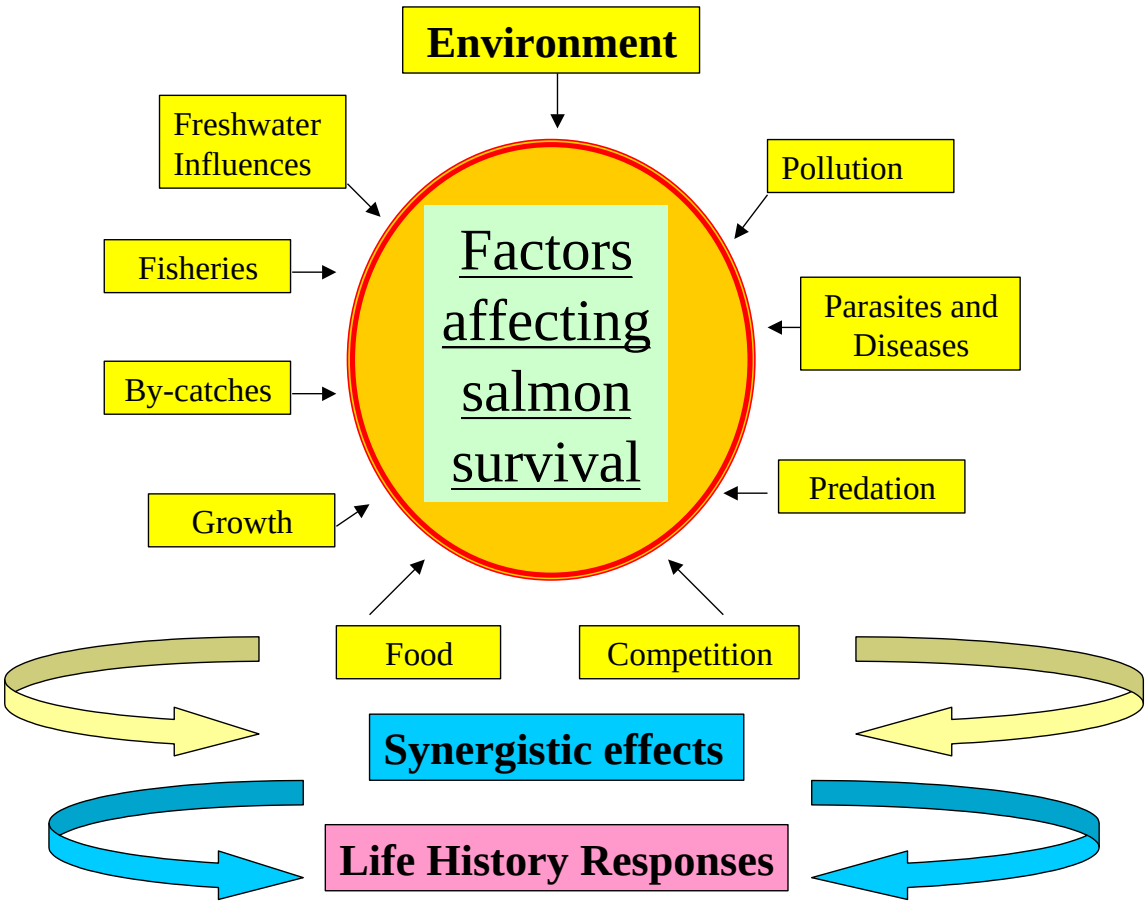


Figure 3 The factors which individually and synergistically affect the marine survival of salmon and which cause significant changes to life history responses such as population structure, fitness and size.

A number of research programmes are underway in Ireland to contribute to the overall NASCO research effort on the problem of low marine survival. Studies include investigations on:

- the marine survival and exploitation on monitored salmon stocks;
- the overall relationship between parasite loading and proximity to aquaculture sites;
- the factors affecting early smolt migration and survival;
- the habitat requirements of returning salmon ;
- Genetic stock identification of returning salmon and their relationship with their environment.

3.2 Effects of salmon fisheries

3.2.1 Homewater fisheries:

The migratory behaviour of the Atlantic salmon presents many opportunities for their interception, and a wide range of fisheries have developed, operating in rivers, estuaries, coastal waters and the open ocean. Any definition should be related to the primary fishery management objective, which is to maintain river stocks within precautionary limits. Mixed stock fisheries may therefore be defined as any fisheries for salmon operating outside estuary limits. By this definition, the Irish mixed stock fisheries (predominantly drift nets as few if any draft nets operate outside of an estuary) accounted for approximately 70.5% of the salmon catch nationally in 2005 with 11.7% going to draft net fisheries and 15.6% going to the angling fisheries. The remainder (2.2%) are taken in snap nets, loop nets and other fixed engines. In each district salmon are captured that are destined for the rivers belonging to that district but fish are also taken that are returning to rivers in other districts. There is some geographical adherence as fishing boats belonging to each district are confined to an area within 6 miles of the statutorily defined boundary of that district and report their catch accordingly.

The National Coded Wire Tag and Tag Recovery Programme currently provides information on the extent of mixed stock element of the commercial salmon fisheries. It has been estimated from coded wire tag returns that more than 50% of the returning stock may be caught outside the fishery region where they originated and in most cases in several fishery regions (Figure 4).

3.2.2 Distant water fisheries

An estimated exploitation rate of 18% on returning 2SW hatchery reared River Shannon salmon in the West Greenland fishery was made in 1992 (Ó Maoiléidigh *et al*, 2006). Estimates of exploitation in the Faroes fishery around the same time of less than 5% of 1SW returns. However, in recent years exploitation of Irish stocks at West Greenland is estimated to have been less than 1% and there has been no Faroese fishery in the period 2001 to 2005.

3.2.3 Capture of other European country's stocks in Irish fisheries

Exploitation of English and Welsh stocks in the Irish coastal fisheries has declined since the introduction of new management measures in Ireland in 1997, and since 2002 the Irish fishery has also been regulated by quotas, which have been reduced each year. Exploitation of salmon from north east England in the Irish fishery is estimated to be negligible (<1%), the exploitation on stocks from north west England and north Wales is currently low, but levels increase for rivers further south in Wales (3 to 11%) and in southern England, where it may exceed 10% (e.g. 12% for the River Test). Recent estimates for the River Tamar in south west England (2003 and 2004 only) indicate a current exploitation rate in Ireland of about 2% for this stock.

