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REPORT OF THE STUDY GROUP ON THE STATUS OF DIADROMOUS FISH SPECIES (SGSDFS)

BY CORRESPONDENCE



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Executive Summary

Highlights with Section references

This document should be used primarily as guidance to the status of specific diadromous fish species using existing national/international criteria. A number of species are clearly in great difficulty such as the European sturgeon (4.11), allis (4.1) and twaite (4.2) shads, and houting (4.14). Other species clearly have problems in specific areas (e.g. American shads 4.3). Even species such as Atlantic salmon (4.8) and sea trout (4.7) appear to be compromised in some areas. Similarly, the European eel (4.4) is widely known to be in decline. In contrast, the striped bass (4.22) is an example of a species which has recovered significantly principally due to management intervention and supports a viable fishery. Summary information provided and obtained in the literature suggests that species which migrate through estuaries were more threatened than freshwater and marine species whose distribution extended into estuaries (4.23). Remedial actions are suggested by several people (see references in text).

Science Committees that should be notified:

DFC, LRC, ACFM, ACE

Expert Groups that should be notified:

WGNAS, WGBAST, WGFE, WGEEL

Major anomalies or changes to the state of the ecosystem

The report indicates specific cases where changes to the status of diadromous species are occurring and which are directly related to ecosystem changes

Important new methodologies and findings

None

Emergent issues, challenges and problems

The main issues are likely to be water quality barriers which have been created in estuaries and the widespread and intense human alteration of estuaries which occurs by habitat loss or modification.

The DFC noted that to Texel Faial Criteria to any species involves a formal nomination of a species by a member state or national institute to OSPAR which would be reviewed by its Bio-diversity Committee. OSPAR may then seek assistance from ICES (as they had done in 2003) to evaluate the status of this species in relation to the Texel-Faial criteria. Similarly, the IUCN have a specific format and requirement to have new species listed or existing species reviewed under the IUCN Red List of Threatened Species™ including assessment of any submission by at least two members of the Red List Authority.

Summary of the Terms of Reference

- a) Examine the existing information on - this TOR has been met;
 - i) Distribution of diadromous fish species in ICES areas,
 - ii) The status of these species;
- b) Report the current status of each of these species – This TOR has been met;

- c) Provide information on current threats faced by these species – This TOR has been met.

1 Introduction

1.1 Main Tasks

At its 2004 Statutory Meeting, ICES resolved (C. Res. 2004/2I02) that the Study Group on the Status of Diadromous Fish Species [SGSDFS] (Chair: Niall. Ó Maoiléidigh, Ireland) will meet by correspondence to:

- a) Examine the existing information on:
 - i) Distribution of diadromous fish species in ICES areas,
 - ii) The status of these species;
- b) Report the current status of each of these species;
- c) Provide information on current threats faced by these species.

1.2 Background

At the first meeting of the Diadromous Fish Committee in 2002, it was agreed to establish a “baseline” status report on all diadromous fish in response to the query on the scope and diversity of species which should be handled by the Committee.

The distribution and status of many diadromous fish species is poorly known. A number of these species are protected under the Bern Convention, European Habitats Directive and CITES. In 2002, WGFC provided a review of the status of three diadromous fish species (Sea lamprey *Petromyzon marinus*, Houting *Coregonus laveratus oxyrinchus*, and Allis Shad *Alosa alosa*) not normally assessed by ICES in the context of the Texel-Faial Criteria for assessment of the conservation status of a number of sensitive fish species (Annex V to the OSPAR Convention – on the Protection and Conservation of the Ecosystems and Biological Diversity of the Maritime Area). This report provides information on the current status of these and other diadromous fish species in the context of these and other formal international or national classification schemes.

2 Geographic area to be covered by SGSDFS

The Texel-Faial criteria are applied to OSPAR areas and include the Mediterranean. This report will deal with the North Atlantic and Baltic areas initially. Although USA and Canada are obviously outside the OSPAR area, species in these countries may have classifications based on other national criteria.

3 Categories and criteria presently used for classifying the status of Diadromous fish species

3.1 Texel-Faial

http://www.ospar.org/documents/dbase/decres/agreements/03-13e_Texel_Faial%20criteria.doc

Annex V to the OSPAR Convention – on the Protection and Conservation of the Ecosystems and Biological Diversity of the Maritime Area – was adopted in July 1998, together with a Strategy on the Protection and Conservation of the Ecosystems and Biological Diversity of the Maritime Area. This Annex gives the OSPAR Commission a duty to develop means, consistent with international law, for instituting protective, conservation, restorative or

precautionary measures related to specific areas or sites or related to particular species or habitats.

A package has been prepared to identify those species and habitats in need of protection, conservation, and where practical, restoration and/or surveillance or monitoring. There are four sections to the package:

- 1) the Texel-Faial criteria for assessment of the conservation status of a number of sensitive fish species, with supporting guidance;
- 2) procedure for applying the Texel-Faial criteria;
- 3) outline contents for supporting Case Reports;
- 4) checklist of human activities.

Texel – Faial classifications are provided in Table 1. The specific guidelines to be used for the identification of species and habitats in need of protection by OSPAR are shown in Appendix 1.

The procedure for having a species formally considered as being in need of protection, conservation, and where practical, restoration and/or surveillance or monitoring should start with:

- A nomination from a Contracting Party or an observer organisation to the Biodiversity Committee.
- OSPAR Commission arranges for appropriate quality assurance and peer review (for example, by the International Council for the Exploration of the Sea) of the evidence presented in support of the proposal.
- A working group of the Biodiversity Committee examines and makes a recommendation to the Biodiversity Committee.
- The Biodiversity Committee present it to the OSPAR Commission for final adoption.

3.2 Habitats Directive

http://europa.eu.int/comm/environment/nature/nature_conservation/eu_nature_legislation/habitats_directive/index_en.htm

The Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna).

If a species is included under this Directive, it requires measures to be taken by individual member states to maintain or restore them to favourable conservation status in their natural range. Article 3 of the Habitats Directive requires the establishment of a European network of important high-quality conservation sites that will make a significant contribution to conserving the 169 habitat types and 623 species identified in Annexes I and II of the Directive. The listed habitat types and species are those considered to be most in need of conservation at a European level. A selection of these habitats and species are given priority status in the Directive because they are considered to be particularly vulnerable and are mainly, or exclusively, found within the European Union and these sites have been designated as Special Areas of Conservation (SACs). In those SAC areas there is also an obligation for member states to assess numbers and the level of exploitation for the designated species. Three main Annexes identify the species which require special consideration:

Annex II – Animal and plant species of community interest whose conservation requires the designation of special areas of conservation.

Annex IV – Animal and plant species of community interest in need of strict protection.

Annex V – Animal and plant species of community interest whose taking in the wild and exploitation may be subject to management measures.

