Sea Trout Workshop

9th & 10th February 2011, Plas Menai, Bangor

Organised by the Atlantic Salmon Trust, Suite 3/11, King James VI Business Centre, Friarton Road, Perth PH2 8DGG

www.atlanticsalmontrust.org

ATLANTIC SALMON TRUST

SEA TROUT WORKSHOP

9 &10 February 2011, PLAS MENAI, BANGOR

1 INTRODUCTION

1.1 The objectives of the Workshop, which was organised by the Atlantic Salmon Trust with financial support from the Environment Agency, were to consider what progress had been made in sea trout *(Salmo trutta*) research since the 2004 Sea Trout Symposium in Cardiff and to identify continuing gaps in our knowledge. The Workshop concentrated on what managers and regulators need to know to manage sea trout stocks and on the research needed to meet their requirements.

1.2 The Workshop did not attempt to review the whole range of existing work. Instead, it concentrated on a limited number of key topics;

1. management priorities ;
2. stock structure and composition;
3. habitat requirements;
4. monitoring and assessment methods.
5. key threats

1.3 In considering these topics the Workshop focused on issues that are specific to sea trout rather than generic issues that affect all species including sea trout. This report summarises the outcome of the discussions at the Workshop and records the recommendations for further work that the Workshop agreed on; it is not a detailed record of the discussions.

1.4 The Workshop was attended by invited participants from Britain and Ireland; they are listed in Annex A. The Workshop Agenda is at Annex B

2 PROGRESS SINCE 2004

2.1 The 2004 Symposium identified major strategic priorities for further research and investigation. Progress on many of these has been limited. In advance of the Workshop a comprehensive inventory of current research on sea trout in Britain and Ireland was drawn up (Annex C) and from this it can be seen that while a good deal of work is being done, and some significant progress made, the coverage and scope is patchy. An important advance has been the development of the three EU Interreg funded programmes – Living North Sea, (LNS), Celtic Sea Trout Project (CSTP) and Atlantic Aquatic Resource Conservation (AARC) project. When these are completed we should have baseline genetic data on sea trout stocks covering most of England and Wales and the east coasts of Scotland and Ireland. The outstanding gaps in this coverage are the west coasts of Scotland and Ireland.

3 OVERVIEW OF THE WORKSHOP

3.1 The Workshop's primary aim was to produce advice to research funders, scientists and managers on research and monitoring priorities. It sought to produce a clear programme of future work, involving specific projects and, where necessary, further meetings, workshops etc on particular topics. In the event, it proved to be impossible to decide on such a programme at a single meeting , but the Workshop was able to identify five key areas for future work and recommend further research/action on specific topics.

3.2 The Workshop agreed that the greatest area of uncertainty so far as sea trout, and indeed Salmo trutta generally, are concerned is our understanding of the factors (genetic, food availability, physical habitat characteristics etc) that influence the **life history strategies** that they adopt. Anadromy is the defining characteristic of sea trout, but going to sea is only one life history strategy that trout can adopt. Trout may remain resident close to their spawning areas or migrate within rivers or large lake systems (croneen and dollaghan) lakes or brackish estuaries (slob trout). The Workshop recommended that one of the principal focuses of future work should be the development of a comprehensive programme, provisionally titled ***Life History Optimisation in Trout in a Changing Environment,*** to explore the factors that influence these choices, together with the ways that climate change might affect them. ..

3.3 The Workshop agreed that another significant area of uncertainty was the **role that** estuaries **and coastal habitats** played in sea trout life cycles. Estuaries, in particular, are complex, and varied, environments which appear to be of importance in several different life stages. It recommended the development of another work programme to address these uncertainties.

3.4 So far as freshwater habitats are concerned, the Workshop concluded that a greater focus was needed on the **significance of small streams for sea trout production;** these provide important spawning habitat, but are easily blocked by impassable culverts, farm crossings and minor land use changes. Research is needed to quantify the contribution small streams make to sea trout recruitment. There is also a need to identify both actual and potential sea trout spawning streams, and to draw attention to the need to protect them.

3.5 Monitoring and assessment, of stocks, habitats and fisheries, play an essential role in identifying potential threats and assessing the effectiveness of management measures; monitoring data is currently a limiting factor in stock model development. **The Workshop agreed that there are significant shortcomings in the monitoring and assessment of sea trout stocks**. Remedying these is a priority

3.6 The Workshop agreed that more should be done to establish **the social and economic importance of sea trout and sea trout fisheries.** In particular, more work is needed on the ecosystem services value of these fisheries. It recommended that a seminar or workshop, attended by the appropriate experts, should be organised to take this forward.

3.7 A better understanding of both anadromy and the social and economic aspects of sea trout and their fisheries is needed if sea trout are to be managed within a clearly defined management cycle, involving set management objectives. This is discussed in Section 4 on **Management Priorities**. The Workshop agreed that sea trout should be managed on the basis of the management cycle described in 4.3; this involves, inter alia, assessing the state of the stock/habitat against indicators that will show whether management objectives are being met. These objectives in turn should be determined by defined outcomes linked to stock abundance and diversity, social and economic values and habitat conservation. The management process described would enable research requirements to be determined according to those scientific issues that are identified as constraints on management.

3.8 Section 5 looks in more detail at **Stock Structure**, and in particular at the issues raised by anadromy and life history strategies, which directly affect stock structure. It then discusses the problem of modelling sea trout populations. The Workshop agreed that sea trout population models would be useful, and should address life history optimisation as well as incorporating conventional population dynamics processes.

3.9 Section 6 considers **Habitats,** focusing on the issues that are of particular relevance to sea trout, and are highlighted above, the role of small streams in freshwater (6.2) and the role of estuaries and coastal waters (6.3).

3.10 **Monitoring and Assessment Methods** are discussed in section 7. Areas covered include the need to have a comprehensive inventory of sea trout rivers and streams in the British Isles (7.2), and ways of assessing stock status and diversity, social and economic values and habitat quality; the Workshop made a number of recommendations for

improving the range and quality of data collected. The Workshop also noted the need to conserve historic data and reports, and recommended that ways of doing this should be explored (7.21).

3.11 The final section of the report, section 8, considers **Threats to Sea Trout**. There is a comprehensive list of threats (8.2), but the Workshop focused on the more limited range of threats that it identified as being particular issues for sea trout. These include stocking, net fisheries, predation, aquaculture and renewable energy projects.

3.12 The report concludes with a summary of the Workshop's **Recommendations,** listing first five key, overarching recommendations (highlighted in 3.2 to 3.6 above) and then more specific recommendations. 3.13 Similar recommendations have been made in the past and many of the points and specific recommendations made by the Workshop echo those made by the 2004 Symposium, which in turn deplored the fact that these largely repeated recommendations made in 1984 and 1994. In the hope of breaking this pattern, the Workshop agreed to establish a small steering committee[1] to ensure that the work it recommended is taken forward. Much will, of course, depend on the availability of funding, but the first step will be to develop projects, in collaboration with potential funders, for which funding can be sought. It is intended that these should be part of a comprehensive programme of future research and monitoring on sea trout that will guide government departments and agencies, research councils, fisheries managers, rivers trusts and associations, fisheries and angling NGOs and universities in reaching decisions on funding.

[1] The steering committee comprises: Ken Whelan, John Armstrong , Ted Potter, Nigel Milner, Graeme Harris, Graeme Peirson, Dylan Bright , Alistair Maltby and Ivor Llewelyn.

4 MANAGEMENT PRIORITIES

Defining a common management process

4.1 The overall aim of the Workshop was to recommend future research programmes that will ensure the conservation of sea trout stocks and sustainable management of sea trout fisheries. The Workshop agreed that consideration of these research requirements should be framed around a fisheries management cycle that identifies those scientific issues that are priority constraints to management, and that the focus of the discussions should be on topics that are primarily relevant to sea trout.

4.2 As with any other exploitable resource, effective management of sea trout requires a clear vision for what 'management' is trying to achieve, and for this purpose there is a need to define clear and relevant management objectives. Such objectives are essential for demonstrating the context and importance of any research proposals, particularly at a time when funding opportunities are likely to be limited. The objectives are likely to be influenced by a range of political, conservation and economic drivers that may differ from a local (e.g. river specific) to a national (e.g. statutory) level but need to relate to the outcomes and benefits that are sought from management of the resource. Following on from this, there is a need to define the criteria (or indicators) against which the achievement of the management objectives can be evaluated.