Exploitation rates have not been calculated for other European stocks, but tagged salmon originating from France, Spain, Germany, Norway and Denmark have been captured in Irish drift net fisheries (Table 2).

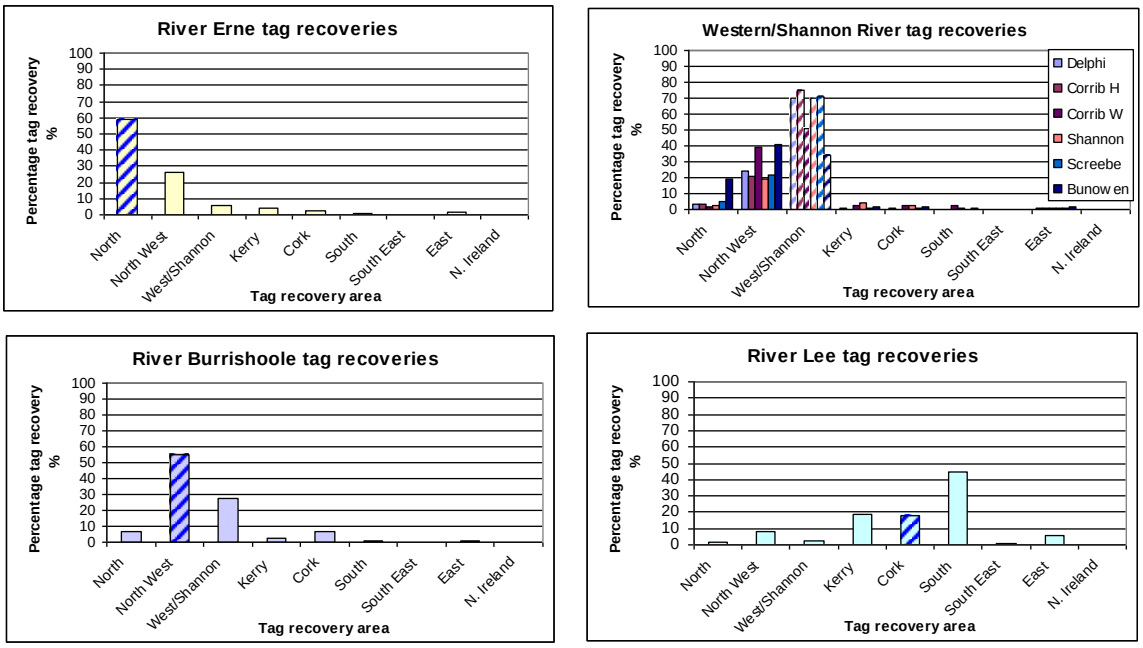


Figure 4 The average distribution of coded wire tag recoveries by tag recovery area (after 1997 when the fishery was restricted from 12 to 6 miles) including those recovered in freshwater (i.e. percentage of total tag recovery). Striped bars indicate the area from which the tagged fish were released e.g. River Erne fish released in the Northern area.

	Countries of Origin								
Fishing year	**Ireland**	**N. Ireland**	**England/Wales**	**Scotland**	**France**	**Spain**	**Norway**	**Denmark**	**Germany**
1985	-	-	35	647	-	-	-	-	-
1986	**5,052**	-	155	802	-	-	-	-	-
1987	**2,450**	572	264	260	-	-	-	-	-
1988	**4,442**	627	658	401	-	-	-	-	-
1989	**2,833**	466	313	78	28	-	-	-	-
1990	**14,261**	153	514	375	9	-	-	-	-
1991	**15,945**	677	175	175	-	-	-	-	-
1992	**8,690**	820	204	10	10	-	-	-	-
1993	**9,352**	490	288	6	3	23	3	-	-
1994	**10,209**	247	229	9	-	11	3	-	-
1995	**5,793**	153	442	12	186	9	-	69	-
1996	**2,691**	302	237	31	3	9	-	3	-
1997	**17,994**	418	109	-	-	5	-	-	-
1998	**8,573**	133	88	18	-	42	-	36	-
1999	**12,322**	137	351	-	6	21	-	104	3
2000	**14,204**	379	280	5	2	42	-	-	2
2001	**7,956**	871	237	-	-	35	-	-	0
2002	**9,555**	260	122	6	-	18	-	-	3
2003	**18,136**	198	92	0		58			0
TOTAL	**152,321**	**6,703**	**4,703**	**2,834**	**247**	**216**	**6**	**213**	**9**

Table 2 The estimated number of tagged salmon originating from each country that are caught in Irish mixed stock fisheries.