Species included under the Habitats Directive are shown in Table 2.

3.3 CITES

<http://www.cites.org/>

CITES (the Convention on International Trade in Endangered (EN) Species of Wild Fauna and Flora) is an international agreement between Governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Currently, only one diadromous fish species is covered (*Acipenser sturio*).

3.4 Convention on the Conservation of European Wildlife and Natural Habitats – Bern Convention

http://www.coe.int/t/e/cultural_cooperation/environment/nature_and_biological_diversity/Nature_protection/

The aims of this Convention are to conserve wild flora and fauna and their natural habitats, especially those species and habitats whose conservation requires the cooperation of several States, and to promote such cooperation. Particular emphasis is given to endangered and vulnerable species, including endangered (EN) and vulnerable migratory species. Species included under this convention are shown in Table 2.

3.5 The World Conservation Union (IUCN)

Red Data Books/Lists and Categories

Since the 1960s, [IUCN - The World Conservation Union](#), through its [Species Survival Commission \(SSC\)](#) has been providing an assessment of the conservation status of species, subspecies, varieties and even selected subpopulations on a global scale in order to highlight taxa threatened with extinction, and therefore promote their conservation. The wide range of species which are assessed and the information on their conservation status and distribution provides the foundation for making informed decisions about preserving biodiversity at local to global levels.

The IUCN Red List of Threatened Species provides taxonomic, conservation status and distribution information on taxa that have been evaluated using the [IUCN Red List Categories and Criteria](#). This classification has been recently revised (2001 – Version 3.1). The main purpose of the IUCN Red List is to define the status of species which are particularly vulnerable to extinction or extirpation (i.e. listed as Critically Endangered (CR), Endangered (EN) and Vulnerable (VU)). However, the Red List also includes information on taxa that are categorized as Extinct (EX) or Extinct in the Wild (EW); on taxa that cannot be evaluated because of insufficient information (i.e. are Data Deficient); and on taxa that are either close to meeting the threatened thresholds or that would be threatened were it not for an ongoing taxon-specific conservation programme (i.e. Near Threatened). The diadromous species for which there is IUCN classification are shown in Table 2.

In addition some countries have country specific Red Data Books where classifications have been carried out (using the IUCN categories) on a more local scale. These include Ireland, France, Spain, Germany, and Flanders.

Recently, local experts from other countries have provided similar classifications (Elliot and Hemingway, 2002) and these have also been used where possible to provide as much information on the current status of diadromous fish populations as possible within this report.

Species included under this scheme are shown in Table 3.

3.6 National Classification and or protection

Species for which there is specific country Red Data Lists or other classifications are shown in Table 3.

Canada

Canada Species at Risk Act

Canada has recently introduced new legislation, the Species at Risk Act or SARA, to meet commitments under the international Convention on Biological Diversity. The primary goal of the Act is to prevent endangered or threatened wildlife from becoming extinct or lost from the wild, and to assist the recovery of these species. It is also intended to manage species of special concern and to prevent them from becoming endangered or threatened. The Act has developed the following definitions to describe species status:

Extinct – No longer occurring anywhere;

Extirpated – A species no longer existing in the wild in Canada, but exists elsewhere in the world;

Endangered – A species facing imminent extirpation or extinction;

Threatened – A species likely to become endangered if nothing is done to reverse the factors leading to extirpation or extinction

Special Concern – Those species that are particularly sensitive to human activities or natural events but are not endangered or threatened species.

Ireland

The main legislations governing the legal protection of Irish wildlife including fish species are the Wildlife Acts (1976 to 2000), the European Union Habitats Directive (92/43/EEC) and the Irish National Biodiversity Plan (Buckley 2004). The Wildlife Acts of 1976 and 2000 are the principal national legislation for the protection of wildlife habitats and species in Ireland. Recently the Wildlife (Amendment) Act was enacted to include all species occurring in Ireland whereas previously aquatic invertebrates and fish species were excluded by definition. Although presently all freshwater fish species and a number of commercial marine fish are excluded from the operation of the Wildlife Acts, additional species can under the amended Act if appropriate, by amending the regulations rather than by primary legislation.

UK (All areas)

UK Wildlife and Countryside Act 1981

<http://www.jncc.gov.uk/species/protect/animals.htm>

If a species is listed in Schedule 5 it is an offence to intentionally kill, injure or take it.

Schedule 5 section 9 (4) (a) relates to damage to, destruction of, obstruction of access to any structure or place used by a scheduled animal for shelter or protection.

UK Biodiversity Action

UK Biodiversity Action plans can be found at the following site:

<http://www.ukbap.org.uk/>

USA

Endangered (EN) Species Act

The purposes of this Act are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions set forth

<http://www.fws.gov/endangered> (EN)

4 Current status by species and country

4.1 Allis Shad *Alosa alosa*

International Status

Under the current Texel-Faial criteria, this species is considered to be globally important, rare, sensitive and in decline. It is listed in the Habitats Directive under Annex II and V, and under the Bern Convention under Annex III. Its IUCN Red List status relative to its vulnerability to extinction is not clear and it is classified as data deficient (DD).

A recent publication (*Alosa alosa* and *Alosa fallax* spp. Literature review and Bibliography, Arahamian *et al.*, 2003) provides a comprehensive current account of the species and its current status in various countries. These are included in the individual country synopsis below.

Austria

Absent from red data book or equivalent (Arahamian *et al.*, 2003).

Belgium

Regarded as endangered (EN) using IUCN criteria (Arahamian *et al.*, 2003).

Czech Republic

Regarded as extinct (EX) using IUCN criteria (Arahamian *et al.*, 2003).

Denmark

The species is occasionally caught in Danish fjords and coastal waters. There are no quantitative data on the species, and there is no certain evidence of spawning. Mature adults have been observed to migrate into Ringkøbing Fjord during spring. Furthermore, the species is occasionally caught in River Ribe Å. The species is not protected but is listed in the National Red List as endangered (EN) (Berg, 1998a). It is regarded as extinct (EX) in Elliot and Hemingway (2002) although Arahamian *et al.*, (2003) considered it as critically endangered (CR) using the IUCN Red List criteria. No specific conservation plan is in place for this species.

Finland

Not evaluated (NE) against the IUCN criteria (Arahamian *et al.*, 2003).

France

Considered as vulnerable (VU) using IUCN criteria (Arahamian *et al.*, 2003).

Flanders

Considered as endangered (EN) in the Flanders Red List (Elliot and Hemingway, 2002).