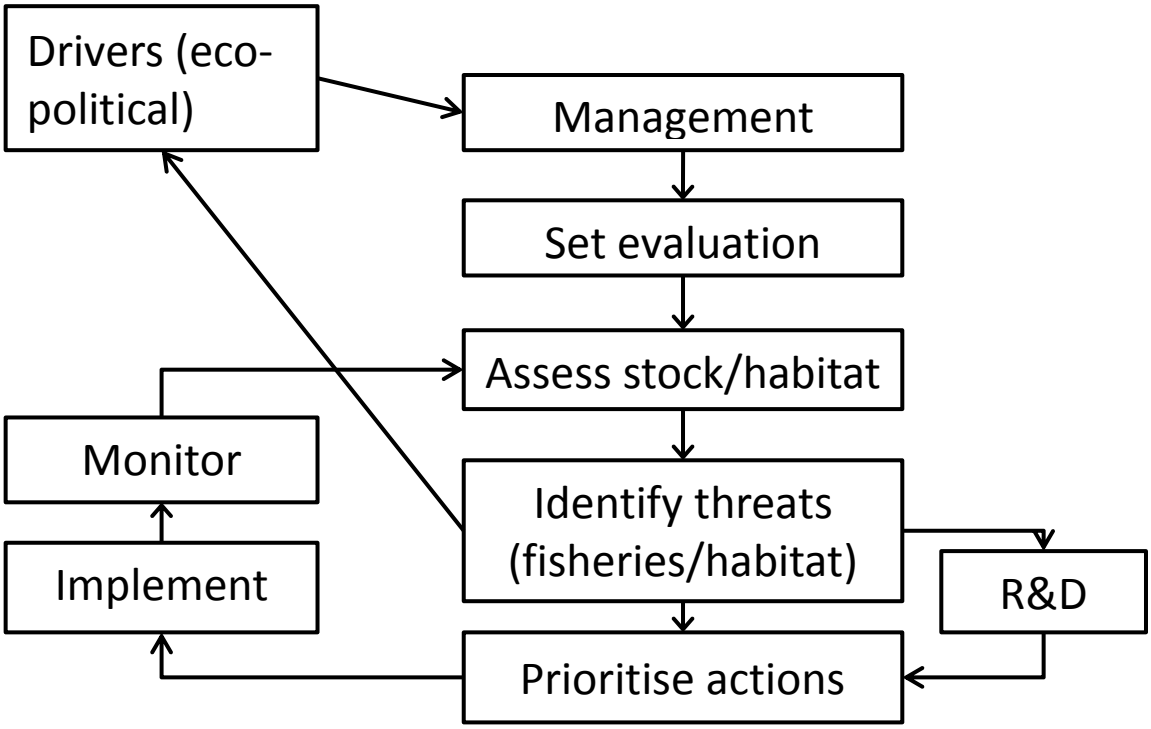

Figure 1 Management cycle

4.3 Although the objectives and indicators may be modified over the medium to long term, and even the overall drivers may change, these elements set the 'rules' for a regular cycle of assessments and management actions. This requires a process of (1) assessing the present state of the stock and/or habitat against indicators, (2) identifying specific threats, (3) identifying and prioritising remedial management actions, (4) implementing the identified actions, (5) monitoring the outcomes of the actions taken, and (6) re-assessing whether the management objectives (as assessed against the chosen indicators) are being achieved. This entire process comprises the management cycle (Figure 1) and must be sufficiently reactive to respond to immediate and longer-term threats and also provide a framework from which to prioritise research and development needs. It is important to note that detailed assessment of sea trout stocks is often extremely difficult and much local management action and research is sensibly conducted without rigorous adherence to the ideal management cycle. For example, it may be obvious that certain environmental factors are likely to constitute a serious threat to a population and it may be more prudent to invest in ameliorating that risk directly rather than embarking on an assessment of stock.

Defining management objectives

4.4 Management objectives for sea trout may be established at a range of levels, from local to national, and the supporting evidence requirements may be quite different. For the management of sea trout as a nationally significant resource, desired outcomes are likely to relate to one or more of the following themes:

1. Abundance and diversity: - optimising numbers of spawning fish to maximise output of high quality smolts and sustaining diversity (inter and intra specific) and fitness;
2. Social and economic value/ecosystem services: – maintaining the economic, cultural and environmental value of resource and the fisheries they support
3. Habitats: – protecting, conserving and restoring the full range of habitat types supporting the different life stages within freshwater, estuary and marine environments.

4.5 Conservation objectives underpin all management of sea trout, but the social and -economic value of the resource and related ecosystem services are also a significant justification for Government spending. However, more information is required both on the social and economic valuation of sea trout fisheries and the conservation requirements of the stocks in order to set sound objectives. As an interim measure, management objectives are sometimes set on the basis of maintaining or enhancing catches or angler participation, but this is very risky because these may be maintained in the face of stock decline and so not be sustainable. Habitat protection is an important objective in its own right, and in the absence of good stock assessments may be the only avenue for management, but ideally it should be linked to improvements in abundance and social or economic values

Defining stock/habitat indicators

4.6 The choice of indicators to evaluate compliance with stock conservation objectives is likely to be constrained by the practicalities and costs of the required monitoring, and this in turn may affect the practicality of setting particular objectives for management. Due to the wide range of life history strategies exhibited both within and between different sea trout populations, the practicality of setting biological reference points such as conservation limits is uncertain. Given the gaps in our knowledge of trout biology, particularly in our understanding of the factors regulating life history variations, it may be difficult to set appropriate limits or targets for specific life stages. This in turn will affect decisions about the ways in which stocks should be assessed and hence the monitoring requirements for the migratory and non-migratory components of the stocks. **There is a clear need for further research into the practicality of setting biological reference points and into alternative indicators for use in stock assessment**.

4.7 Maintaining diversity within trout populations may be viewed on a range of levels, including preservation of genetically discrete populations, protection of components exhibiting different life-history strategies and also the conservation of the wide range of habitat types utilised (and required) by sea trout (e.g. small streams unused by salmon). Genetic techniques are increasingly capable of differentiating an ever-growing number of separate 'sub-stocks' and variations within and between populations, but the extent to which we should try to manipulate or manage this variation, which is likely to be the subject of selective pressures from human activities and the environment, is unclear and will require careful consideration. Assessment techniques focusing on 'operationally significant units' of populations (Laikre et. al 1999[2]) may provide some practical guidance.

4.8 Without a clear understanding of methodologies for the valuation of the sea trout resource and of intra and inter-specific diversity, the Workshop was unable to propose quantitative social or -economic indicators. Although a large number of valuation studies have been undertaken on different fisheries/species, taking account of both user and non-user values, there is limited agreement on how such valuations should be conducted and little guidance on how the results should be used in making management decisions. However, the Workshop recognised that advances are being made through such initiatives as The Economics of Ecosystems and Biodiversity (TEEB) study. This is a major international initiative which aims to draw attention to the global economic benefits of biodiversity, to highlight the growing costs of biodiversity loss and ecosystem degradation, and to draw together expertise from the fields of science, economics and policy to enable practical actions moving forward. **The Workshop recommended that a seminar or workshop, attended by the appropriate experts, be organised to take forward work on the economic, social and ecosystems services value of sea trout and sea trout fisheries, including the development of quantitative indicators**.

[2] (Laikre, L. *et al* (1999) Conservation genetic management of brown trout (Salmo trutta) in Europe. Report of the Concerted Action on Identification, Management and exploitation of Genetic Resources in the Brown Trout (*Salmo trutta*) ("TROUTCONCERT" EUFAIR CT97-3882).)

5 STOCK STRUCTURE

Anadromy

5.1 Anadromy is the defining characteristic of sea trout, being a threshold quantitative trait influenced by multiple genes and environmental factors. Variation in the expression of anadromy and related life history traits in response to environmental gradients determines population structure (e.g. size/age/maturity/survival) variation between and within rivers. Describing these variants and traits and understanding the causes of their variation should be central to understanding, modelling and predicting stock change.

5.2 The Workshop agreed that understanding anadromy was one of the key questions relating to sea trout. In particular, there is a need for an understanding of the processes affecting anadromy; specifically, the interplay between environmental and genetic factors. There is evidence of a significant genetic component, for example from stocking studies on the Conwy. However, there is wide agreement that the environment plays a critical role in influencing the level of anadromy, with populations under environmental stress in freshwater, mainly through competition for food, being more likely to become anadromous. Likely mechanisms for this have recently become clearer; involving the balance between intrinsic (genetically determined?) metabolic rates of fish and growth opportunities provided by their freshwater environment.

5.3 It was also noted that there is published work on links between habitat characteristics and degrees of anadromy, and that this question is being looked at further as part of the CSTP. A complicating factor is that there seem to be catchment scale influences on anadromy as well as reach-scale ones, because there appears to be less anadromy in the upper zones of catchments. Habitats with the same characteristics in different parts of a catchment could therefore be associated with different levels of anadromy. This may reflect the energetic demands of migration, in which the benefits of migration are expected to be less, all things being equal, in the highest reaches of large rivers. .

5.4 While the size and age at which trout smolt is believed to be influenced in large part by the freshwater environment, the age at maturation and first return may be affected by experiences in both freshwater and the sea.. It's therefore important to take account of factors in both freshwater and the sea when considering life history processes. Factors controlling maturation are not fully understood, but may be influenced by marine growth conditions as well as consequential effects of the freshwater experience. In any event, (sea) trout typically display widely varying life history tactics, even within a single population, with some fish not migrating (typically males), and others returning after 1-3 years at sea and repeat spawning. This phenotypic diversity within sea trout populations is thought to confer advantages in terms of population resilience in the face of fluctuating environments.

5.5 Research into anadromy would be simpler if it was possible to assign the maternity of juveniles to resident or migratory trout. There are microchemical and isotopic methods which work in the youngest fry stages, based on geochemical environments of the mothers.

Also, an assay technique is available to distinguish between eggs originating from sea trout and resident trout based on differences in their carotenoid pigment content.

5.6 However, the Workshop noted that going to sea is only one life history strategy that trout can adopt and, as noted above, further important diversity lies in time of maturation and spawning frequency. These different tactics, and the factors that influence these choices, need to be explored alongside anadromy, together with the ways that climate change might affect them. **The Workshop therefore recommended the development of a comprehensive programme, provisionally titled *Life History Optimisation in Trout in a Changing Environment*.**

5.7 In the meantime, **existing and prospective projects on individual streams that could contribute to such a programme, such as an evaluation of existing material from the Tadnoll brook (R. Frome) should be identified.** More also needs to be done to identify the migratory and non-migratory trout components at a sub-catchment level.

Modelling sea trout stocks

5.8 Modelling is simply an approach to assembling data into mathematical forms that allow its better interpretation and to formalise answers to management questions. For example, how might stock composition alter in the face of climate change or changing fishing pressure? Such models may be generic in nature or attempt to describe a specific population in detail. As such modelling is just another approach to be used in assessment and management. However, in the case of sea trout in which much stock spatial and temporal variability is believed to derive from the major life history switches (e.g. anadromy and time of maturation), there is a case for explicitly developing the modelling in terms of life history responses and optimisation. This will require active promotion because it is novel to most organisations in British Isles and will make particular demands on monitoring data.

5.9 Distinctions can be made between theoretical life history optimality models, which seek to describe the trade-offs amongst traits to maximise fitness, and life cycle models which conventionally do not include feedback (between traits). The two could be combined and this might offer improved realism, but there are difficulties in parameterising all such models, because conventional survey methods do not provide age-specific parameters such as survival, maturation and sex ratios. It is particularly difficult to obtain this information simultaneously for the migrant and non-migrant components of a trout population. The Workshop concluded that to be useful sea trout population models must address the life history aspects as well as incorporating conventional population dynamics processes such as density dependent regulation, take environmental and habitat variables in to account. **The possibility of developing comprehensive models on this basis should be explored.**

5.10 It was noted that from the managers' perspective it was important for models to be transferable between catchments. Various applications were discussed including exploitation control, assessment of stock status, production potentials of catchments and the impacts of climate change.

5.11 The size of the appropriate management unit also affects modelling approaches and practicalities. This introduces the problems of sampling scale, population sizes, distribution and connectivity. Underpinning these are the realities of the scales at which management, monitoring and assessment takes place, for these limit the resolution of data and application of models. At present there is a feeling that we are limited by data and understanding across all scales, but that life history framework offers a scientifically robust way to design and prioritise future research.