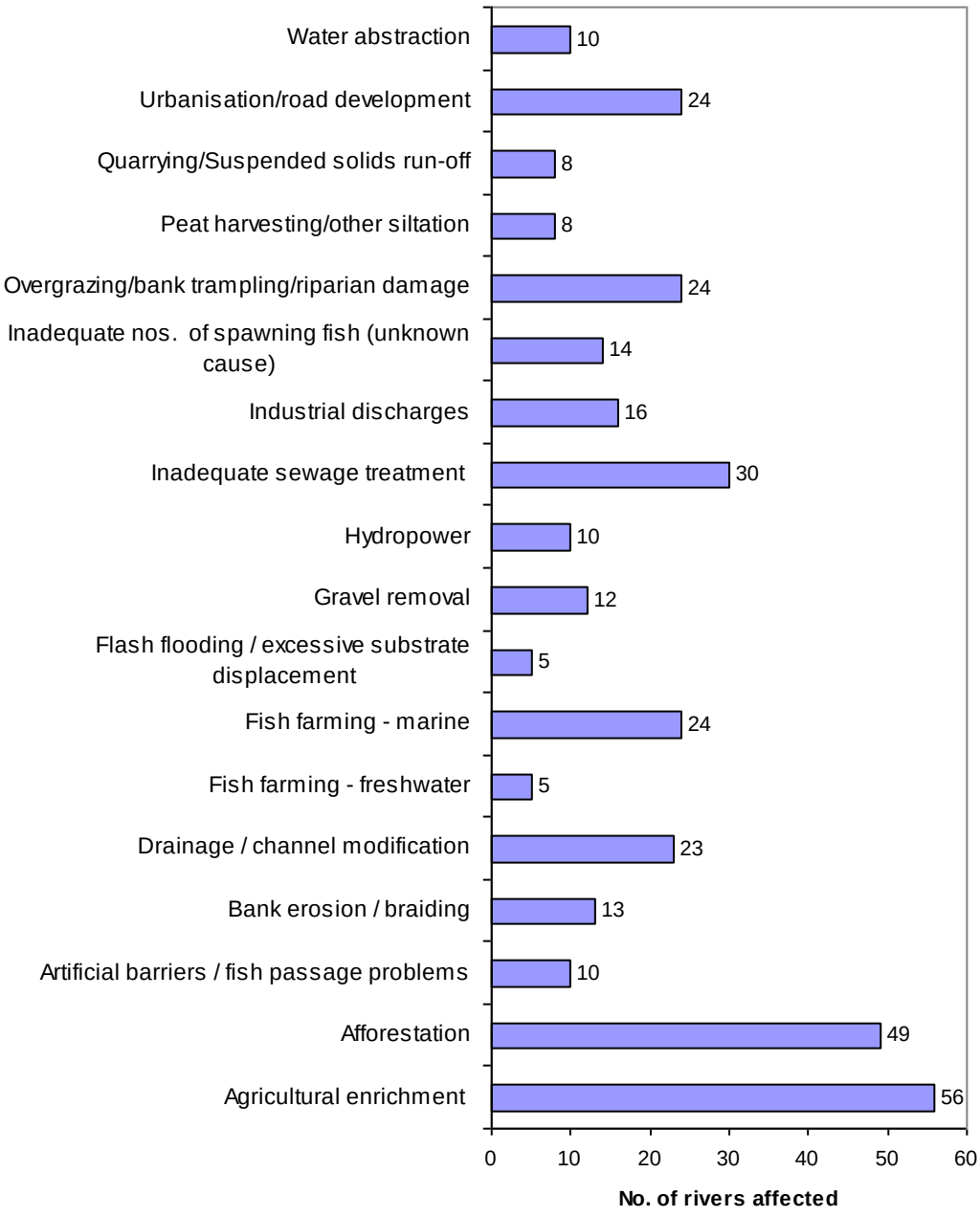
3.2.4 By-catch of Irish salmon in other fisheries

Possible exploitation of salmon post-smolts in the pelagic, mainly mackerel, fisheries in the Norwegian Sea has been raised as a concern, but reliable estimates are not available. ICES has advised NASCO that recent investigations suggest that pelagic trawl designs used by commercial fisheries are unlikely to catch significant numbers of salmon post-smolts or adult salmon, and salmon by-catches are believed to have little impact on PFA or returns to home-waters.

3.3 Factors affecting estuarine and freshwater salmon habitat

Recent habitat impact information for the 148 Irish salmon rivers was set out into 18 principal categories and presented for each river in CNL(05)45. Several habitat impacts may prevail in any single salmon river. Data are summarised in Figure 5 below. The information indicates that agriculture and forestry are the major habitat impacts affecting Irish salmon rivers.

Figure 5. Habitat impact factors in Irish Salmon Rivers



3.4 Impacts of aquaculture, introductions and transfers and transgenics

In general, all of the existing regulations and protocols relating to the Irish aquaculture industry are consistent with the NASCO Implementation Plan (specifically the Williamsburg Resolution).

3.4.1 Incidence of escaped farmed salmon

The aquaculture industry has developed a code of practice for containment of farm salmon so as to achieve a level of escapes that is as close to zero as practicable. The industry is obliged to report on the level and causes of escapes as a condition of their licence. Generally reported escape levels are low in most years.

The identification of fish farm escapees is based on morphological characteristics of samples examined from commercial catches over the May to August period. Following the examination of 32,400 fish in 2005 (Table 3), the proportion of salmon identified as farm escapees based on external examination ranged from 0% in the South and East to 0.49% in the South West.

Overall the rate of escapees in Irish catches is usually less than 0.5%. Approximately 1 t of farmed salmon escapees are estimated to have been taken in the national catch in 2004 and 2005 which are amongst the lowest values in the series. It is emphasised that this figure should be regarded as an underestimate due to difficulties in identifying escapees from morphological characters alone and also because escapees may not be included in the catches brought to sale in established dealers premises. Escapes are also more likely to occur over the winter months when no commercial fisheries operate but no estimate of ingress into rivers is available. There is no systematic reporting of fish farm escapees in riverine catches in Ireland and the returns of escapees to the Burrishoole River total trapping facility rarely exceed two or three fish per year. Therefore there is a severe lack of information on the incidence of escapees in river catches or more importantly in spawning stocks. Similarly, there were no reports from the industry of escape incidents in 2004 or 2005.

Specific trials been undertaken to evaluate the performance of strains of sterile fish under production conditions and the results of these experiments have been published (Wilkins *et al, 2001*). However, there has been a general reluctance by the industry to consider these in place of normal industry brood stocks.

The feasibility and cost effectiveness of tagging or marking of farmed fish has been assessed but as recovery of escapee farmed fish is presently very low and the number of rivers where routine scanning of returning fish is limited, this has not been considered as a practical option.

Specific genetic research has been conducted to investigate interactions between wild salmon and salmon of aquaculture origin, e.g. extent of hybridisation, composition of stocks and identification of disease strains and appropriate treatment (McGinnity et al, 2003a). This study also examined competitive and behavioural interactions that may affect the viability and success of the wild populations.