Germany

Historically, allis shad (*Alosa alosa*) populations occurred along the eastern Atlantic coasts from Norway to Morocco and into the western Mediterranean Sea, extending along the coasts of Portugal, Spain, France, British Isles, Belgium, Holland and Germany (Baglinière *et al.*, 2003). In Germany, allis shad was an economically important species, especially in the basin of the River Rhine prior to the beginning of the 20th century. Fishing has been invoked as one of the primary factors involved in the reduction of the Rhine population of allis shad (de Groot 1989). According to Bartl and Troschel (1997) massive overfishing during the beginning and heavy pollution in the middle of the 20th century may be the reasons why allis shad vanished from the River Rhine. Although the last specimen from the River Rhine was caught in 1963 (Bartl and Troschel 1997), the species disappeared even earlier from other German rivers draining into the North Sea and Baltic Sea basins (e.g. Duncker 1960; Freyhof 2002) due to poor water quality and/or building of weirs (Lelek 1987). The number of recorded allis shad, however, has increased in the River Rhine since 1978 (Grimm 1993; Freyhof 2002).

Today the main distribution range of allis shad is restricted to the Atlantic coasts of France and Portugal (Baglinière *et al.*, 2003) and it is possible that those individuals found in the River Rhine are only vagrants from the large French populations (Freyhof 2002). Therefore, the species is expected to occur only accidentally in the German waters of the North- and Baltic Seas.

The record of allis shad in the Strelasund in 1998 was the only specimen of *A. alosa* caught in German Baltic waters during the last 20 years (Winkler *et al.*, 2002; Thiel 2003).

Ireland

Allis Shad (*Alosa alosa*) has not been recorded in Irish freshwaters in recent years and it is suspected that any spawning populations have been lost through a combination of weir installation and poor water quality. Their classification in the Irish Red data Book is Endangered (EN) but there is no specific national legislation to protect the species.

A recent survey has been published by the Irish National Parks and Wildlife Services and is available at:

<http://www.npws.ie/en/PublicationsLiterature/Allpublications/d6792.en.v1.0.t4.PDF>

In this report, the species is considered to be very vulnerable.

Italy

Absent from red data book or equivalent (Arahamian *et al.*, 2003).

Luxembourg

Considered extinct (EX) using IUCN criteria (Arahamian *et al.*, 2003).

Netherlands

Considered endangered (EN) using IUCN criteria (Arahamian *et al.*, 2003).

Poland

Considered extinct (EX) using IUCN criteria (Arahamian *et al.*, 2003).

Portugal

Considered vulnerable (VU) using IUCN criteria (Arahamian *et al.*, 2003).

Spain

Considered endangered (EN) using IUCN criteria (Arahamian *et al.*, 2003).

Sweden

Since the species does not reproduce in Sweden it is classified as Not Applicable (NA) using the IUCN criteria (Gärdenfors (ed.) 2005).

UK England and Wales

Allis Shad (*Alosa alosa*) occurs in coastal waters mainly around south Wales and along the Channel coast of England, but though a spawning population was reported in the River Severn until the middle of the 19th century, and possibly in the Trent, there are no current records of spawning in England or Wales. Declined due to mainly to construction of weirs and pollution. A possible spawning population in the River Tamar (SW England) is unconfirmed. The species is regarded as endangered (EN) in the UK. Legislation: no national fisheries laws; 3 SAC rivers in E&W

UK N. Ireland

No known spawning populations in rivers. Not recorded offshore.

UK Scotland

Allis Shad (*Alosa alosa*) occurs in coastal waters around Scotland and there are sporadic reports of adult fish from rivers in the south west of Scotland and various rivers of the Scottish East Coast. However, confirmation of successful spawning in any rivers is still lacking. Declined in the UK due mainly to construction of weirs and pollution. The species is regarded as endangered (EN) in the UK. Legislation: no national fisheries laws; no SAC rivers in Scotland.

4.2 Twaite shad – *Alosa fallax*

International Status

There is no currently accepted Texel-Faial classification of *Alosa fallax*. However, it is listed in the Habitats Directive under Annex II and V, and under the Bern Convention under Annex III. Its IUCN Red List status relative to its vulnerability to extinction is not clear and it is classified as data deficient (DD).

The subspecies *A. fallax fallax* of twaite shad is distributed in the Baltic Sea and along the whole Atlantic sea coast including the North Sea (Saemundsson 1949; Kartas 1981; Taverny 1991; Sabatié 1993; Arahamian *et al.*, 2003). Winkler *et al.* (2000) evaluated the distribution status of twaite shad within the framework of their checklist of fish species in the Baltic Sea. The authors described the distribution status of *A. fallax fallax* in the Baltic Sea as “present” for Denmark, “common” for Poland and Lithuania, and as “very rare” for Russia, Finland, Latvia and Germany. Generally, the twaite shad, which was very common in a number of

Baltic and other European waters about a hundred years ago, has declined substantially throughout Europe (Reshetnikov *et al.*, 1997). This decline has been attributed to pollution, overfishing, and migratory route obstructions (Whitehead 1985). There are just a few rivers left with healthy populations of twaite shad, like the Garonne-Dordogne river system in France and the Elbe River (North Sea) in Germany (Quignard and Douchment 1991). A recent publication (Arahamian *et al.*, 2003) provides a comprehensive current account of the species and to its current status in various countries. These are included in the country synopsis below.

Austria

Absent from red data book or equivalent (Arahamian *et al.*, 2003).

Belgium

Considered to be endangered (EN) using IUCN criteria (Arahamian *et al.*, 2003).

Denmark

Generally same distribution as *Alosa alosa*, but occurring much more frequently in commercial catches. Also found in the Western part of the Baltic Sea. Classified as endangered (EN) in the Danish Red List (Berg, 1998a) and as critically endangered (CR) using IUCN criteria (Arahamian *et al.*, 2003). However, they are considered extinct (EX) in Elliot and Hemingway (2002).

Finland

Not evaluated (NE) against the IUCN criteria (Arahamian *et al.*, 2003).

Flanders

Considered endangered (EN) in Elliot and Hemingway (2002)

Germany

According to Kloppmann *et al.* (2003), there are high density areas of twaite shad within the German coastal waters (12-nautical mile zone) of the North Sea. An analysis of Stelzenmüller and Zauke (2003) indicates that the population of twaite shad has increased in the study area since 1997. Stelzenmüller *et al.* (2004) confirmed the importance of the Weser and Elbe estuaries as areas with the highest probabilities of catching twaite shad, while within the German EEZ of the North Sea; no such areas could be discerned. Spawning populations of twaite shad exist in the estuaries of Elbe and Weser (e.g. Hass 1965; Möller and Dieckwisch 1991; Scheffel and Schirmer 1991; Thiel *et al.*, 1996; Gerkens and Thiel 2001). Actual spawning activities have not yet been observed in the estuaries of Ems and Eider, although adult individuals were caught in the River Eider (Vorberg and Breckling 1999) and high abundances of small juveniles occur in the Wadden Sea close to the mouth of the Eider Estuary during summer (Breckling *et al.*, 1994).