6 HABITATS

Freshwater

6.1 In freshwater sea trout need to have access to and from good quality spawning and nursery areas. The requirements of juvenile trout are reasonably well understood, and there are programmes in place under the Water Framework Directive to address problems such as diffuse pollution from agriculture, siltation and over-abstraction. There are also plans to identify and deal with barriers to the migration of salmon and sea trout in main rivers and their tributaries. While these are serious problems, and on many rivers resolving them will be the key to the successful conservation of migratory and resident trout, they are not exclusive to sea trout and so were not considered in any depth by the workshop.

6.2 The Workshop concluded that one topic which should be given greater emphasis was the significance of small streams for sea trout production**.** Although very small streams are not good holding habitat, they can be very productive spawning areas; they may host little more than the spawning stage of the sea trout life cycle, with the emerging fry emigrating quickly to larger channels downstream. However, they are easily blocked by impassable culverts, farm crossings and can be adversely affected by very minor land management practices. They are poorly protected by existing legislation. **The Workshop agreed that research is needed to quantify the contribution such streams make to sea trout recruitment**. Work is also needed to identify both actual and potential sea trout spawning streams, obstacles on them to up -stream movement and areas of degraded spawning habitat. In addition, more should be done to draw the attention of land and fisheries managers, and regulators, to the important role played by small streams and to the need to protect them.

Estuaries and Coastal Waters

6.3 The Workshop agreed that the role of estuaries and coastal habitats in sea trout life cycles is poorly understood. Estuary habitats are complex, and sea trout will behave differently in lowland estuaries with extensive inter-tidal habitat and in sea lochs. Topics for further research include the possible utilisation of estuaries by juvenile sea trout, movements and ecology of post-smolts, the significance of these habitats for finnock and adult sea trout and the impact of predation there. An important area for discussion is the development of techniques for effective sampling and movement studies in these difficult and varied environments. **The Workshop recommended the development of a comprehensive programme of research on the utilisation of estuaries, inter-tidal and coastal habitats by sea tout at all life stages**.

6.4 Estuaries provide the link between freshwater and marine environments, and need to be included in the management regimes for both. Catchment planning under the Water Framework Directive needs to include estuaries; in England and Wales this is nominally the case, but it needs to be more comprehensive. Estuaries also need to be included in Marine Framework Strategies.

7 MONITORING AND ASSESSMENT METHODS

General

7.1 Monitoring and assessment, of stocks, habitats and fisheries, play an essential role in identifying potential threats and assessing the effectiveness of management measures; monitoring data is currently a limiting factor in stock model development. **The Workshop agreed that priority should be given to remedying the significant shortcomings in the monitoring and assessment of sea trout stocks**. It recommended a number of specific measures, which are outlined in the remainder of this section.

Key areas for monitoring and assessment:

Extent of the resource

7.2 There is a lack of knowledge about which rivers contain sea trout in the UK and Ireland, although it is believed that sea trout use most of those rivers in Scotland that are accessible. In England and Wales (E&W), for example, rivers supporting major sea trout rod fisheries are the focus of management, but smaller systems, with little or no fisheries remain largely overlooked. The position is similar elsewhere.

7.3 A basic list of rivers currently containing sea trout, with some measure of the size of the resource (e.g. from catches or other information) is needed. Linked to a GIS, this would provide a useful visual map of the extent of the resource. An initiative along these lines is being developed as parts of the CSTP, the Living North Seas and AARC projects. An inventory of sea trout rivers would also be useful for studies into the social and economic, or biodiversity, value of the resource. **A GIS linked inventory of sea trout rivers should be**

developed, with supporting information on the size of the resource, and once the system is operational it should be taken up throughout the British Isles.

Stock status:

General

7.4 It was agreed that it was not clear how the conservation status of trout was assessed within the overall assessment of Good Ecological Status (GES) under the Water Framework Directive. **It was recommended that this point should be clarified.**

Adults

7.5 Catch, counter and trap data are commonly used to assess the status of adult sea trout returns. Catch data provide the most widely available indices of abundance. In contrast, returning stock estimates from counters or traps are produced on very few rivers.

7.6 In England and Wales, net and rod fishing effort, as well as catches, are recorded via the licence return system. However, for rod fisheries, no distinction is made between effort targeted at sea trout and that expended on salmon (although periodic surveys have been carried out to collect such information). In Scotland, there is no systematic means of collecting effort statistics from rod fisheries; similarly in Ireland there is no requirement to record angling effort targeted at fish <40cm (i.e. most sea trout). The absence of fishing effort data, as well as inconsistencies in the way sea trout catches have been recorded in time and between rivers, were noted as important shortcomings. However, good records of catch and fishing effort do exist for a few systems e.g. where fisheries are tightly controlled, or where special schemes are in place (e.g. angler logbook schemes). **Standardised protocols for recording catches, incorporating information on angling effort for sea trout, should be developed**

7.7 Catches of resident trout are generally less well documented than those of sea trout and adult brown trout are not routinely sampled at all. Angling club records can prove a valuable source of information, dating back to the 1920s on some rivers in Scotland, but need to be interpreted with care (e.g. taking into account changes in fishing methods, takeable size limits, etc.). Organised angling events – providing that enough capable fishermen are present – can prove an effective way of sampling trout in large rivers**. The Workshop recommended that adult resident trout populations should be sampled on a routine basis**

7.8 It is important to be able to distinguish between sea trout and non-migratory trout in counter data. This is not thought to be a problem on Irish counted rivers with significant lake systems as non-migratory trout are considered to remain lake resident and so effectively separate from river-run sea trout. On the Tweed, a bi-modal size distribution is evident from counts of ‘trout’ sized fish suggesting non-migratory and sea trout components can be identified in the run.

7.9 Experience at Burrishoole indicates that the downstream trapping of sea trout kelts can be an effective method of enumeration and less difficult than the upstream trapping of pre-spawners.

7.10 Formal methods to assess the status of sea trout stocks, e.g. by comparison with some benchmark or reference point, are less well advanced than in the case of salmon. Whole catchment sea trout stock-recruitment relationships have been produced on very few rivers (the Burrishoole is an exception), or extrapolated elsewhere, as part of general stock assessment procedures (e.g. in contrast to the methods developed for salmon in England and Wales and in Ireland). Catch based assessment procedures have recently been applied in England and Wales. Habitat-referenced systems have also been proposed.

7.11 Finally, description of stock life history structures, noted above as particularly important for sea trout science and management requires stratified collection of scales and the data they provide on age and reproduction. This is not a straightforward task and needs to be developed as part of a routine monitoring programme. (see also "stock diversity"). **Scale sampling from adult sea trout should therefore be developed as part of such programmes.**

Smolts

7.12 Rivers with facilities to evaluate sea trout smolt output are even less common than those with traps or counters to estimate adult returns. In Ireland, fixed smolt traps have been used for many years for this purpose on the Burrishoole, Connemara and Bush. Similarly, (temporary) Rotary Screw Traps have been employed on a number of rivers to obtain estimates of smolt run size (e.g. Spey, Tyne, etc.) or return rate (e.g. Tamar and Dee) using mark-recapture. On the North Esk, a long time-series of estimates of smolt output is available for salmon but not sea trout, despite the significant runs of sea trout on this river.

Fry and parr

7.13 Electrofishing surveys are widely used to monitor the distribution and abundance of fry and parr. Often, however, surveys have been designed with salmon in mind and so can under-represent reaches important for trout - particularly small/upland streams where salmon spawning is minimal or absent. These small streams are often among the most vulnerable to environmental degradation.

7.14 While it is usual to obtain length data from electrofishing samples of fry and parr; the importance of taking scales and weight measurements (to assess condition) - from at least a sub-sample of fish - was stressed. **Where juvenile trout are sampled in sea trout (accessible) reaches, scales, length and weight data should be recorded as a matter of course. Suitable sub-sampling protocols need to be developed to be used in the extensive routine national monitoring programmes.**

.

7.15 The Habitat models HabScore and FCSII have been used in England and Wales to predict expected trout (and salmon) densities at electrofishing sites, and so form the basis for identifying under-performing reaches where spawning levels or environmental quality may be an issue.

Stock Diversity:

7.16 Sea trout stock diversity has been described in terms of sea age composition and life history variation. In addition, a number of studies are currently underway, e.g. as part of the Celtic Sea Trout, Living North Seas and AARC programmes, to examine genetic diversity and stock identity. Adults' scales and size distribution data are essential for this purpose.

7.17 Aside from the use of genetic analysis for stock discrimination purposes, its application in defining 'effective population size', the link with 'census population size' and the implications for conventional approaches to fisheries management, were discussed. This is an area which is generally poorly understood by non-geneticists but appears to offer great potential to fisheries managers and requires better explanation. There is also a need for thorough testing of the potential of EPS to provide useful information on the actual numbers of anadromous trout and evaluation. **The potential of the genetic assessment of Effective Population Size methodologies to be used as a robust tool in the assessment the size of sea trout populations should be evaluated.**

Social and Economic values:

7.18 The rod licensing system in England and Wales provides information on the numbers of anglers fishing as well as data on age, sex, home address, etc.; information which is not readily available in Scotland or Ireland. Licence details are useful in answering some social and economic questions, but can not, for example, be used to evaluate how much money angling brings into local economies.

7.19 Other measures of value, not linked to angling, are important, and these should be developed by the workshop recommended in paragraph 4.7.

Habitat and environmental quality:

7.20 Assessing the connectivity and quality of riverine habitats is important as a means of judging the accessibility and the suitability of river reaches for supporting all freshwater life stages). Suitability is evident in three ways: (a) the physical channel habitat, controlling carrying capacity; (b) the local biological productivity and physical conditions (e.g. temperature) controlling growth opportunity and (c) the geographical location within a catchment, influencing migration costs. Various methods are employed in habitat assessment, from walk-over surveys to GIS linked aerial surveys and the use of LIDAR (the latter to identify potential barriers to migration). Site and catchment measured habitat variables are used in models such as HabScore (see above) to assess the status of juvenile populations. Information on environmental quality including data on water chemistry (various determinands) and flow, are usually routinely collected by fishery and non-fishery functions within the main Government agencies..

7.21 Water temperature is a particularly important variable to measure (in the context of climate change). Temperature data can be collected relatively cheaply and accurately using data loggers; these can be set to take several readings per hour and need only be downloaded once or twice a year.