Table 3 Salmon farm escapees identified during microtag recovery programmes in Ireland

		FISHING AREA					
	YEAR	Donegal	Mayo	Galway Gal/Lim	S.West	South & East	TOTAL
No. examined	**2005**	13969	4037	8093	5147	1238	32,484
No. escapees		3	12	3	25	0	43
% escapees		0.02	0.30	0.04	0.49	0.00	0.13
Total escapees		8	109	8	211	0	337
No. examined	**2004**	20393	5129	9069	5335	1963	41,889
No. escapees		11	16	7	10	5	49
% escapees		0.05	0.31	0.08	0.19	0.25	0.12
Total escapees		19	126	20	92	78	257
No. examined	**2003**	24955	8999	11762	11993	1403	59,112
No. escapees		19	38	0	6	0	63
% escapees		0.08	0.42	0.00	0.05	0.00	0.11
Total escapees		33	176	0	29	0	238
No. examined	**2002**	47885	11095	1549	15521	3183	79,233
No. escapees		23	101	13	10	0	147
% escapees		0.05	0.91	0.84	0.06	0.00	0.19
Total escapees		28	537	337	39	0	941
No. examined	**2001**	29191	10824	4519	9786	2212	56532
No. escapees		10	65	85	68	2	230
% escapees		0.034	0.60	1.88	0.69	0.09	0.41
Total escapees		19	328	906	507	37	1,759
No. examined	**2000**	42,641	13,049	139	12,799	3,175	68,628
No. escapees		1	81	3	6	5	91
% escapees		0.002	0.62	2.16	0.05	0.16	0.13
Total escapees		1	251	780	29	49	1,062
No. examined	**1999**	33,725	13,770	8,190	13,461		69,146
No. escapees		12	109	42	93		256
% escapees		0.04	0.79	0.51	0.69		0.37
Total escapees		12	291	174	275		752
No. examined	**1998**	48,697	25,707	6,867	8,001		89,272
No. escapees		7	43	7	88		145
% escapees		0.01	0.17	0.10	1.10		0.16
Total escapees		8	101	32	557		698
% total catch examined		*85*	*43*	*22*	*16*		*45*
No. examined	**1997**	54,389	28,670	5,109	5,081		93,249
No. escapees		19	78	3	24		124
% escapees		0.03	0.27	0.06	0.47		0.13
Total escapees		23	144	15	173		355
No. examined	**1996**	25,874	24,665	32,962	5,429	390	88,930
No. escapees		89	61	1	23	0	174
% escapees		0.34	0.25	0.00	0.42	0.00	0.20
Total escapees		182	179	1	219	0	581
No. examined	**1995**	56,329	30,785	23,676	14,407		125,197
No. escapees		9	42	6	28		85
% escapees		0.02	0.14	0.03	0.19		0.07
Total escapees		12	94	11	123		240
No. examined	**1994**	78,021	16,270	21,853	18,859		135,003
No. escapees		106	17	18	203		344
% escapees		0.14	0.10	0.08	1.08		0.25
Total escapees		105	73	28	676		882
No. examined	**1993**	62,291	29,801	17,298	1,425		110,815
No. escapees		53	81	11	15		160
% escapees		0.09	0.27	0.06	1.05		0.14
Total escapees		49.84	151.67	14.13	405.80		621.45
No. examined	**1992**	73,828.00	23,787.00	9,771.00	7,119.00		114,505.00
No. escapees		18.00	403.00	10.00	1.00		432.00
% escapees		0.02	1.69	0.10	0.01		0.38
Total escapees		15.25	1,213.85	30.42	5.95		1,265.45
No. examined	**1991**	59,891.00	29,245.00	3,853.00	5,621.00		98,610.00
No. escapees		0.00	338.00	15.00	0.00		353.00
% escapees		0.00	1.16	0.39	0.00		0.36
Total escapees		0.00	524.86	51.88	0.00		576.75

3.4.2 Introductions and transfers

Salmon aquaculture facilities are only been located where hydrographical, epidemiological, biological and ecological standards can be met as identified within an obligatory EIS. Although there are no specific aquaculture free zones designated, the separation distance between aquaculture facilities at marine sites has been based on a general assessment of local conditions and different generations of salmon been reared in separate locations. Similarly, fallowing has been used as a means of minimising outbreaks of diseases and parasites. Generally, aquaculture producers are obliged to adapt production to the holding capacity of individual sites, with density levels based on good husbandry practices. Dead and dying fish must be removed immediately from aquaculture production facilities and disposed of, along with waste materials, in a manner approved by the regulating authority. Procedures been established to address the effective removal and disposal of infectious materials and contingency plans been established for the disposal of mortalities from emergency situations.

There have been some reports of introductions of non-indigenous fish into rivers containing Atlantic salmon in Ireland including recent reports of chub, dace and barbel into a small number of rivers. Whether this was by accident i.e. the inadvertent release of live-baits by overseas anglers or by design no thorough evaluation of potential adverse impacts has been carried out to establish the level of risk of adverse ecological interactions. Similarly, there has been no introductions or use of transgenic salmon into Irish waters and there are no plans being considered for such an introduction.

3.4.3 Diseases and parasites

All steps in the aquaculture production process, from hatchery to processing plant, including transportation of live fish materials, must be conducted in accordance with appropriate fish health protection practices i.e. farms operate to an Approved Fish Health Management Plan. Epidemiological zones (either with or without specific pathogens) been not been specifically established for the following diseases: VHS, IHN, ISA and the parasite *Gyrodactylus salaries* as at the moment, the entire country is a single zone, since Ireland is free of the diseases listed. Should an outbreak /outbreaks occur, appropriate local epidemiological zones would be established. The Fish Health Unit of the Marine Institute carries out an annual monitoring programme for all the diseases listed. There have been no known movements of live salmonids and their eggs from a zone where any of the specified diseases is present to a zone free of these diseases and a list of prevailing infectious diseases and parasites, including methods used for their control, has been established and maintained by the appropriate authorities and is available from Marine Institute / Dept. Communications, Marine & Natural Resources. Generic Contingency Plans have been established for the early identification and detection of, and rapid response to, an outbreak of any new disease or parasite infection likely to affect Atlantic salmon. To date there have been no known movements of live salmonids and their eggs from hatcheries to areas containing Atlantic salmon stocks, or to facilities where there is a risk of transmission of infection to such areas, other than those from facilities where regular inspections have not detected significant diseases and parasites. Medicines and disinfectants been used with care and in accordance with manufacturers' instructions and in compliance with regulatory authorities and this is monitored by private veterinarians, Dept of Agriculture and Marine Institute.

Recently, a study commenced on biophysical properties on Pancreas Disease virus in an effort to control the disease on fish farms. Additional major collaborative studies planned with Norway and Scotland.

The sea louse *Lepeophtheirus salmonis* (Kroyer) continues to be the major external parasite causing harm to both farmed salmon stocks and wild salmonids. Sea lice Protocols are in place aimed at achieving low infestation rates of sea lice on farmed salmon in spring, prior to wild salmonid smolt runs. While good compliance with protocols is achieved on many farm sites, there are still many incidents annually where ovigerous sea lice levels exceed protocol levels in spring.