Twaite shad was an important commercial species in some areas of the Southern Baltic, especially during the last quarter of the 19th and the first half of the 20th century (Thiel *et al.*, 2004). The mean annual twaite shad catch from 1891 to 1960 amounted to 90,982 kg for the entire Southern Baltic Sea. The annual catches of this species in the Southern Baltic declined so dramatically in the 1950s that from then on twaite shad was only occasionally caught in the Baltic Sea region until the mid 1990s (Thiel *et al.*, 2004). Today the population is increasing again.

Given the recent records from the German Baltic waters, it is assumed that the Baltic population of twaite shad has been increasing since the middle of the 1990s, after about 50 years of decrease. A migration of greater numbers of twaite shads from the North Sea into the Baltic Sea has not been observed yet. On the other hand, the species has also been observed more frequently in the Polish, Lithuanian, and Estonian waters of the Southern Baltic Sea since the mid 1990s. Therefore, the starting point of the population increase is probably the eastern twaite shad stock of the Curonian Lagoon (Thiel *et al.*, 2004).

Classified as vulnerable (VU) using IUCN criteria (Arahamian *et al.*, 2003).

Ireland

Twaite shad are included in the Irish Red Data Book where they are considered to be vulnerable (VU) with the main threats coming from weirs and pollution. There is no specific national legislation giving protection to the twaite shad. Twaite shad have only been identified in freshwater in five southern rivers (Rivers Suir, Nore and Barrow, Co. Waterford, Slaney Co. Wexford and River Blackwater, Co. Cork) in recent years and spawning has only been confirmed in the River Barrow. A recent survey by King and Linnane (2004) has been published by the Irish National Parks and Wildlife Services and is available at:

<http://www.npws.ie/en/PublicationsLiterature/Allpublications/d6792.en.v1.0.t4.PDF>

In this report, the species is considered to be very vulnerable, suggesting that they are closer to extinction in Ireland than previously believed.

Lithuania

Considered vulnerable (VU) using IUCN criteria (Elliot and Hemingway, 2002 and Arahamian *et al.*, 2003).

Luxembourg

Considered extinct (EX) using IUCN criteria (Arahamian *et al.*, 2003).

Netherlands

Considered extinct (EX) using IUCN criteria (Arahamian *et al.*, 2003).

Poland

Considered endangered (EN) in Elliot and Hemingway (2002), but classified as vulnerable (VU) using IUCN criteria (Arahamian *et al.*, 2003). In the Polish Red Data Book of Animals the twaite shad is classified as "Near Threatened". However, it is only rarely observed in Polish waters.

Sweden

Since the species does not reproduce in Sweden it is classified as Not Applicable (NA) using the IUCN criteria (Gärdenfors (ed.) 2005).

UK England and Wales

Twaite shad (*Alosa fallax*) occurs in coastal waters mainly around south Wales and along the Channel coast of England, but spawning populations are known only in the Rivers Severn, Wye, Usk and Tywi that flow into the Bristol Channel. Populations used to exist in the Thames and Trent but declined due to pollution. The main threat is impassable barriers. It is uncertain to what extent the extant populations of this species are depleted, but it is considered

vulnerable (VU) in the UK. No specific legislation or national fisheries laws but there are three SAC rivers in E&W with populations of twaite shad.

UK N. Ireland

No known spawning populations in rivers in Northern Ireland. Occasionally recorded as individual specimens in Southern Irish Sea in research trawls.

UK Scotland

Twaite shad (*Alosa fallax*) occurs in coastal waters around Scotland and there are sporadic reports of adult fish from rivers, mainly in the south west of Scotland. However, confirmation of successful spawning in any rivers is still lacking. This species is considered vulnerable (VU) in the UK. No specific legislation or national fisheries laws and no SAC rivers in Scotland.

4.3 American shad, *Alosa sapidissima*, Alewife – *Alosa pseudoharengus*, Blueback herring, *Alosa aestivalis* and Hickory shad, *Alosa mediocris*

American shad, *Alosa sapidissima*, and river herring (the general term for both alewife, *Alosa pseudoharengus*, and blueback herring, *Alosa aestivalis*) are anadromous fishes that spend the majority of their adult lives at sea, only returning to freshwater in the spring to spawn. Historically, shad and river herring species likely spawned in virtually every accessible river and tributary along the US Atlantic coast. However, blockage of spawning rivers by dams and other impediments, combined with degradation of water quality, has severely depleted suitable shad and river herring spawning habitat. Species of shad and river herring once supported important commercial and recreational fisheries along the Atlantic coast. Today, these fisheries are just a small fraction of what they were.

The Fishery Management Plan for American Shad and River Herring contains three main regulations. The first is a five-year phase out of the ocean intercept fishery for American shad, which began January 1, 2000. The second requirement establishes a fishing mortality target for in-river fisheries and calls for the maintenance of existing or more conservative regulations for river herring and hickory shad, *Alosa mediocris*. Lastly, it implements an aggregate 10-fish daily creel limit in recreational fisheries for American shad and hickory shad, with all jurisdictions maintaining existing or more conservative recreational regulations for river herring.

4.4 European eel – *Anguilla anguilla*

International Status

ICES/EIFAC (2003) report that a review of the available information on the status of the stock and fisheries of the European eel supports the view that the population as a whole has declined strongly in most of the distribution area, that the stock is outside safe biological limits and that current fisheries are not sustainable. Recruitment is at a historical minimum. Evidence has been given that anthropogenic factors (e.g. exploitation, habitat loss, contamination and transfer of parasites and diseases) as well as natural processes (e.g. predation, climate change) have contributed to the decline.

The continental eel population extends throughout Europe and northern Africa and fisheries are scattered over many large and small water bodies. Management at the local level has not adequately addressed the global decline of the stock, and no coordinated stock-wide management framework has been set up. The continued depleted state of the stock, as

demonstrated by most recent data, makes the compilation and implementation of an international stock recovery plan a matter of growing urgency.

The eel is not formally classified under the Texel-Faial classification system, nor is it included in the Habitats Directive, the Bern Convention or the IUCN Red List. However, it is assessed annually by a joint EIFAC/ICES Working Group on Eels (WGEEL).

Denmark

Based on both counting ascending elvers and commercial catch statistics the population of European eel is declining drastically in Denmark as in the rest of Europe. A stocking programme, financed by the recreational fishing licence funds, is running, stocking 1–5 million elvers (size 3–5 g) each year. Yellow eels have a legal minimum size, which is 45 cm in freshwater and varying, depending on locality, in marine areas.

Finland

European eel (*Anguilla anguilla*) used to have a widespread distribution throughout Finland in all accessible river systems. After extensive dam construction in Finnish watercourses the distribution has declined dramatically, especially over the past century. Nowadays, 99% of Finnish eels are of hatchery origin and the annual catches are negligible. Stocking programmes restarted in early 1990s and some improvement in catches is expected. No specific legislation for eel fisheries or conservation exists in Finland.