7.22 Historic time-series of water temperature data are rare (in contrast, for example, to air temperature records). The merits of establishing an inter-agency network of data loggers to record water temperatures in rivers across the UK and Ireland were discussed. While this approach could probably be implemented relatively easily, the purpose of such a network would first need to be clearly established. The EA has recently completed a review of its temperature data holdings. Nevertheless, **consideration should be given to establishing a network of automatic river temperature loggers, possibly via rivers trusts and similar organisations**

Historic Data

7.23 The Workshop noted that there was a wealth of historic material in private hands on various aspects of sea trout biology and management; these included important data series. There was a danger that much of this would be lost if it was not catalogued and brought together in a single location. **The Workshop recommended that this be done,** and AST undertook to explore the practicalities.

8 THREATS TO SEA TROUT

8.1 The Workshop considered the principal threats faced by sea trout, with the objective of defining a small number of key priorities for research. Particular attention was given to problems affecting trout rather than other fish species. The identification of threats was structured around the three main environments in which sea trout occur: freshwater, estuary and marine. A simple risk assessment could be used to facilitate the prioritisation of these threats. This would involve scoring the threats according to their likelihood of affecting stocks and the potential magnitude of the impact if it occurred. The product of these values would provide a potential ranking based on the risk that each threat poses.

8.2 A comprehensive list of the threats identified by the workshop is given below. While many of the threats listed are not specific to sea trout, there are often specific issues that relate to sea trout. The threats defined by the Workshop as priorities (following discussion, not using the process suggested in the previous paragraph) are discussed further in the following paragraphs.

Freshwater threats:

1. Access/barriers to migration (weirs & culverts)
    - Upstream (adults)
    - Downstream impoundment (smolts & kelts)

2. Life history switching; anadromy v. non-anadromy
3. Stocking programmes
4. Water quality
    - Acute changes (e.g. Slurry releases). Particularly monitoring problems
    - General problems (acidification etc.)
5. Climate change (flows, temp & anthropogenic impacts)
6. Predation & conflicts with predator management (e.g. Cormorants, otters & goosanders)
7. Non-native species (e.g. signal crayfish)
8. Inappropriate conservation measures (adopting a one shoe fits all approach)
9. Land-use practices/loss of habitat (forestry, agriculture and construction of renewable schemes)

Estuary threats:

Catchment level

1. Low flow, high temp, low DO
2. Pollution (thermal, domestic, agriculture, chemical disruption)
3. Port development

Local threats:

1. Aquaculture
2. Predation
3. Invasive species
4. Commercial netting
5. Tidal barriers (sluices & barrages)
6. Renewable energy (tidal stream & barrages)

Marine Threats

1. Aquaculture (local eutrophication, sea lice)
2. Mixed stock fisheries
3. By-catch & illegal exploitation
4. Climate change
    - Altered currents
    - Temp (may be benefits too)
    - Marine productivity (timing of food availability for post-smolts)
5. Renewables
    - Windfarm/tidal (cables, construction)
    - Possible adv. by creating reefs
6. Predation (seals, cetaceans, fish)
7. Over exploitation of food resources (e.g. sandeels)
8. Marine acidification

Priority Threats

Stocking programmes for sea trout

8.3 Although there are continuing demands from angling groups for stocking programmes, these are problematic for sea trout, as using sea trout broodstock does not guarantee anadromous progeny. There are also practical hatchery management issues involved, as conventional hatchery rearing of sea trout stock to smolt stage is likely to produce brown trout, although stocking out at younger stages can produce sea trout from sea trout stock.

8.4 Adverse impacts from stocking are less obvious for trout than for salmon, for which there is now some evidence for local adaptations and structuring of multiple populations within rivers, associated with homing behaviour. There is some evidence that brown trout are adapted, as shown under the AARC programme. Chalk stream trout populations have been shown to be very different from trout of other areas using neutral mitochondrial markers. Work is going on at Exeter to define functional genetic markers that reflect adaptations to alkaline or acid waters but neutral markers are believed likely to be linked to functional variation. Regardless of the latest genetics findings, it makes clear management sense to assume that where local habitats vary substantially there is likely to be local adaptation and therefore local stock should be used for stocking.

8.5 It is also important to know more about genetic introgression between wild and stocked fish, **and there should be further research into this**. There is evidence that in many rivers with long histories of stocking, native stocks have retained their genetic identity; for example, studies on the Dart showed no lasting contribution from stocked fish over 50 years or so. How universal this observation is likely to be depends on a lot of factors. If, as in many historical cases, stocking simply involves tipping a bucket of fish off a bridge into a well-populated stream, then the absence of introgression is not surprising.

Net Fisheries

8.6 Net fisheries continue to take considerable numbers of sea trout in estuaries. Given the behaviour of sea trout during the marine phase, it is probable that many of these are taking fish from a number of different rivers. **Sea trout taken in these fisheries should be sampled to establish whether this is the case so that appropriate management action can be taken.**

Predation

8.7 Predation is a natural process, but in certain circumstances can be regarded as a threat to the sustainability of stocks. One example would be the effect of predation on stocks already weakened by other causes. **There is therefore a need to assess the contribution made by predation to the continuing decline of such sea trout stocks, for example those on the West coasts of Scotland and Ireland.**

.

8.8 Barriers may also contribute to artificially high levels of predation where migrants are delayed and concentrated above or below them. The impact on smolts may be particularly severe. **Research is needed to assess the effect of barriers, including those linked to hydropower schemes, on levels of predation on emigrating smolts and returning adults.**

Aquaculture

8.9 The Workshop agreed that the most pressing problem for sea trout in relation to aquaculture was the effect of sea lice in areas of marine salmon aquaculture, particularly in confined areas. There is clear evidence of the damage that lice can do to sea trout; however, there is a lack of information on the status of sea trout stocks in these areas; more information is also needed on their distribution and behaviour. Other key areas for research are the effect of different management regimes on lice levels and dispersion, and restoration of damaged stocks**. Future research should therefore focus on the status, distribution and behaviour of sea trout in such areas; on the effect of different management regimes on lice levels and dispersion; and on the restoration of vulnerable stocks .**

8.10 While management regimes need to be site specific, it is not possible to undertake detailed studies for all sites. There is also a need to engage with the salmon farming industry in taking forward studies in this area in order to develop a common understanding and acceptance of the problems and the best solutions. A limited number of in-depth studies should be undertaken to derive general principles which could then be adapted for particular sites

8.11 The Workshop also agreed that while this further research was needed, it should not be used as a pretext for delaying action to .reduce the impact of sea lice on wild salmonids.

Renewable Energy

8.12 In- river hydropower schemes can adversely affect up- and down-stream migration, and pose a particular threat to smolts. The risks are relatively well understood, although **further work is needed on the cumulative impact of a series of schemes at the stock level.** Estuary and off-shore renewable energy schemes could also have implications for sea trout, and indeed salmon

8.13 Estuary barrages remain a potential threat, as they could dramatically change the migration patterns of migratory salmonids. **Results of studies on existing barrages should be brought together and gaps identified for future work.** At the Cardiff Bay Barrage, for example, it appears that trout now migrate down to the impoundment rather than to the sea to feed and then migrate upriver to spawn later than they previously did. **Research is also needed into issues such as migration routes and patterns in estuaries which have potential as future locations of renewable energy schemes, so that the environmental impact of such schemes can be properly assessed**

8.14 Research is needed on the electromagnetic effects of undersea cables. Marine Scotland are looking at this and should get some preliminary results quickly from a pilot study using tank experiments to show if fields affect fish. A review of migration of anadromous fish around Scotland in relation to offshore developments has been published[3], and a review of effects of electromagnetic fields and sound will be available soon.

8.15 Off-shore structures such as wind farms and wave generators would produce acoustic effects; the implications of these for migrating sea trout (and salmon) are not known. Large structures could also provide shelter and feeding habitat for marine species, including sea trout, but might also attract predators.

8.16 **The Workshop recommended that work be undertaken to assess the impact of marine renewable energy schemes on migratory salmonids (and other species), in particular the effect of electricity transmission cables, low frequency sound and collision from sub-sea turbines.**

---

3 **http://www.scotland.gov.uk/Topics/marine/science/Publications/publicationslatest/SMFS/2010Reports/SMFS0114)**

9 SUMMARY OF RECOMMENDATIONS

Principal Recommendations

1. A comprehensive programme, provisionally titled *Life History Optimisation in Trout in a Changing Environment,* should be developed**,** to explore the factors that influence the life history strategies that trout adopt, together with the ways that climate change might affect them (5.6)

2. A programme of research on the utilisation of estuaries, inter-tidal and coastal habitats by sea trout at all life stages should be developed (6.3)

3. More attention should be given to the significance of small streams for sea trout production**.** In particular, research is needed to quantify the contribution small streams make to sea trout recruitment. There is also a need to identify both actual and potential sea trout spawning streams (6.2)

4. Priority should be given to improving the monitoring and assessment of sea trout stocks, and of habitats (7.1)

5. A seminar or workshop, attended by the appropriate experts, be organised to take forward work on the economic, social and ecosystems services value of sea trout and sea trout fisheries, including the development of quantitative indicators (4.7)

Specific Recommendations

Management Priorities

1. There is a clear need for further research into the practicality of setting biological reference points and into alternative indicators for use in stock assessment. (4.5)

Stock Structure

2. Existing and prospective projects on individual streams that could contribute to research on anadromy, such as an evaluation of existing material from the Tadnoll brook (R. Frome), should be identified and carried forward (5.7)

3. The possibility of developing comprehensive *sea* trout population models, incorporating life history aspects as well as conventional population dynamics processes should be explored (5.9)

Monitoring and Assessment

4. A GIS linked inventory of sea trout rivers should be developed, with supporting information on the size of the resource, and once the system is operational it should be taken up throughout the British Isles (7.3)

5. The conservation status of trout is assessed within the overall assessment of Good Ecological Status (GES) under the Water Framework Directive should be clarified. (7.4)

6. Standardised protocols for recording catches, incorporating information on angling effort for sea trout, should be developed (7.6)

7. Adult resident trout populations should be sampled on a routine basis (7.7)

8. Scale sampling from adult sea trout should be developed as part of routine long term monitoring (7.11).

9. Where juvenile trout are sampled in sea trout (accessible) reaches, scales, length and weight data should be recorded as a matter of course. Suitable sub-sampling protocols need to be developed to be used in the extensive routine national monitoring programmes (7.14)

10. The potential of the use of genetic Effective Population Size assessment methodologies in the assessment the size of sea trout populations should be evaluated (7.17)

11. Consideration should be given to establishing a network of automatic river temperature loggers, possibly via rivers trusts and similar organisations (7.22)

12. Historic material in private hands on various aspects of sea trout biology and management should be catalogued and brought together in a single location (7.23).