4. Future management priorities

This section provides an overview of the management actions planned for the post 2006 period.

In March 2006, the Minister decided to adopt the recommendations made by the National Salmon Commission (NSC) in relation to the total allowable salmon catch for 2006. This involves reductions in the quota available to both commercial fishermen and anglers in 2006. In doing so the Minister reaffirmed the Government's commitment to fully align with the scientific advice provided on the management of the wild salmon fishery by 2007.

The fisheries Boards and the Marine Institute have agreed an expansion of the ongoing Genetic Stock Identification (GSI) project during the current salmon fishing season, in order to determine the tendency of certain identified inshore fisheries to impact on multiple stocks. This is in line with the scientific advice provided by the NSC's Standing Scientific Committee that mixed stock fisheries pose particular threats to the status of individual stocks and that fisheries operated in estuaries and rivers are more likely to fulfil national requirements and international obligations. It is important that decisions to close or to keep open individual inshore commercial fisheries on the basis of their propensity to capture multiple stocks, particularly stocks that are below conservation limits, would be made on the best available scientific information.

Given that recent advances in genetic analysis have enabled assignment of salmon caught at sea or inshore to their home rivers with a high degree of probability, it is proposed to collect scale samples from salmon taken in inshore commercial fisheries (drift net, draft nets and fixed bag nets) and to use these genetic techniques to assign salmon to their home rivers. This DNA profile information will be compared to genetic data contained in a river specific juvenile baseline database, currently being developed in the Atlantic Salmon Arc Project (ASAP).

The Marine Institute is currently collecting genetic material from commercial fisheries operating at sea, particularly offshore, to determine the river composition of the salmon catches nationally and at district level. The objective of the additional work is to answer questions about stock composition at the sub-district level targeting specific inshore fisheries in particular locations, thus determining the river composition of those identified inshore fisheries on a site-specific basis.

If the results of genetic analysis show that some estuarine drift net fisheries exploit individual salmon stocks or salmon stocks from a number of rivers in home estuaries, these nets could continue to operate provided the rivers entering those estuaries were above conservation limits.

It is also proposed to undertake a study on the survival of salmon caught and released by different methods of capture in a number of Irish rivers. This information would be very valuable in providing confidence in the practice of catch and release in Irish rivers. The study will also be important in promoting a proper code of practice for catch and release. Catch and release of salmon by anglers in Ireland will become increasingly important as a conservation measure in the coming years.

These projects should yield important information about the commercial and recreational fishery to guide policy towards restoring salmon stocks in threatened catchments while permitting the harvest of salmon where stocks are abundant.

Many of the existing salmon fishermen are already engaged in diverse inshore fishing activity. The salmon fishing effort takes place mainly in July and August and this effort could be redirected towards inshore stocks in the future. In the context of ensuring a sustainable future for inshore stocks, Bórd Iascaigh Mhara (BIM) is working with local inshore groups with a view to putting in place strengthened management and conservation measures for inshore stocks around the coast.

4.1 2006 Fishery Management Actions

This involves reductions in the quota available to both commercial fishermen and anglers in 2006 and to fully align with the scientific advice on the management of the wild salmon fishery by 2007.

In 2005, the total catch for all salmon was 143,541. Accepting the recommendations of the National Salmon Commission and the National Fishery Managers Executive, the total allowable catch for 2006 will be 91,367 for the commercial sector and 15,000 for angling.

The draft regulations make provision for the restriction on the annual angling bag limit of 10 fish per angler for 2006; the NSC had recommended a limit of 15 fish per angler but it was felt that it would be necessary to contain the total harvest by anglers to 15,000 fish, given that there is no appreciable reduction in the average angling catch (25,000) over the past five years and in the interest of balanced treatment of all stakeholders.

The regulations also provide for the introduction of compulsory catch and release from 1st September in 8 districts that are not meeting conservation limits as the fishery managers and scientists have argued that there is an absolute need to conserve stocks in those districts.

4.2 Irish Implementation Plans for 2007 and beyond

4.2.1 Alignment with scientific advice on precautionary catch

In recognising that these reductions and full alignment with scientific advise cause fishermen great difficulty and that full alignment with the scientific advice will likely compound these problems an independent group has been established to examine the implications of the new regulations for the commercial sector in 2007 and beyond and to make recommendations on the options available to address any financial hardship that may arise. The group will focus primarily on determining the scale of financial loss that may be experienced as a result of the measures that need to be imposed to fully align with the scientific advice and the precautionary principle.

4.2.2 River Specific Salmon Action Plans

The scientific advice for 2007 assumes that there will be no fishery operating outside the

estuary or river mouth in order to safeguard individual salmon stocks which are below Conservation Limits. Catches will be restricted to harvest of salmon from stocks which are shown to be above Conservation Limits or to a carefully monitored programme of catch and release where they are not. In order to facilitate this, a comprehensive Genetic Stock Identification programme has been funded under the Irish National Development Plan (NDP) aimed at identifying fisheries in bays and estuaries which take multiple stocks and which will also have to be curtailed or closed if contributing stocks are not meeting Conservation Limits.

Fish counting facilities will continue to be supported and developed. At present there are approximately 12 fully operational counters where a time series or information have been developed. The information has already been used in the scientific advice process in 2006. A PhD study involving the use of hydro-acoustic counting technology for stock assessment in large Irish rivers has commenced and this will provide the operational procedure and protocols for counters in the Moy initially, and subsequently the Cork Blackwater, Laune and Suir. There are up to a further 10 counters which need to be consolidated and validated for use in national assessments and this will be initiated in 2007.

4.2.3 Management of fisheries

There are currently over 20 counting facilities where stock size can be measured against compliance with river specific Conservation Limits. For many others the rod catch is sufficient to allow a measure of the stock to be calculated using a known range of angling exploitation rates. In instances where there is no direct estimate of stock size available, compliance with Conservation limits will be measured in relation to other rivers in the district or vicinity and the precautionary approach will be adhered to.