Iceland

The European eel is present in Iceland but is not considered as economically important.

Ireland

European eel (*Anguilla anguilla*) is widespread throughout the Ireland. In common with other European populations the Irish population has declined over the past 30 years although not to the same extent as other populations. While not included in the Irish Red Data Book, they are afforded considerable protection under national legislation with strict licensing in place for commercial fishermen, and regulations governing the methods and seasons of capture for silver, yellow and glass eels.

Norway

European eel is abundant in large areas in Norway, but there is very little information on status of the species. Data from a small river in SW Norway suggest a decline in recent years.

Poland

European glass eels enter rivers in very low numbers. In previous years many lakes and the Vistula and Szczecin lagoons were heavily stocked but this is now reduced almost close to zero. Although the Polish eel catches has decreased from 1700 tons in 1984 to about 300 tons in 2003, it is still economically important.

Spain

Considered as vulnerable (VU) in Elliot and Hemingway (2002).

Sweden

As most countries within the distribution area of the European eel (*Anguilla anguilla*), Sweden has experienced a severe decline in both the recruitment and the stock of eel. The recruitment during the last five years has decreased to less than 10% of what it was in the early 1940s. That means Sweden has experienced a longer period of decline and not quite as drastic as estimated for the whole European eel recruitment (only about 1% recruitment left after 25 years of decline, Dekker (2003)). As a consequence of the decreased numbers of recruits the commercial catches of eel along the Baltic Coast have decreased from about 1800 tons in the 1950s and 1960s to about 300 tons during the last five years. Thus, the decrease was most obvious in the Baltic Sea and in freshwaters but since the late 1990s also the annual catch of yellow eels along the Atlantic Coast (Skagerrak-Kattegat) has dropped from about a remarkable stable 250–300 tons to about 185 tons. However, from freshwaters the combined commercial catch has been quite stable as a result of stocking activities.

The European eel is considered Critically Endangered (CR) using the IUCN criteria (Gärdenfors (ed.) 2005).

UK England and Wales

European eel (*Anguilla anguilla*) is widespread throughout the UK (England and Wales). The population in Europe has substantially declined since the 1970s and, in common with most of Europe, there has been a substantial decline in recruitment in England and Wales compared with former levels. However freshwater populations of yellow eels in England and Wales have remained fairly stable in many areas due to the relatively low levels of exploitation. Legislation: national and regional byelaws define the gears that might be used to catch eels, set licence dues for their use, and minimum landing size (30 cm, other than for elvers).

UK N. Ireland

Ubiquitous in freshwater, with the exception of a small number of high altitude inaccessible sites. Recent research work (Winter/spring 2004) has confirmed current glass eel immigration on all coasts from all coasts from Foyle to Carlingford Loughs March to April. The eel traps at the tidal limit of the River Bann estuary, which supply Lough Neagh, provide a long term time series which is one of the indices used by ICES WGEEL. This data series shows declining recruitment 1970 to 2004. The decline in glass eel recruitment has not been as severe as in other parts of Europe, current levels being around 10% of long term averages, compared to the 1% level of some other European time series.

There is one major commercial eel fishery in fresh water, Lough Neagh, taking in excess of 500 tonnes annually of combined yellow and silver eels. Significant spawning escapement also occurs, estimated in excess of 200 tonnes annual minimum from the Bann system, of which about 70% by number are female.

Other than in Lough Neagh, there are no major commercial fisheries. The Erne system, shared with the Irish republic, has a small remnant fishery, declining due to low market price. This is a system impacted by hydropower, where all glass eel is trapped and transported upstream. As a result, there is considerable escapement of (female dominated) silver eel runs, but the survival of these past the hydropower turbines is in doubt.

Two river systems on the south east coast of Northern Ireland, the Rivers Lagan and Quoile contain significant, but unquantified, populations of eel. Given current recruitment on all coasts, and an average age to emigration of 14 years (Males) and 18 Years (females) eel populations will persist in Northern Ireland for at least a further 20 years even if recruitment were to fail completely. Economic pressures are currently the major influence reducing commercial fisheries.

UK Scotland

European eel (*Anguilla anguilla*) is widespread throughout the UK (England, Wales and Scotland). The population in Europe has substantially declined since the 1970s and, in common with most of Europe; there has been a substantial decline in recruitment in Scotland compared with former levels. Because of its long life span populations of yellow eels have held up better. Legislation: there is no national regulation of eel fishing in Scotland. Nevertheless, fishing effort for all stages is currently low.

4.5 American eel – *Anguilla rostrata*

American eel, *Anguilla rostrata*, serve as a prey species for many fish, aquatic mammals, and fish eating birds. Eel continue to support valuable commercial, recreational, and subsistence fisheries coastal-wide, although fisheries are at a fraction of what they were historically. The life history of the species, such as late age of maturity and a tendency of certain life stages to aggregate, can make this species particularly vulnerable to over-harvesting. American eel are currently under consideration for listing under the Endangered Species Act due to the large declines in abundance throughout the US. A meeting was held in October 2006 to review the status of American eel populations in Canadian waters. A stock status report was developed from this meeting and has been presented to COSEWIC (Committee on the Status of Endangered Wildlife in Canada) who will review the information and make a determination as to the status of the species (special concern, threatened, endangered) in relation to Canada's Species at Risk Act (SARA).

4.6 Sea char (Arctic Char) – *Salvelinus alpinus*

International

This species is not included in any of the international classifications used previously. The species occurs as a migratory (anadromous) form and a non-migratory (lacustrine) form in some areas. The latter are not considered here.

Iceland

Sea char are primarily found in cold streams in the mountainous areas of northwestern, northern and eastern Iceland, where salmon are practically absent. There are popular angling areas for sea-char on Iceland's north and northwest-coasts and considerable fishing for landlocked char in lakes all over the country. They are subject to controls under the current Icelandic Salmonid Fisheries Act which was enacted in 1970, but has been partly revised several times. Sea run char populations are considered to be in a healthy state.

Norway

Anadromous Arctic charr are generally considered to be in good condition, but problems exist for some local populations.

Sweden

Anadromous Arctic charr are generally considered to be in good condition and is considered Least Concern (LC) using the IUCN criteria (Gärdenfors (ed.) 2005).

4.7 Sea trout – *Salmo trutta*

Denmark

Original populations not influenced by stockings are considered rare (R) in the Danish Red List (Berg, 1998a). Closed season (16 November – 15 January) and minimum legal size 40 cm.

Finland

Sea trout (*Salmo trutta*) distribution on the Finnish coast of the Baltic Sea has decreased from dozens of rivers to only a few and the majority, if not all, of the wild stocks are endangered. The decline in rivers/populations has been mostly due to environmental disturbances, e.g. hydropower development, but the present stocks suffer mainly from overexploitation in mixed-species gill net fisheries along the Baltic Sea coast. There are certain specific regulations in the fisheries legislation concerning sea trout, e.g. on minimum size and fishing season.