Threats to Sea Trout

13. There should be further research into genetic introgression between wild and stocked trout (8.5).

14. Sea trout taken in net fisheries should be sampled to establish whether they are taking fish from a number of different rivers so that appropriate management action can be taken (8.6)

15. The contribution made by predation to the continuing decline of vulnerable sea trout stocks, for example those on the West coasts of Scotland and Ireland, should be assessed (8.7)

16. Research is needed to assess the effect of barriers, including those linked to hydropower schemes, on levels of predation on emigrating smolts and returning adults (8.8).

17. Research should be undertaken on the status, distribution and behaviour of sea trout in marine salmon farming areas; on the effect of different management regimes on lice levels and dispersion; and on the restoration of vulnerable stocks (8.9).

18. Further work is needed on the cumulative impact of a series of in-river hydropower schemes at the stock level (8.12).

19. Results of studies on existing barrages should be brought together and gaps identified for future work. Research is also needed into issues such as migration routes and patterns in estuaries which have potential as future locations of renewable energy schemes, so that the environmental impact of such schemes can be properly assessed (8.13)

20. Work should be undertaken to assess the impact of marine renewable energy schemes on migratory salmonids (and other species) (8.16)

ANNEX A

ATLANTIC SALMON TRUST

SEA TROUT WORKSHOP

PLAS MENAI: BANGOR: 9-10th FEBRUARY 2011

Delegates

Name	Organisation/Interest	E-mail Contact
Ivor Llewelyn	Atlantic Salmon Trust	ivor@linkwell.org.uk
Nigel Milner	APEM Ltd	n.milner@apemltd.co.uk
Graeme Harris	FishSkill Ltd	fishskill@btinternet.com
Ken Whelan	Atlantic Salmon Trust	ken.whelan@hotmail.com
Paddy Gargan	Inland Fisheries Ireland	paddy.gargan@fisheriesireland.ie
Willie Roche	Inland Fisheries Ireland	willie.roche@cfb.ie
Dylan Bright	West Country Rivers Trust	dylan@wrt.org.uk
Alistair Maltby	Association of Rivers Trusts	alistair@associationofriverstrusts.org.uk
David Solomon	Independent Consultant	djsolomon@onetel.com
Ben Wilson	Environment Agency Wales	ben.wilson@environment-agency.wales.gov.uk
Graeme Peirson	Environment Agency	graeme.peirson@environment-agency.gov.uk
Miran Aprahamian	Environment Agency	miran.aprahamian@environment-agency.gov.uk
Tim Jacklin	Wild Trout Trust	tjacklin@wildtrout.org
Paul Knight	S&TA	paul@salmon-trout.org
Jim Henderson	Nith District Salmon Fishery Board	board@river-nith.com
John Armstrong	Marine Scotland Freshwater Laboratory	j.armstrong@marlab.ac.uk
Andy Walker	Scottish Sea Trout Group	andywalker231@aol.com
Dylan Roberts	Game& Wildlife Conservation Trust	droberts@gwct.org.uk
Ted Potter	Cefas	ted.potter@cefas.co.uk
Ian Davidson	Environment Agency	ian.davidson@environment-agency.gov.uk
Colin Adams	Glasgow University	c.adams@bio.gla.ac.uk
Ron Campbell	Tweed Foundation	rcampbell@tweedfoundation.org.uk
Shona Marshall	West Sutherland Fisheries Trust	wsft@btconnect.com
Jamie Ribbens	Galloway Fisheries Trust	mail@gallowayfisheriestrust.org
Marcus Walters	Moray Firth Sea Trout Project	walters.mfstp@googlemail.com
Tony Andrews	Atlantic Salmon Trust	director@atlanticsalmontrust.org
Barry Bendall	Cefas	barry.bendall@cefas.co.uk
Jamie Stevens	Exeter University	j.r.Stevens@exeter.ac.uk
Andy King	Exeter University	r.a.King@exeter.ac.uk
Bruce Stockley	West Country Rivers Trust	bruce@wrt.org.uk
Martin Taylor	Bangor University	m..taylor@bangor.ac.uk
Ian McCarthy	Bangor University	i.mccarthy@bangor.ac.uk

ANNEX B

Sea Trout Workshop 9/10 February 2011

Plas Menai, Bangor

Agenda

9 February

9.00-9.15 Welcome: Aims and Objectives of Workshop Ken Whelan

9.15 – 9.45 Progress since 2004 symposium Graeme Harris

Future research needs identified at the symposium (Chapter 34 of proceedings.)

9.45- 12.30 Management priorities and key threats

(10.45 -11.15 Coffee)

Session led by Ted Potter

Rapporteur Barry Bendall

Can we define a common management process/cycle? What management outcomes are we seeking for sea trout? What management objectives are/should be set? What stock/habitat indicators are/could be used? What do managers need to know to meet objectives and achieve outcomes? What specific threats have their main impacts on sea trout rather than other fish?

12.30-1.30 Lunch

1.30 – 3.45 Stock Structure and composition

Session led by Nigel Milner

Rapporteur Graeme Harris

Anadromy is the essence of “sea trout”, being a threshold quantitative trait under the influence of multiple genes and environment. Variation in the expression of anadromy and related life history variants in response to environmental gradients (reaction norms) leads to stock and fishery structures (e.g. size/age/maturity/survival) variation between and within rivers. Determining these variables and understanding causes of the variation should be central to understanding, modelling and predicting stock change. As a research area it is neglected: why? Are there constraints, are there alternatives? What are the critical questions? What data does this approach need?

3.45-4.15 Tea

4.15 -6.30 Habitat and Climate Change

Session led by John Armstrong

Rapporteur Ron Campbell

Defining ideal freshwater, estuarine and marine habitats. Defining “migration habitat” that ensures access to and from the sea. Manipulating and protecting habitat in response to local impacts and climate change.

7.30 Dinner

10 February

8.45- 11.00 Monitoring and Assessment methods

Session led by Miran Aprahamian

Rapporteur Ian Davidson

Taking the stock and habitat indicators identified in 'Management priorities and key threats' do we have the necessary monitoring data / what indicators can our current monitoring support; where are the data gaps; what additional data need to be collected ('for example in relation to habitats); how best can the data be collected; what priority should we give to the different data components.

11.00-11.30 Coffee

11.30 -1.30 Concluding session Ken Whelan

Rapporteur Nigel Milner

Advice on priorities for research, monitoring and assessment for:

- research funders
- scientists
- catchment and fisheries managers

-

ANNEX C

AST Sea Trout Project Update, January 2011

Introduction

This document compiles the returns from a questionnaire survey last year of sea trout projects current or imminent in the British Isles. It has been updated to help the workshop identify synergies, gaps, overlaps and opportunities for collaboration.

Table 1 Basic features of sea trout projects, April 2010 (updated Jan 2011)

Project	B Isles leads	Geographical scope	Duration	Funding source (amount)
Anglian Rivers Sea Trout Project	WTT/EA	East Anglia	May 2008 - ongoing	EA, Defra, Interreg 1VB, Living North Seas (285k)
Celtic Sea Trout Project	Bangor University/Central Fisheries Board	Irish Sea	May 2009- March 2013	Interreg IVA, Ireland-Wales ERDF (€2.1m Euros)
Living North Sea	ART/EA	North Sea	June 2009 –Sept 2012	Interreg IVB North Sea Region ERDF (€6.5m Euros)
Moray Firth Sea Trout Project	Marcus Walters (MFSTP)	Moray Firth	March 2008-March 2011	various funders, (overall sum?)
South Coast Sea Trout Project	WTT/EA	South coast	May 2008 – March 2010	EA (?)
SFC (Defra) R&D programme	Andy Moore (Cefas)	UK and experimental	April 2009 – March 2014	Defra (£200k)
Sea Lice Monitoring	Paddy Gargan	Ireland	ongoing annual	Internal budget
Atlantic Aquatic Resources Conservation Project	Dylan Bright	SW England and Western Europe	May 2009-Marcch 2013	€3.8m at 65% intervention rate
Salmonid catchment management programme	Robert Rosell & Richard Kennedy AFBI	NI	ongoing	Internal budget
Salmonid catchment programme	Russell Poole Marine Institute	Burrishoole and N. Mayo, Ireland	ongoing	Internal budget (€60k + infrastructure and overheads)
Shieldaig sea trout project	Marine Scotland Science	NW Scotland	ongoing	Scottish Government
Analysis of sweep netting data	Marine Scotland Science	Western Scotland	2009-2011	Scottish Government

Sea trout tracking	Marine Scotland Science	Loch Linnhe	2010-2013	Scottish Government
Genetic assessment of sea trout populations	Eric Vespoor	West Sutherland	1 April 2011 to 31 December 2011	Scottish Government

Nigel Milner (on behalf of HSAP)

26/01/2011

ATLANTIC SALMON TRUST, UK SEA TROUT PROJECTS UPDATE, JAN 2011	
Project Title	**Anglian Rivers Sea Trout Project**
Overall aim	A phased programme which has identified rivers in East Anglia where significant potential exists for improvements to access and in-river habitat for sea trout.
Specific Objectives	For a number of chalk rivers in the Anglian EA region, to: • Review existing information of sea trout populations • Undertake feasibility studies on factors limiting sea trout production • Prioritise fully-costed schemes and action plan for delivery • Apply for external and partnership funding to finance prioritised projects • Negotiate with and support landowners and relevant organisations • Undertake practical works to support sea trout populations e.g. tidal gate alterations; fish passage and riverine habitat improvement.
Anticipated outputs	Annual reports, final project report, conference presentations, website, collaboration through relevant PhD studies
Anticipated outcomes	Greater understanding of sea trout populations in East Anglia and delivery of practical projects to facilitate access for migratory fish and eels to freshwater and improvements to in-river habitat .
Approach (briefly)	Phased programme has reviewed known status of local sea trout populations and identified key factors impacting on those populations. Current phase focuses on practical projects such as re-engineering of tidal gates (e.g. on Stiffkey) and in-river habitat improvements (e.g. spawning riffles in Stiffkey) with prioritisation of next phase works on Glaven. Also, communication and dissemination both locally and nationally through website, shows, conference presentations and magazine articles.
Timescale	May 2008 and ongoing
Progress	All according to plan with practical project delivery well advanced and ongoing.
Partners	Lead partner Wild Trout Trust and Environment Agency, Anglian Associate partners: Association of River Trusts, CEFAS, National Trust, Natural England & landowners, University of Southampton, University College, London.
Grant Funding sources and amounts	Environment Agency
Matched funding (sources and amounts)	Interreg 1VB Living North Seas
Outline governance	WTT Project leads Shaun Leonard and Tim Jacklin; EA lead Ros Wright. Formulated Action Plans reviewed and updated at quarterly project board meetings.
Lead contacts	WTT: Shaun Leonard director@wildtrout.org Tim Jacklin tjacklin@wildtrout.org EA: Ros Wright ros.wright@environment-agency.gov.uk
other information	Partnership PhD studies with University of Southampton and UCL