4.2.4 Protection and restoration salmon habitat

Since the 1970s, Fisheries agencies have been working with other authorities to advise and reduce the impacts of the various land use practices on waters and river habitat. Following the implementation of the Water Framework Directive and the formation of river basin district management structures, a collective approach to reducing all adverse impacts on aquatic resources is now in place. Having characterised the risks posed to water-bodies nationally, Programmes of Measures are being developed to address habitat impacts / land use practices and to restore impaired water bodies to good status.

4.2.5 Management of aquaculture, introductions and transfers

The Marine Institute and the Regional Fisheries Boards will continue to monitor the incidence of escaped farm salmon in catches and rivers and advise on mitigation actions including direct removal by traps in certain circumstances.
Similarly, existing protocols for the management of aquaculture operations will continue with relevant agencies and state bodies currently engaged in research, development, enforcement and administration.

Adequate control of the sea louse *Lepeophtheirus salmonis* (Kroyer) continues to be a problem at certain marine salmon farm sites in spring. Annual monitoring of wild sea trout returning pre-maturely to rivers continues to record heavy lice infestation in estuaries where high lice levels are recorded on farm salmon in spring. Sea trout stocks in some rivers are

now at critically low levels and consistent adequate control of sea lice on salmon farms will be required if stocks are to recover.

4.2.6 Restocking and genetic intrusion

All stocking activities will continue to be regulated by the Department of Communications, Marine and Natural Resources in accordance with the national stocking policy and with NASCO guidelines on restocking with the principal objective being to restrict as much as possible the interactions between cultivated and wild salmonid populations.

5. The evaluation procedure leading to scientific and management advice

5.1 Information and data

Every effort is made to monitor the performance of stocks (attainment of Conservation Limits) at both the river and district level and consequently to assess the status of individual and aggregated district stocks. Several sources of information are used in this process.

Commercial catch data - The commercial catch statistics are an important source of quantitative information, particularly in determining the size of the returning stock and the attainment of district Conservation Limits. Catch records are obtained from commercial salmon dealers' registers and are available for the period 1971-2000. Following implementation of the wild salmon and sea trout tagging scheme, which commenced in 2001 (Ó Maoileidigh *et al.*, 2001; Anon 2004), the catch data are derived from the logbook returns of commercial and recreational fishers.

Rod catch data - The reported rod catch from the wild salmon and sea trout tagging scheme is adjusted to take into account the numbers of fish that have been caught by anglers who have not returned their logbook. The adjustment follows Small (1991). Exploitation by angling is generally between 10% and 20% of the total river stock available (Shelton *et al.*, 2001). Therefore this range of values is used to provide an estimate of the total standing stock in the river prior to angling taking place and the number of spawners remaining after the fishery. It is recognised that some rod exploitation rates will fall outside this range e.g. they are possibly higher than 20% in very well fished rivers such as Ballysadare, Corrib, Moy etc. Account will be taken of these exceptions in the formulation of advice. In the main, however, the fish counter data suggests that there is good coherence between the adjusted rod catch and spawning escapement levels. As an example, the estimated spawning escapement into Irish rivers in 2004 was 184,382 1SW salmon (ICES 2005). The estimated rod catch in 2004 was 26,202 (Wild Salmon & Sea Trout Tagging Scheme) suggesting a national rod exploitation rate of approximately 14%, well within the range suggested. This assessment approach is best applied where there is a consistent level of fishing activity in the river system. For many small rivers this will not be the case. Consequently, for rivers with an estimated Conservation Limit of 200 or less or where the average reported rod catch, between 2001 and 2004, is 10 or less, this assessment approach is not applied.

Total traps and counters - Data from the Burrishoole river, which is a national and international salmon index river system, provides a direct measure of performance of an Irish salmon stock.

Count data are available for up to 17 fish counters nationally, since 2001. In interpreting the count data and utilising them as measures of the attainment of Conservation Limit, the following approach has been adopted. It is assumed that all of the downstream counts up to the end of May represent out-migrating kelts i.e. fish ascending the river in the previous year. The downstream count from June to December is then subtracted from the upstream count in the same period to provide the "net" run of fish. This corrects for fish counted upstream but which may then come back downstream. The ratio of salmon to sea trout, obtained during

video analysis (resistivity counters) or image analysis (infra-red counters), and is applied to fish observed over the entire run in order to determine the number of salmon in the run. The Slaney and Cork Blackwater counts are raised by a factor of two to allow for the partial nature of these counts. It is acknowledged that this may be an underestimate but until other verification is obtained provides at least a minimum count. For those counters where the possibility of fish moving over the weir has been reported (e.g. Bandon), the recorded count is raised by a further 10%. In those situations where the majority of the rod catch is made above the counter, the rod catch is subtracted from the fish counter record.

National Coded Wire Tagging and Tag Recovery - The programme was initiated in 1980 to estimate marine survival of Irish salmon stocks and exploitation rates by high seas fisheries, and home water commercial and recreational fisheries (Browne, 1982). A 1 mm long magnetised tag, etched with a specific batch code is injected into the nose cartilage of juvenile fish, usually pre-smolts. The code identifies the origin and release conditions of any fish subsequently recaptured. The adipose fin is removed to facilitate the identification of these fish in the recovery programmes. Tagging has taken place using over 10 hatchery stocks and between 1 and 3 wild salmon stocks. Since 1980, up to 200,000 salmon have been individually examined each year to identify coded wire tagged salmon and recover these tags. Over 50% of the declared catch has been examined in some years. In 2005, over 44,000 salmon were examined representing approximately 30% of the declared catch. Information is also collected from in-river traps and broodstock returns to allow a complete return of fish to be estimated and providing invaluable information on marine survival and exploitations rates for these tagged stocks.

Other data - Information on juvenile abundance indices derived from electro fishing surveys carried out annually may also be a useful surrogate of stock performance and will be developed in the future. Redd counts are currently being compiled from many salmon rivers nationally and will also serve as an index of stock abundance.

Water Quality Assessment - The Environmental Protection Agency (EPA) carries out a triennial survey of the biological elements of water quality at over 3,300 monitoring stations on main river channels. These surveys derive a biological quality rating or 'Q value' of waters at each monitoring station. Recent studies carried out by the Central Fisheries Board (T. Champ, *pers. comm.*) correlating the presence or absence of individual fish species to water quality (Q values) indicate that there is a relationship between juvenile salmon distribution and water quality. A GIS database was developed to link river habitat with water quality data provided in the Environmental Protection Agency's (EPA) 'Biological River Monitoring Programme'. A custom GIS automated function determines the Q value for each river by a geographical cross-reference to the corresponding element in the water quality database. Water quality statistics are taken directly from McGinnity *et al.* (2003).