France

Considered vulnerable (VU) in the French Red List (Elliot and Hemingway, 2002).

Iceland

Sea trout are most abundant in lowland areas of the south coast, where they are a popular angling species especially in the vicinity of “Kirkjubæjarklaustur”. They are subject to controls under the current Icelandic Salmonid Fisheries Act which was enacted in 1970, but has been partly revised several times. Sea trout populations are considered to be in a healthy state.

Ireland

Sea trout (*Salmo trutta*) occurs in most rivers in Ireland which enter the sea. The status of a small some these stocks has been measured directly with automatic fish counters or traps since 1995 and indicates that while there has been some recovery since the 1990 stock collapse, most populations remain in a tenuous state in the West of Ireland where they are given specific protection under national legislation. These stocks must therefore be considered as vulnerable. In other areas, national legislation covers the length of the commercial and angling seasons in a similar way to salmon.

Norway

Anadromous brown trout are generally considered to be in good condition, but several local populations are under heavy pressure: Main problems: acid water, river regulations, aquaculture.

Poland

Sea trout stocks are generally considered to be in good condition mainly due to intense stocking with smolts and alevins. Yearly releases of sea trout smolts have varied from 0.250 million to about 1.5 million. Natural spawning has been reduced due to the restrictions in spawning area by damming of rivers. The largest population of sea trout in Poland occurs in the Vistula River. Annual commercial sea trout catches vary from 200 to 600 tons, with an in-rivers catch of between 20 and 100 tons. Sea trout has status Endangered in Polish Red Data Book of Animals and also is protected through Polish national regulatory measures.

Spain

Considered vulnerable (VU) in Elliot and Hemingway (2003).

Sweden

Considered Least Concern (LC) using the IUCN criteria (Gärdenfors (ed.) 2005).

UK England and Wales

Sea trout (*Salmo trutta*) occurs as breeding populations in most rivers of the UK (England and Wales) apart from along the east coast south of the Yorkshire Esk (54° 30' N). Stocks in England and Wales are buoyant and increasing in some previously polluted rivers (e.g. S. Wales, NE England). Legislation: sea trout are afforded considerable protection under the salmon legislation, but have a different (earlier) open season and no mandatory catch and release.

UK N. Ireland

Sea trout are present all coasts and in all major estuaries of Northern Ireland but do not spawn in all rivers. The rivers entering the Irish Sea on the South-and east coasts, tend to have small spawning populations which include large multiple spawning fish to 5Kg or more. On the East coast, sea trout tend to replace or at least outnumber salmon. The Foyle system on the North coast has larger populations of generally smaller spawning fish.

No specific conservation based legislative status. Some river populations and many reduced under pressure from agricultural impacts (eutrophication and occasional acute pollution), and a history of land drainage activity.

UK Scotland

Sea trout (*Salmo trutta*) occurs as breeding populations in most rivers of Scotland. In all rivers numbers fluctuate, but in the rivers of the West and North West of Scotland, sea trout numbers have shown a sustained decline over recent decades, so that numbers are severely depressed in many rivers. There have also been marked declines in older fish and growth rates too seem to be lower than in the past. Sea trout are afforded considerable protection under Scottish salmon legislation.

4.8 Atlantic salmon – *Salmo salar*

International

The international advice from ICES (ICES, 2004) is summarised below.

North America

Estimates of pre-fishery abundance (PFA) suggest a continuing decline of North American adult salmon over the last 10 years. The total population of 1SW and 2SW Atlantic salmon in the northwest Atlantic has oscillated around a generally declining trend since the 1970s, and the abundance recorded in 1993–2002 was the lowest in the time-series. During 1993 to 2000, the total population of 1SW and 2SW Atlantic salmon was about 600,000 fish, about half of the average abundance during 1972 to 1990. A 21% increase however has occurred between 2001 and 2002, the most recent year for which it is possible to estimate the total population. The decline from earlier higher levels of abundance has been more severe for the 2SW salmon component than for the small salmon (maturing as 1SW salmon) age group. In 2003, the overall conservation limit (S_{lim}) for 2SW salmon was not met in any area.

Salmon populations in the southern portion of the range in North America and in isolated locations throughout the range have diminished to levels that require actions to prevent their extirpation. Two population segments in North America have been listed as Endangered by their respective national legislation, one listing consists of eight rivers in Maine, USA and the other consists of thirty-three rivers of the inner Bay of Fundy, Canada. Within the USA, a team is reviewing the status of stocks in other rivers within the Gulf of Maine for future consideration as either threatened or endangered. A similar process is occurring for Outer Bay of Fundy and Atlantic coast of Nova Scotia stocks in Canada.

In addition to historic extirpations, no spawning occurred on two of the eight listed rivers in the USA in 2001 and 2002. In two areas in Canada, the Atlantic coast of Nova Scotia (approximately 50 of 65 rivers) and the outer Bay of Fundy (11 of 11 rivers) have salmon populations that have been extirpated or are perilously close to extirpation. Population viability modelling in both the USA and Canada has predicted that many of the river populations are not sustainable, possibly even when supportive breeding and rearing programs are used.

Northern European 1SW stocks: The pre-fishery abundance (PFA) of 1SW salmon from the Northern European stock complex has been above the spawning escapement reserve throughout the time series available (1970 to 2003). However, the spawning escapement was at or below the conservation limit until 1997. Thereafter the spawning escapement has remained above the conservation limit. However, given the confidence limits on the spawner estimates, ICES considers that this stock complex is outside safe biological limits.

Northern European MSW stocks: The PFA of non-maturing 1SW salmon from the Northern European stock complex has been declining throughout the time series available (1970 to 2003) and the exploitable surplus has fallen from around 1.2 million recruits in the early 1980s to about 0.7 million in recent years. ICES considers the Northern European MSW stock complex to be within safe biological limits, as spawners are currently above CL and trending in a positive direction. However, the status of individual country stocks may vary considerably.

Southern European 1SW stocks: Recruitment of maturing 1SW salmon in the Southern European stock complex has shown a strong decreasing trend throughout most of the time series (1970 to 2003). Moreover the spawning escapement for the whole stock complex has fluctuated around the conservation limit in recent years, and was only marginally above the conservation limit in 2003. Despite a small surplus above Spawning Escapement Reserve (SER) of around 400,000 fish during the last five years, exploitation in these years was clearly high enough to prevent conservation limits being consistently met. ICES considers that this stock complex is outside safe biological limits and further that, mixed stock fisheries present particular threats to conservation.