ATLANTIC SALMON TRUST, UK SEA TROUT PROJECTS UPDATE, JAN 2011	
Project Title	**Celtic Sea Trout Programme (CSTP)**
Overall aim	To improve understanding of sea trout marine ecology, stock structuring, life history variation and fisheries in order to improve collaborative management of Irish Sea sustainable resources in context of climate change
Specific Objectives	For the Irish sea (Interreg area plus adjacent areas: • To map and describe the sea trout fisheries in rivers and coastal waters, examining opportunities for development • To develop and promote a network of awareness and activity protecting and enhancing sea trout fisheries and conservation. • To map the marine distribution of sea trout, describe genetic variation and stock structuring • To describe marine ecology (feeding, growth survival) and life table features • To describe and model freshwater production based on river habitat • To model life history variation and responses to freshwater (catchment scale) and marine environmental variation • To develop and disseminate management advice, based on improved understanding
Anticipated outputs	Annual reports, final project report, website, scientific peer-reviewed papers
Anticipated outcomes	improved communication and collaboration between Interreg eligible partners and adjacent regions; improved evidence based management of sea trout stocks; improved development of fisheries and associated benefits to communities.
Approach (briefly)	6 technical and 1 communication tasks, shared amongst partners: 1. Communication and dissemination: website, active networking and sea trout promotion amongst user groups e.g. anglers, river trusts, agencies, public. 2. Review of fisheries: locations, catch statistics, participation, values, limiting factors, development opportunities. 3. Sampling (supports most other tasks): marine and freshwater sampling by project staff, contractors and by anglers. 4. Genetics: Microsatellite and some SNPs development; genetic baseline in 80 rivers and marine GSI. 5. Microchemistry: of scales and otoliths sampled in rivers and at sea. 6. Freshwater production: description of trout spawning and nursery distribution and capacity in rivers; modelling freshwater smolt production against catchment environmental features. 7. Marine ecology and life histories: scale analysis of age/growth etc from contemporary and historical samples, construction of life tables; marine feeding from gut contents; marine production capacity modelling using Cefas models. Modelling stock life history variation and exploring mgmt implications of spatial and temporal environmental variation.7
Timescale	May 2009 to March 2013
Progress	Sampling 2009/10; angler network; staff recruitment; launches in E&W and RoI; website; scale reading workshop and manual; Luarca poster.
Partners	Lead partner Bangor University, full partners Central Fisheries Board, Environment Agency, University College Cork. Associate partners: Association of River Trusts, Eastern Regional Fisheries Board,

	Southern RFB, Southwestern RFB, CEFAS, Isle of Man, Nith District Salmon Fisheries Board, Galloway Fisheries Trust, Annan District Salmon Fisheries Board
Grant Funding sources and amounts	Interreg IVA Ireland-Wales: 2.1m Euros
Matched funding (sources and amounts)	
Outline governance	BU is lead partner, JK (below) overall manager, IM lead scientist; overall partner Steering Group (strategy /direction); smaller executive management group (daily decisions, reporting to SG); five appointed staff (2 project officers and a Post Doc research Assistant); three contractors on subtasks.
Lead contacts	Dr Jon King, CAMS, Menai Bridge, J.w.king@bangor.ac.uk Dr Ian McCarthy, School of Ocean Sciences, Menai Bridge. i.mccarthy@bangor.ac.uk Dr Willie Roche, CFB. W.roche@cfb.ie Dr Phil McGinnity, UCC, p.mcginnity@ucc.ie
other information	inter-UK project liaison planned, wider liaison through ICES diadromous fish working group

ATLANTIC SALMON TRUST, UK SEA TROUT PROJECTS UPDATE, JAN 2011	
Project Title	**Living North Sea**
Overall aim	The aim of this project is to use Sustainable Coastal Zone Management tools for key migratory species of the North Sea countries, share existing knowledge between countries and sectors, on populations and migratory routes to identify and fill the essential gaps in knowledge, as well as demonstrate ways in which to address some of the key problems for migratory fish in this region.
Specific Objectives	• Identify current knowledge held by partners & outside bodies, potential for species, problems and missing essential knowledge for the management of migratory fish within the scope of Sustainable Coastal Zone Management. • Develop & implement a transnational action plan (to include national actions) for migratory fish & Sustainable Coastal Zone Management in the North Sea region which will also address essential gaps in knowledge. • Incorporate the action plan into current programmes and EU, national and regional policies. • Identify the important challenges and bioregions for Sustainable Coastal and Inland Zone Management for migratory fish. This may include those relating to flood management, agriculture, energy generation, habitat and water quality. • Use a transnational team of experts to develop best practice solutions and priority regions to be integrated into Sustainable Coastal Zone Management, fisheries management and with the consideration of climate change pressures. • Make recommendations for the integration of best practice solutions in EU, national and regional policies and across multiple sectors. • Develop a transnational communication tool exploring open source internet Geographical Information Systems and Google Ocean for partners and external contributors to follow and contribute to the programme. • Develop a transnational communication strategy which will raise awareness of integrated coastal zone management, migratory fish management and potential restoration benefits, the threats to sustainable management and best practice for dealing with them (including climate change issues). This will include both internet tools such as YouTube and exploration of hard hitting publicity events designed to foster public stewardship. • Create a permanent migratory fish management group who will continue to work together on migratory fish issues, share expertise with others who wish to replicate the approach for other species, and most importantly influence EU, national and local policies which will help sustain and improve migratory fish stocks.
Anticipated outputs	Website to include online GIS system for recording and analysing migratory fish populations in the NSR. Demonstration sites for fish passage problems. Management plan for migratory fish in the NSR. Management group for long term collaboration hopefully around the ICES diadromous fish group (or daughter of).
Anticipated outcomes	Collaboration on migratory fish science between all NSR countries, identification of links between populations and nations, analysis of problem areas in NSR, greater awareness of migratory fish issues amongst public and other sectors.
Approach (briefly)	4 work packages: 1. Project Management 2. Communications • Online GIS system for sharing data

	• Use of YouTube and Google Ocean etc for reporting • Work with public and other sectors 3. Transnational Knowledge Development • Sea trout genetic work concentrating on SNP development at DTU (Denmark) • Some work on eel and lamprey by partners without sea trout interest 4. Innovative Solutions • Identification of key issues affecting migratory fish populations (e.g. hydropower, pumping stations, habitat loss). • Demonstration of potential solutions
Timescale	June 2009 – September 2012
Progress	Early data review in progress ahead of action plan for sea trout and other migratory fish knowledge development. Website and GIS system in development. Communication strategy in development.
Partners	Lead partner: Association of Rivers Trusts Partners: Environment Agency (UK), Tweed Foundation (UK), Centre for Marine & Coastal Zone Management, Aberdeen University (UK), Regional Water Authority Hunze en Aas (NL), Regional Water Authority Noorderzijlvest (NL), Regional Water Authority Waternet (Amsterdam & environs) (NL), Royal Dutch Angling Organisation (Sportvisserij Nederland) (NL), INBO (BE), Municipality Falkenburg (SE), Sea Trout Fyn (DK), DTU (DK), NINA (NO), VTI (DL). Sub Partner: CEFAS (UK)
Grant Funding sources and amounts	Interreg IVB North Sea Region (European Regional Development Fund) €6.5M
Matched funding (sources and amounts)	
Outline governance	ART (AM) overall lead, lead for work packages delegated to named partners with project management conducted through steering group.
Lead contacts	Alistair Maltby, ART, Project Manager Alistair@associationofriverstrusts.org.uk Charles Crundwell, lead for fish migration work package, charles.crundwell@environment-agency.gov.uk Johan Coeck, lead for solutions work package, johan.coeck@inbo.be Stephan Dupon, lead for comms. s.dupon@noorderzijlvest.nl
other information	www.livingnorthsea.eu

ATLANTIC SALMON TRUST, UK SEA TROUT PROJECTS UPDATE, JAN 2011	
Project Title	**Moray Firth Sea Trout Project (MFSTP)**
Overall aim	To address the imbalance in sea trout management, collate existing information on sea trout stocks and identify where further data is required to facilitate improved management practice.
Specific Objectives	• Collate existing and historical data on sea trout on the Inner Moray Firth Coast • Identify the extent of freshwater habitat, spawning and juvenile distribution • Identify areas of degraded habitat and through fishery management planning process identify mitigations. • Identify anthropogenic obstacles to migration and through management planning process identify mitigations • Establish scale sampling regime on each river and compare current age structure with previous collections i.e. Nall's work in the 1920s and 30s • Establish tagging projects to examine exploitation rates, recapture rates and spawning locations in collaboration with local Angling Assocs, Fishery Trusts & DSFBs • Investigate the current population dynamics to establish how many distinct populations are present • Source and assess relevant data from FRS and other sources on marine issues effecting sea trout • Liaise widely with local sea trout fisheries and anglers to raise sea trout profile • Establish sea trout catch data base schemes with local stakeholder groups • Identify some of the wider benefits to other fresh water species which would result from the proposed work on sea trout • Promote sea trout as an important species to the wider community through initiatives such as Sea Trout in the Classroom and by use of linked websites • Recognise and act upon habitat improvements for all species which will result from work identified specifically for this project • Identify management advice on practical habitat improvement which will have a knock on effect to other species
Anticipated outputs	• Production of sea trout section for each of the Moray Firth rivers' Fisheries Management Plans (FMP) • Annual reports and updates
Anticipated outcomes	• Identification of current bottlenecks such as habitat and spawning area loss within each system to assist with meaningful targeting of management resources where required • Develop long term rolling programme to identify practical works and initiatives to enhance and maintain the stocks • Safeguard and enhance the Moray Firth sea trout stocks and the fisheries that depend upon them • Improve awareness of sea trout importance and management requirements • Involve local community user/stakeholder groups – Salmon & Trout in the Classroom, website sections of partner groups (consider a dedicated website) • Increase local tourism and rural income streams • Identify and advise upon management practice in habitat improvement and wider