5.2 Estimating the total returns of salmon and spawning stocks

Estimates are made of the total ***returns*** prior to the fisheries taking place and the ***spawners*** remaining after the fisheries using a run reconstruction approach similar to that described by Potter and Dunkley (1993) and Rago *et al*. (1993). Following Potter *et al*. (1998) the model takes the catch in numbers of 1SW salmon in each district, then raises it to account for exploitation rates and estimates of non-reported catches. The two last parameters are

generated from the National Coded Wire Tagging and Tag Recovery Programme (Browne, 1982; Ó Maoileidigh *et al*., 1996) described above.

In those districts where there are no specific exploitation rate data, the maximum and minimum exploitation rates either nationally or based on regional indices are used. Exploitation rate data for individual districts are based on the estimated range of values for the rivers monitored in the Coded Wire tagging programme in those districts or the next nearest districts.

Unreported rates prior to 2000 are based on best information available to Departmental Fisheries Inspectors in that period. After 2000 and with the introduction of carcass tagging and logbooks, these unreported rates have been reduced to account for the increase in the proportion of the legal catch now being declared. As unreported catch cannot be estimated precisely, minimum and maximum values likely to encompass true values are provided, based on local information or inspection. The spawning population is estimated by subtracting the catch from the returns.

5.3 Provision of Harvest Guidelines

Once estimates of average spawners, average catch, and district Conservation Limit (CL) are produced, harvest options are provided along with the associated probability of meeting the District Conservation Limit (Figures 6 to 8). It should be noted that as the harvest increases, the chances of meeting the Conservation Limit decreases. Following the procedure used by ICES for the provision of catch advice for West Greenland, the harvest option that provides a 0.75 probability level (or 75% chance) of meeting the Conservation Limit in a given district is highlighted. The average catch (2002 to 2005 by all methods) is also shown for comparative purposes. In following a precautionary approach, increases over the average catch for the period 2002 to 2005 should not be permitted even if the harvest option at the 75% probability of meeting the Conservation Limit is higher. This is because each district fishery catches salmon destined for other districts and there is clearly a need to protect vulnerable stocks in these other districts. This advice will be reviewed annually to assess any improvement in the status of these vulnerable stocks. Where there is no harvest option that will provide a 75% chance of meeting the district Conservation Limit, then there is no surplus of fish to support a harvest (commercial or rod). Based on the current mixed stock fisheries, examples of the risk outputs and application of the harvest guidelines are shown in Figures 2 to 4. These risk plots show the probability of meeting or exceeding the district Conservation Limit and the harvest options by all methods (commercial and rods) of one sea winter (1SW) salmon.

A schematic of the scientific procedure leading to the Precautionary Catch Advice is shown below in Figure 9.

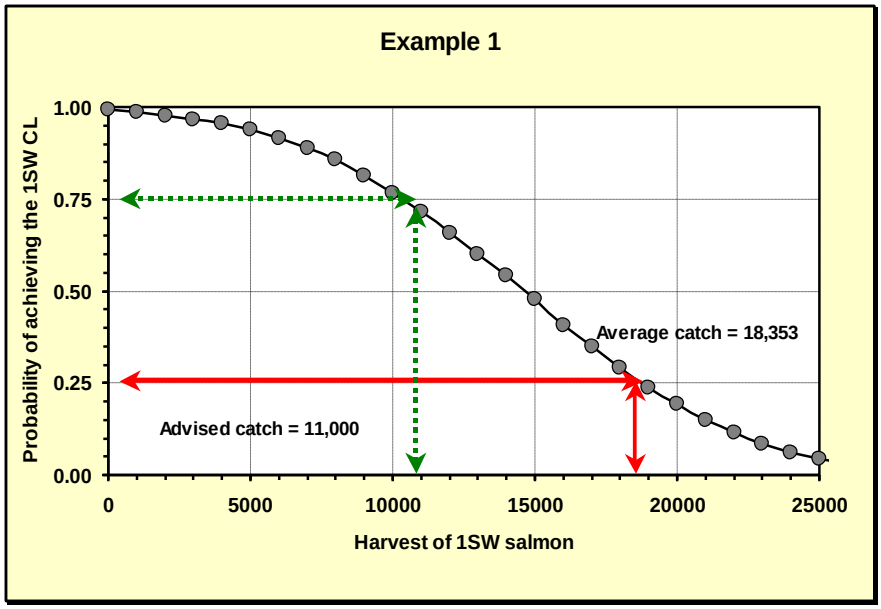


Figure 6 Example 1 district risk plot. The average catch for this district (2001 to 2005, all methods, excluding sea trout and hatchery fish, but including an unreported catch) was 18,358 1SW salmon. At this level of harvest there is only a 25% chance that the Conservation Limit will be met. The harvest option that provides a 75% chance of meeting the Conservation Limit is approximately 11,000 1SW salmon.

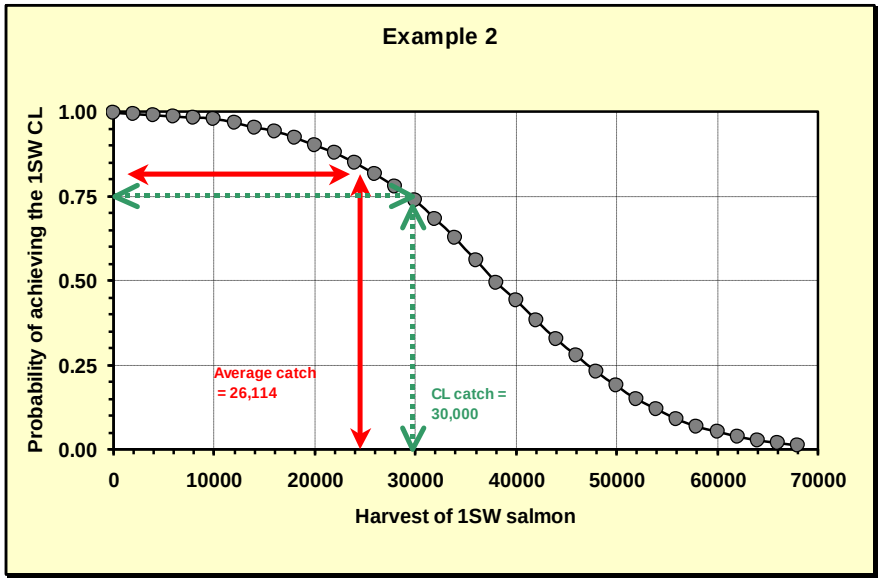


Figure 7 Example 2 district risk plot: The average catch for this district (2001 to 2005, all methods, excluding sea trout and hatchery fish, but including an unreported catch) was 26,114 1SW salmon. At this level of harvest there is a greater than 75% chance that the CL will be met. The harvest option, which provides a 75% chance of meeting the CL, is approximately 30,000 1SW salmon. As the average catch is lower than the harvest option at 75%, the lower catch is selected as the precautionary catch. This is because this district fishery catches