Southern European MSW stocks: The PFA of non-maturing 1SW salmon from Southern Europe has been declining steadily since the 1970s and the preliminary quantitative prediction of PFA for this stock complex in 2004 is 489,000. There is evidence from the prediction that PFA will decrease in the near future and the spawning escapement has not been significantly above conservation limit for the last eight years. ICES considers that this stock complex is outside safe biological limits and further that, mixed stock fisheries present particular threats to conservation. Reductions in exploitation rates are required for as many stocks as possible, except those stocks shown to above conservation limits

Canada

In certain parts of Canada (Inner Bay of Fundy, Nova Scotia and Terra Nova), Atlantic salmon are on the endangered list.

Denmark

Salmon was originally occurring in nine rivers on the Jutland peninsula. At present specimens of natural genetically origin is found in only four of these. The population size is small in the four remaining stocks. During the last few years the situation has improved a little, mainly due to fisheries regulations and captive breeding and restocking. These populations are still far from a stable situation. Salmon are considered endangered (EN) in the Danish Red List (Berg, 1998a) and in Elliot and Hemingway (2002).

Finland

Atlantic salmon (*Salmo salar*) used to occur as breeding populations in c. 30 rivers of the Baltic coast of Finland. Nowadays, only two rivers support viable natural spawning stocks. Data inputs to the ICES assessment include both Finnish and Norwegian rod catches for this river. The analysis suggests that the numbers of returns and spawners have fluctuated widely since 1971. The early part of the time-series (1971 to 1975) is characterised by a steep rise, followed by a sharp decline. Numbers of returns and spawners remained low until 1982, but have shown a steady increase since this time, reaching a peak in 2000. In the last three years both returns and spawners have again shown a steep decline. In 2003, 1SW spawners were below CL and MSW spawners were at or above CL.

The decline in populations has been due to hydropower development, other environmental problems and overexploitation. There are a few stock-rebuilding programmes underway, but their success has been slow so far. In contrast, the two wild populations have improved rapidly after mid-1990s. There are two rivers running into the Barents Sea that are border rivers between northernmost Finland and Norway. Salmon stock status in these rivers are among the best in the entire Atlantic area. Salmon are protected by a range of measures, limiting the number, types, design and operation of gear allowed to catch salmon, seasonal and weekly close times etc. Bilateral treaties concerning border rivers with Sweden and Norway.

Salmon are considered endangered (EN) in Elliot and Hemingway (2002).

France

Returns and spawners are estimated by ICES to have declined over the past 20 years, although there have been large annual fluctuations. Numbers have been particularly low in recent years, with the last nine years being the lowest in the time-series. There has also been a decline in the proportion of MSW salmon in the catch over the time-series. The current status of the stocks must therefore be considered to be low with no indication of a recovery. In 2003, both 1SW and MSW spawners were below their respective CLs.

Salmon are considered vulnerable (VU) in Elliot and Hemingway (2002).

Flanders

Salmon are believed to be extinct (EX) in Elliot and Hemingway (2002).

Germany

Salmon are believed to be endangered (EN) in Elliot and Hemingway (2002).

Iceland

The current Salmonid Fisheries Act was enacted in 1970, but has been partly revised several times. One of the important provisions of the Act, dating back to 1932, states that salmon fishing in the sea is forbidden, with minor exceptions. The ICES assessment suggests that

there has been an overall decline in total returns of salmon to Iceland, from around 120,000 in the 1970s to about 60,000 in 2003. However the values for both returns and spawners in 2002 and 2003 are greater than observed in the two previous years. Estimated returns showed an upward trend in the early part of the time-series (1971–1978), followed by a sharp decline (1979–1984) and a brief recovery to early levels in the late 1980s. There has been a clear downward trend since 1988. There has also been a marked decline in MSW salmon relative to 1SW fish in the catch. In 2003, both 1SW and MSW spawners were below their respective CLs.

Ireland

There are approximately 173 rivers in Ireland supporting salmon stocks. While conservation limits (CLs) have been set for each of the salmon fishing districts of Ireland only 5 out of 17 are meeting or exceeding CL while the remaining districts are at various degrees of attainment of CL. There is specific legislation covering salmon fishing which in recent years has allowed the imposition of a district TAC to facilitate the attainment of CL in each district or to allow rebuilding in those districts which are far below CL. Salmon were included in the Irish Red Data Book, where it has been classified as Internationally Important but not threatened. Although marine survival has generally been poor for the past decade or more, the main threats to populations are overfishing and pollution.

Lithuania

Salmon are considered to be vulnerable (VU) in Elliot and Hemingway (2002).

Poland

The last salmon population became extinct in the mid 1980s. Restoration programmes began in 1985 when salmon eggs from the Daugava River were imported for release programmes in Polish rivers. Stocking with smolts has been carried out since 1994. The number of smolts released annually has varied from 150,000 to 500,000. Adult salmon enter the Vistula and Pomeranian Rivers. While natural spawning is observed, between 1 million and 2.5 million eggs are collected for enhancement programmes. A commercial catch of approximately 10 tonnes is taken mainly in the Vistula River. Salmon are protected under Polish national legislation. The Polish Red Data Book of Animals classifies salmon as Critically Endangered (CR). However, it is considered extinct in Elliot and Hemingway (2002).

Norway

Atlantic salmon as a species is in a relatively good shape, but several populations are under heavy pressure (see table below). Main problems: acid water, *Gyrodactylus salaris*, river channelisation, aquaculture.

Classification of rivers based on the condition of the salmon stock in relation to adverse human impact. Only rivers which have or have had natural self reproducing populations are included. Tributaries not included as units in this table.

TOTAL NUMBER OF SALMON RIVERS IN NORWAY	471
Lost stocks	48
Threatened stocks	29
Vulnerable (VU) stocks – near threatened	34
Vulnerable (VU) stocks - maintained by mitigative actions	21
Reduced stocks – reduced young fish production	60
Reduced stocks – reduced number of adults only	6
Moderate or lightly affected stocks – requiring special concern	204
Moderate or lightly affected stocks – not requiring special concern	56
Uncertain classification	13

ICES reports a decline in returns from the beginning of the time series (1983) until the late 1990s. Thereafter, a sustained increase in returns was observed over the period 1998–2001, followed by a decline once again in 2002. ICES considers that the spawning stock has remained relatively stable throughout this period due to a reducing exploitation rate through the time period. In 2003, both 1SW and MSW spawners were at or above their respective CLs.

Russia

Total returns to Russia are estimated by ICES to have been at their highest in the early 1970s, followed by a sharp decline during the late 1970s and early 1980s. From this period onwards there has been a general upward trend in the number of returns although the estimates for last year show a decline. Estimates of spawners follow a similar pattern to that described for returns. There has been a marked reduction in the exploitation rate in the last decade. It should be noted that, for Russia in particular, year on year trends in estimated PFA may not be closely reflected in the subsequent year on year trend in the number of spawners. To account for biological reality, the model assigns a fixed proportion of potential spawners returning in a given year to the spawning numbers for the following year. In 2003, both 1SW and MSW spawners were at or above their respective Conservation Limits.