	benefits to other fresh water species which will result from this programme of work with sea trout • Develop a broad educational programme based upon this research • Review the potential impact of new threats such as: • Industrial development within Moray Firth • The interactions of increased use of herring and other inshore fisheries including sea trout as a by-catch and the potential removal of sea trout food sources • Outfall pipes and increased discharge of sewerage and industrial effluent into the Firth
Approach (briefly)	▪ Collate existing and historical data. (Marine Scotland catch returns, angling club records). ▪ Identify the extent of fresh water habitat, spawning and juvenile distribution. (review past electrofishing surveys and design new surveys) ▪ Identify degraded habitat and mitigation planning (Questionnaires on local knowledge). ▪ Identify anthropogenic obstacles to sea trout migration and mitigation planning (local knowledge, GIS, walk surveys) ▪ Establish and undertake scale sampling regime (Volunteer anglers, Trust netting, and commercial netsmen). Compare age structure with previous work. ▪ Establish tagging regime to examine exploitation, re-capture rates and spawning locations (netting) ▪ Investigate population dynamics. ▪ Source and assess data on marine issues effecting sea trout (marine indicator spp data, marine fisheries data). ▪ Establish catch data base schemes with stakeholder groups (logbooks). ▪ Liaise with stakeholder groups and promote sea trout awareness (public talks).
Timescale	March 2008-March 2011 (currently putting proposal together to continue).
Progress	Volunteer angler network established Scale collection continuing Logbook distribution ongoing Report on Spey scale collections completed 2 annual reports completed Quarterly newsletter Marine report in progress Presentations to angler and community groups ongoing Restoration projects in process and new ones being identified Trusts ongoing with coordinated small and coastal stream electrofishing surveys Trout tagged on Spey Opportunistic genetic sampling continuing
Partners	Management group consists of Trust Biologists (Deveron Isla & Bogie Fisheries Trust, Spey Research Trust, Ness & Beauly Fisheries Trust, Cromarty Fisheries Trust & Kyle of Sutherland Fisheries Trust) & Dr Andy Walker Local angling associations where involved
Grant Funding sources and amounts	**Annual Funding: each contribute from £100-5,000 pa** 6 Local Fisheries Trusts 9 District Salmon Fisheries Boards

	Scottish and Southern Energy Wild Trout Trust Wild Trout Trust auction and match funding Highland Council Scottish Natural Heritage Angling Associations – donations towards WTT auction Angling Associations cash **Single payments** Sea Trout Group Moray Firth Partnership (specific project funding) Atlantic Salmon Trust Highlands and Islands Enterprise (1st year graduate placement grant and traning grant)
Matched funding (sources and amounts)	Trust Biologist management time Trust office space
Outline governance	The project will be managed by a steering committee of local Fishery Trust and Board representatives. Additional committee members will be invited from GO and NGO participants. Appropriate representatives from Angling Assocs and project funders will also be invited. The Steering Committee will nominate the usual positions of office and they will raise and manage funds and provide direction for the project. They will meet at least 4 times per year to review progress.
Lead contacts	Marcus Walters MFSTP Project Officer Walters.mfstp@googlemail.com
other information	

ATLANTIC SALMON TRUST, UK SEA TROUT PROJECTS UPDATE, JAN 2011	
Project Title	**South Coast Sea Trout Project**
Overall aim	A phased programme which has identified rivers in central and south-east England (Hampshire, Sussex and Kent) where significant potential exists for improvements to access and in-river habitat for sea trout.
Specific Objectives	For a number of rivers in the Southern EA region, to: • Review existing information relating to existing sea trout populations • Identify habitat bottlenecks limiting sea trout production • Prioritise fully-costed schemes and action plan for delivery • Apply for external and partnership funding to finance prioritised projects • Negotiate with and support landowners and relevant organisations • Undertake practical works to support sea trout populations e.g. installation of easements; riverine habitat improvement.
Anticipated outputs	Action Plan for South Coast sea trout,, conference presentations, website, collaboration through relevant PhD studies.
Anticipated outcomes	Greater understanding of sea trout populations in specified rivers in Hampshire, Sussex and Kent and delivery of practical projects to facilitate access to freshwater and improved in-river habitat designed to boost trout production
Approach (briefly)	Phased programme (SCST Action Plan) is about to publish a review of known status of local sea trout populations and key factors impacting on those populations. Next phase will seek (if funding can be found) to deliver practical projects to support local ST populations. Also, communication and dissemination both locally and nationally through website, shows, conference presentations and magazine articles.
Timescale	May 2008 to present. Current project funding ceases in March 2010.
Progress	Project report due Feb 2010, including Action Plan of works.
Partners	Lead partner Wild Trout Trust and Environment Agency, Southern Associate partners: Atlantic Salmon Trust, local fishery and conservation interests (e.g. Sussex Ouse Conservation Society, River Adur Conservation Society) & landowners.
Grant Funding sources and amounts	Environment Agency
Matched funding (sources and amounts)	Some funding (ART – DEFRA allocation) to deliver sea trout projects has been secured by SOCS and RACS . The WTT is looking to support these groups as a project delivery partner
Outline governance	WTT Project leads Shaun Leonard and Andy Thomas; EA lead Lawrence Talks.
Lead contacts	WTT: Shaun Leonard director@wildtrout.org Andy Thomas athomas@wildtrout.org EA: Lawrence Talks lawrence.talks@environment-agency.gov.uk
other information	A key element of this project will be to focus attention on the large network of small non-main river tributaries that receive little protection and are comparatively overlooked by fisheries interests but which are of huge significance in maintaining runs of sea trout in Southern Region. WTT is well placed to coordinate a programme of awareness and enhancement.

ATLANTIC SALMON TRUST, UK SEA TROUT PROJECTS UPDATE, JAN 2011	
Project Title	**Defra SF Commission Research Programme**
Overall aim	To understand the factors influencing salmonid populations in England and Wales
Specific Objectives	There are a number of work packages within the research programme that deal with migratory trout populations: 1. Potential impact of non-native crayfish on trout eggs and embryos. 2. Potential predation impact by stocked and escapee trout on emigrating salmonid smolts. 3. Investigate contaminants derived from or associated with freshwater aquaculture facilities and determine their effects on critical salmonid life stages; 4. Model the effects of diffuse and point source contaminants derived from agriculture and aquaculture on wild salmonids populations; 5. Provide an updated literature review on the predicted effects of climate change on flows and temperatures in salmonid rivers in the light of the new climate predictions detailed in UK Climate Projections (UKCP09). 6. Investigate the impact of the changes in flows and temperatures that may be expected under different climate change scenarios on the impacts of environmental levels of specific contaminants on biological processes regulating fish populations (e.g. reproduction and survival of diadromous fish between fresh and marine environments). 7. Investigate the impact of obstructions on the biology of migratory fish in the context of increased residency within zones of high temperatures and contaminant loading. 8. Model the impact of different climate change scenarios on the effects of specific contaminants on wild salmonid populations. 9. The potential impact of diffuse artificial light pollution on salmonid fry emergence and smolt migratory behaviour.
Anticipated outputs	Annual reports, final project report, website, scientific peer-reviewed papers
Anticipated outcomes	Advice to Defra, the Agency and other stakeholders on the management and conservation of migratory salmonid stocks
Approach (briefly)	The research involves an integrated approach using desk based modelling, experimental laboratory studies and field based assessment techniques to examine the factors regulating migratory trout populations.
Timescale	April 2009 – March 2014
Progress	1st annual Reports to be submitted to Defra on 1st April 2010
Partners	Cefas, Lowestoft Laboratory.
Grant Funding sources and amounts	Defra (£200K)

Matched funding (sources and amounts)	N/A
Outline governance	Cefas under contract to Defra.
Lead contacts	Dr Andy Moore (CEFAS): andy.moore@cefas.co.uk Bill Riley (CEFAS): bill.riley@cefas.co.uk Ted Potter (CEFAS): ted.potter@cefas.co.uk
other information	

ATLANTIC SALMON TRUST, UK SEA TROUT PROJECTS UPDATE, JAN 2011	
Project Title	**Sea Lice monitoring programme on sea trout**
Overall aim	To investigate sea lice infestation on prematurely returning sea trout post-smolts in aquaculture estuaries over the May/June period annually
Specific Objectives	• To determine lice infestation levels • Determine prevalence and abundance • To examine trends in infestation over recent years by river
Anticipated outputs	Annual report,
Anticipated outcomes	Assess the impact of salmon farms on local sea trout stocks
Approach (briefly)	.
Timescale	May to June annually
Progress	Monitoring has been in place since 1992, monitoring rivers are not confined to rivers entering salmon aquaculture bays
Partners	Inland Fisheries Ireland, Regional Fisheries Boards
Grant Funding sources and amounts	Internal budget
Matched funding (sources and amounts)	
Outline governance	
Lead contacts	Dr Patrick Gargan
other information	

ATLANTIC SALMON TRUST, UK SEA TROUT PROJECTS UPDATE, JAN 2011	
Project Title	**Atlantic Aquatic Resource Conservation Project (AARC)**
Overall aim	To examine sustainable integrated water resource management using anadromous fish species as an indicator of success and point of linkage between trans-boundary socio-economic and environmental issues and drivers.
Specific Objectives	1. We will undertake some river restoration across the region to improve habitat and water quality, which will complement and expand our current work. 2. We will try to link the restoration described above to sustainable drivers i.e. Incorporation of fish pass schemes with sustainable hydro-generation schemes. 3. We will develop conservation aquaculture facilities for anadromous species (salmon, sea trout shad, lamprey), supporting their reintroduction and we will study the feasibility of a cryogenic gene bank for rare or threatened populations. We will also examine genetic population structure for the species as per the ASAP project for Salmon, so that we can take sample from fish caught at sea and determine river of origin (they are all rare anadromous species protected by the Habitats Directive and the Marine Bill with significant socio-economic value). Using these methods we will build up a picture of when and where these populations are at sea so that they can be better protected by regional, national and EU law. 4. We will sample high-seas catch of these fish so that they can be assigned to their origin populations. 5. We will develop an international masters qualification in sustainable river basin management using an ecosystem approach (This will tie up everything in theory)
Anticipated outputs	Annual reports, final project report, website, scientific peer-reviewed papers.
Anticipated outcomes	improved communication and collaboration between Interreg eligible partners and adjacent regions; improved evidence based management of sea trout stocks; improved development of fisheries and associated benefits to communities.
Approach (briefly)	Oporto university will collect shad and sea lamprey samples from across Europe. Sea trout samples will be collected at Exeter University. Samples will be genotyped using standardised methods. A database will be assembled listing genotyped populations and assignment tests will be undertaken on unknown samples to determine population structure and spatio/temporal location. Aquaculture will be investigated and trialled for reintroduction purposes. Inshore and offshore fisheries will be contacted and asked to report and return incidental catches of all species under examination. Samples will be analysed physiologically and assigned genetically.
Timescale	May 2009 to March 2013
Progress	Contracting process in-hand. Start date Jan 2010.
Partners	WRT are the lead partner. We have partners in France (INRA, the National Fisheries and Agriculture Research Organisation), Spain (Oviedo University), Portugal (Oporto University and two NGO river restoration groups ADLAP and ADRIN) and Ireland (The Regional Water Board and the Regional Fishery Board for the Shannon and Cork University). In the UK the partner is Exeter University and the EA are Associate Partners.