salmon destined for other districts and there is clearly a need to protect vulnerable stocks in these other districts. Until significant improvements in these stocks occur the average catch when lower should be considered.

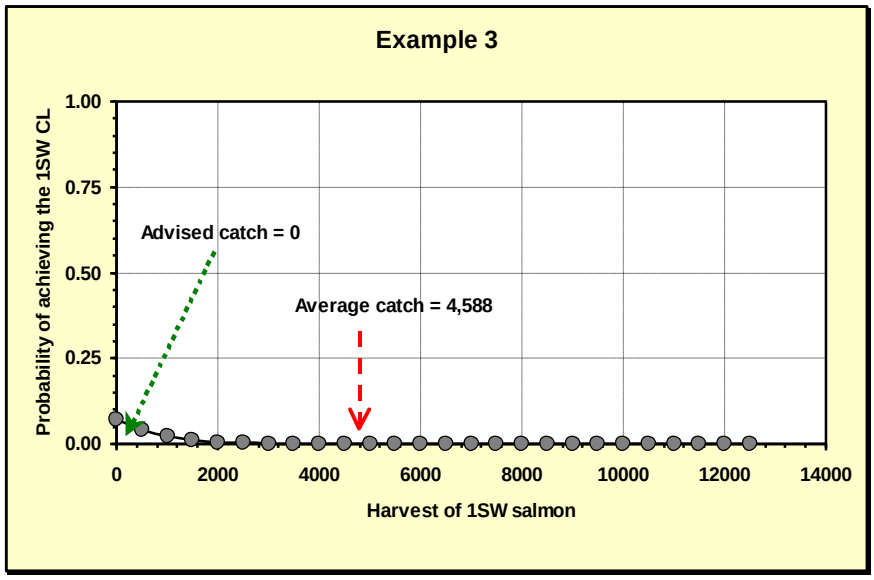


Figure 8 Example 3 district risk plot: The average catch for this district (2001 to 2005, all methods, excluding sea trout and hatchery fish, but including an unreported catch) was 4,588 one-sea winter salmon. At this level of harvest there is no chance that the CL will be met. Similarly, there is no harvest option, which provides 75% chance of meeting the CL. In this instance there is no surplus fish over spawning requirements to support a harvest (commercial or rod). This also suggests that mixed stock fisheries in other districts impacting on this district should also be curtailed.

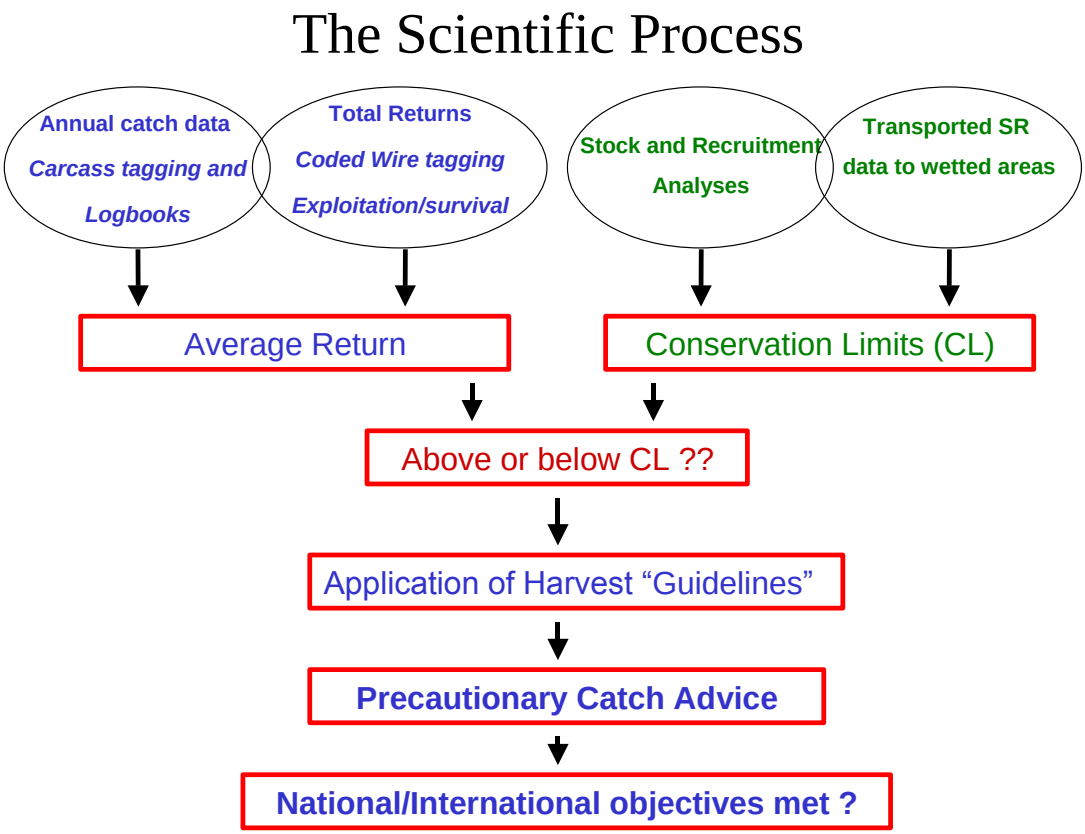


Figure 9 The Scientific process for the provision of catch advice for Irish salmon stocks

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