Grant Funding sources and amounts	3.8 million Euros at 65% intervention rate.
Matched funding (sources and amounts)	Matched by private exemplar river restoration projects in the West country.
Outline governance	Project will have a lead partner who will define tasks for work package leaders and involved partners. Organogram available.
Lead contacts	Dr Dylan Bright: dylan@wrt.org.uk
other information	inter UK project liaison planned, wider liaison through ICES diadromous fish working group

ATLANTIC SALMON TRUST, UK SEA TROUT PROJECTS UPDATE, JAN 2011	
Project Title	**Salmonid Catchment Management Programme UK, Northern Ireland (DCAL area[4]).**
Overall aim	To assess stock status of salmonids on index river catchments.
Specific Objectives	There are several aspects of the monitoring programme associated with sea trout populations in UK (N. Ireland). • Installation and commissioning of a resistivity fish counter on the Shimna River (notable sea trout river in Co. Down) in 2010. • Annual electric fishing programmes conducted on several coastal sea trout rivers since 2003. • Determination of potential bottlenecks to productivity on index catchments. • Investigation of efficacy of fishery management measures.
Anticipated outputs	Salmonid catchment management reports, local management reports.
Anticipated outcomes	Advice to DCAL and local fishery owners on the management and conservation of migratory salmonid stocks.
Approach (briefly)	The monitoring programmes involve field based assessment techniques supported by desktop studies to examine local migratory trout populations.
Timescale	Ongoing regulatory work
Progress	Ongoing
Partners	DCAL.
Grant Funding sources and amounts	DCAL
Matched funding (sources and amounts)	N/A
Outline governance	AFBI under SLA to DCAL.
Lead contacts	Dr Robert Rosell (AFBI): Robert.rosell@afbini.gov.uk Dr Richard Kennedy (AFBI): Richard.kennedy@afbini.gov.uk
other information	Participation in Celtic Sea Trout Programme

[1] Two fishery areas in UK (Northern Ireland) - DCAL area and Loughs Agency area.

ATLANTIC SALMON TRUST, UK SEA TROUT PROJECTS UPDATE, JAN 2011	
Project Title	Salmonid Catchment Programme, Burrishoole, Mayo, Ireland.
Overall aim	To assess stock status and population dynamics of salmonids on the Burrishoole index river catchment.
Specific Objectives	There are several aspects of the monitoring programme associated with sea trout populations in the Burrishoole: • Daily maintenance and monitoring of the Burrishoole sea trout stock migrating upstream into and downstream out of the Burrishoole catchment • Annual monitoring of the juvenile salmonid, including trout, stock in the Burrishoole Rivers and lakes and in the Rivers of North Mayo. • Using the monitoring census data (trap, electrofishing and lake seine) to support scientific assessments, including stock-recruit relationships, Bayesian and other assessments of the juvenile stock, stock dynamics, growth rate analysis and impact of land-use and climate factors. • The Burrishoole sea trout stock was severely affected in the late 1980's early 1990s by sea lice and subsequent smolt output has decline significantly. Long-term monitoring will assess the response of the indigenous trout stock to this collapse.
Anticipated outputs	Salmonid catchment management reports, local management reports, scientific papers.
Anticipated outcomes	Advice to DCENR, Inland Fisheries Ireland and local fishery owners on the management and conservation of migratory salmonid stocks. Inputs to national and international fora and workshops.
Approach (briefly)	The monitoring programmes involve field based assessment techniques supported by desktop studies to examine local migratory trout populations.
Timescale	Ongoing census work and periodic analysis
Progress	Ongoing
Partners	Marine Institute, BEAUFORT fish genetics projects (QUB/UCC)
Grant Funding sources and amounts	Marine Institute (DAFF, DCENR)
Matched funding (sources and amounts)	N/A
Outline governance	Marine Institute under SLA to DAFF/DCENR.
Lead contacts	Dr Russell Poole (MI): russell.poole@marine.ie (co-ordinator & senior biologist) Dr Elvira deEyto (MI): elvira.deeyto@marine.ie (catchment biologist) Mr Ger Rogan (MI): ger.rogan@marine.ie (lab analyst responsible for fish census) Ms Mary Dillane (MI): mary.dillane@marine.ie (lab analyst responsible for juvenile stock assessment)
other information	Participation in Celtic Sea Trout Programme; Beaufort trout projects Similar programmes exist in Burrishoole for salmon and eel.

ATLANTIC SALMON TRUST, UK SEA TROUT PROJECTS UPDATE, JAN 2011	
Project Title	**Shieldaig sea trout project**
Overall aim	A study of a population of sea trout in North West Scotland.
Specific Objectives	• To measure the return rates of sea trout smolts • To measure the lice burdens on early returning post-smolts and to compare these to the activity on local salmon farms. • To measure the lice levels in the environment, and to compare these to those on local salmon farms • To model the dispersal of sea trout smolts within Loch Torridon • To model the dispersal of sea lice within Loch Torridon.
Anticipated outputs	Annual reports and peer reviewed publications
Anticipated outcomes	Advice to Scottish Government and local fishery owners on the relationship between sea trout and aquaculture.
Approach (briefly)	A multi-disciplinary approach has been undertaken involving: • A two-way fish trap at the mouth of the River Shieldaig • Annual sampling of lice on early returning fish • Shoreline and offshore plankton sampling to assess lice levels • Creation and validation of a dispersal model for Loch Shieldaig • Acoustic tracking of sea trout smolts
Timescale	Ongoing
Progress	The project has led to a large number of peer reviewed publications detailing the linkages between fish farm production cycles and lice on farms, in the environment and on early returning fish.
Partners	-
Grant Funding sources and amounts	MSS internal budgets
Matched funding (sources and amounts)	-
Outline governance	MSS
Lead contacts	Stuart Middlemas (s.middlemas@marlab.ac.uk)
other information	-

ATLANTIC SALMON TRUST, UK SEA TROUT PROJECTS UPDATE, JAN 2011	
Project Title	**Analysis of sweep netting data**
Overall aim	To analyse the data collected on lice burdens of sea trout by the Trusts and under the auspices of the Tripartite Working Group.
Specific Objectives	Analysis of sweep net data collected to investigate possible links between sea lice found on sea trout and: 1. distance to nearest salmon farm 2. year of production of nearest salmon farm
Anticipated outputs	Publication detailing the analysis
Anticipated outcomes	Results should feed into the aquaculture planning process.
Approach (briefly)	-
Timescale	2009-2011
Progress	Analysis has been undertaken and is currently being discussed with Fishery Trusts.
Partners	Argyll, Lochaber, Wester Ross, West Sutherland and Outer Hebrides Fishery Trusts.
Grant Funding sources and amounts	MSS internal budgets
Matched funding (sources and amounts)	-
Outline governance	MSS are undertaking the analysis with input from local fishery Trusts.
Lead contacts	Stuart Middlemas (s.middlemas@marlab.ac.uk)
other information	-

ATLANTIC SALMON TRUST, UK SEA TROUT PROJECTS UPDATE, JAN 2011	
Project Title	**Sea trout tracking**
Overall aim	To track sea trout smolts and compare their distribution to salmon smolts and the densities of lice from salmon farms.
Specific Objectives	To compare the at-sea distributions of salmon and sea trout To compare fish movements with maps of sea lice densities produced by dispersion modelling.
Anticipated outputs	Peer reviewed publications.
Anticipated outcomes	Increased understanding of interactions of aquaculture and wild fish which will inform management- i.e. through suggesting locations for farms.
Approach (briefly)	This forms part of a larger project aiming to examine sea lice in the Loch Linnhe system, which involves production and testing of a dispersion model in conjunction with examination of the habitat use of salmon and sea trout smolts.
Timescale	2009-2011
Progress	Salmon and sea trout smolts were tracked in 2010, with funds being sought to continue this work in 2011.
Partners	MSS and Lochaber Fishery Trust.
Grant Funding sources and amounts	MSS internal budgets augmented by TWG grant to the Lochaber Fishery Trust
Matched funding (sources and amounts)	-
Outline governance	MSS in conjunction with Lochaber Fishery Trust
Lead contacts	Stuart Middlemas (s.middlemas@marlab.ac.uk)
other information	

ATLANTIC SALMON TRUST, UK SEA TROUT PROJECTS UPDATE, JAN 2011	
Project Title	**Genetic assessment of the sea trout populations within the West Sutherland area**
Overall aim	The principle aim of this study is to examine genetic diversity and differentiation among sea trout populations in the West Sutherland area. A secondary aim is to place the observed variation of the fish in this area in a broader national context.
Specific Objectives	• to assess levels and patterns of genetic differentiation among sea trout from different West Sutherland rivers • to assess genetic differentiation between sea and resident trout in the River Laxford • to compare levels and patterns of genetic differentiation between sea trout in West Sutherland and selected populations in other parts of Scotland
Anticipated outputs	Single report
Anticipated outcomes	Better understanding of population structuring within and among river stocks of sea trout and between sea and resident trout
Approach (briefly)	Analyse genetic variation within and among samples of sea and resident trout using microsatellite and SNP markers
Timescale	1 April 2011 to 31 December 2011
Progress	Samples have been collected and microsatellite markers identified; collaboration with CIGENE on SNP markers has been put in place
Partners	Freshwater Laboratory, Marine Scotland Science, and West Sutherland Fisheries Trust
Grant Funding sources and amounts	Scottish Government grant £24,000
Matched funding (sources and amounts)	none
Outline governance	
Lead contacts	Dr Eric Verspoor
other information	