Spain

Considered endangered (EN) in Elliot and Hemingway (2002).

Sweden

Stocks in Sweden have fluctuated widely throughout the time-series. Following a substantial decline in the mid-1990s, ICES reports there has again, been a rapid recovery followed by successive declines in the last three years. A feature of the latter half of the time-series is the increase in the proportion of the stock that is comprised of MSW salmon. The exploitation rate has remained high over the last 30 years although there has been a decline from 1990 onwards. In 2003, both 1SW and MSW spawners were at or above their respective CLs.

Salmon are considered Least Concern (LC) in the latest Swedish Red List (Gärdenfors (ed.) 2005). However, one local population (Lake Vänern) is considered Endangered (EN) using the IUCN criteria.

Switzerland

Considered extinct (EX) in Elliot and Hemingway (2002).

UK England and Wales

Atlantic salmon (*Salmo salar*) occurs as breeding populations in most rivers of the UK (England and Wales) apart from along the east and south coasts of England between the Yorkshire Esk (54° 30' N) and the River Itchen (1° 20' W). Stocks in England and Wales have declined since the 1980s, especially the multi-sea winter component, and only 16 of 64 rivers exceeded their conservation limit (estimated egg deposition) in 2003. However, stocks in a number of previously polluted rivers have increased markedly. Legislation: Protected by a range of measures, limiting the number, types, design and operation of gear allowed to catch salmon (under licence), seasonal and weekly close times, prohibiting the taking of unclean (gravid) fish and, in England and Wales, prohibiting retention of multi-sea-winter salmon (catch and release before 16th June for angling); 14 SAC rivers in E&W.

UK Northern Ireland

Atlantic salmon enter rivers on all coasts of Northern Ireland. The River Foyle and its tributaries system in the North-west, a shared catchment with the republic of Ireland, has the strongest stocks and has candidate SAC status for the species. The river Roe, entering the sea in the Foyle estuary, is also a candidate SAC. Significant populations also spawn in tributaries of the Bann/Lough Neagh system. The east coast of Northern Ireland has several smaller rivers with small stocks which are generally close to or below their conservation limits. The River Bush is an ICES index river with full counts of all smolt emigration and adult return supplied annually to NASCO and ICES. Sea survival from smolt to return to the coast, determined by Index data from the River Bush is at an all time low.

The majority of Northern Ireland salmon stocks are of 1SW fish. The Foyle system retains some 2SW fish in some tributaries, a significant feature of its SAC designation. There has been significant reduction in exploitation rates at sea within the past 3 years due to a buy-out of North Coast commercial drift nets.

Returns are estimated by ICES to have declined over the time series as a whole, albeit with considerable short-term fluctuations. The catch is dominated by 1SW fish, but there are uncertainties in the relative status of 1SW and MSW fish, as the data on catch composition by sea age are uncertain for most of the historical time-series. In 2003, both 1SW and MSW spawners were at or above their respective CLs.

UK Scotland

Atlantic salmon (*Salmo salar*) occurs as breeding populations in most rivers of Scotland. Generally, within river numbers are holding up quite well, but this is partly due to a substantial reduction in exploitation by nets (as a result of net buy outs) and the release of many of the fish taken by rod, which have offset reductions in the numbers of fish returning to Scottish waters. Different components of the stocks are showing different trends, the early multi-sea winter component showing a particularly pronounced downward trend. However, stocks in a number of previously polluted rivers have increased markedly. Legislation: Protected by a range of measures, limiting the types, design and operation of gear allowed catching salmon, the seasonal and weekly close times, and prohibiting the taking of unclean (gravid) fish. There are 17 SAC rivers in Scotland.

USA

Returns of Atlantic salmon, *Salmo salar*, to the USA have been so low that eight rivers have been listed as endangered under the Endangered Species Act. For the US as a whole, returns have been well below conservation limits in all rivers for decades. Management actions include prohibition of catching the species either commercially or recreationally.

4.9 River lamprey – *Lampetra fluviatilis*

International

River lamprey have no formal Texel-Faial category assigned to date and are not listed in either Annex II and V of the Habitats directive. They are listed as Least Concern/Near Threatened (LC/NT) in the IUCN Red List suggesting that although there is no immediate threat of extinction of the species there may be some factors causing some concern in the mid-term to longer term.

Denmark

Lampetra fluviatilis is frequently found in Danish rivers in most regions of Denmark, but very little is known about status and trends in population development. It is included in the Danish Yellow List in category X (species which needs attention) (Berg, 1998b). Status is considered indeterminate in Elliot and Hemingway (2002).

Finland

River lamprey (*Lampetra fluviatilis*) used to have a widespread distribution throughout Finland in all accessible river systems. After extensive dam construction in Finnish watercourses the distribution has declined dramatically, especially over the past century. There are still a number of rivers producing high catches annually and the importance of the fishery is high in certain regions. Quantitative data on the range or size of the populations is lacking. The main threats to this species come from pollution, river engineering and various impassable barriers. Some specific legislation on lamprey fisheries exists.

France

Considered vulnerable (VU) in the French Red List (Elliot and Hemingway, 2002).

Flanders

Considered vulnerable (VU) in the Flanders Red List (Elliot and Hemingway, 2002).

Germany

The river lamprey (*Lampetra fluviatilis*) occurs in marine and brackish waters of the German North Sea and Baltic Sea region (Diercking and Wehrmann 1991; Gaumert and Kämmererit 1993; Spratte and Hartmann 1998; Winkler *et al.*, 2002). Generally, river lamprey populations have decreased in Germany since the mid 1950s (e.g. Imam *et al.*, 1958; Wilkens and Köhler 1977; Möller 1984). It is assumed that pollution of estuaries and the building of weirs and dams prevented lampreys from reaching their original spawning grounds (Lelek 1987).

Thiel and Salewski (2003) estimated that the anadromous spawning migration of river lampreys into the Elbe Estuary proceeds in autumn. Thiel and Salewski (2003) recorded only 10 individuals of sea lampreys in the Elbe Estuary from 1989–1995. In the Elbe Estuary from 1989–1995 2,217 river lampreys were caught. According to Thiel *et al.* (2005) 317 records of river lampreys with 19,977,622 individuals and 89 records of sea lampreys with 129 individuals were obtained in subdivisions 20–26 of the Baltic Sea for the period from 1649 – 2005. The river lamprey was mainly distributed within the Szczecin Lagoon and adjacent waters, the lower Vistula River, the Vistula Lagoon, the Bay of Gdańsk and the Curonian Lagoon. From 1887–1999 about 14,377 kilogram of river lampreys were caught annually in the southern Baltic Sea (Thiel *et al.*, 2005). 82% of the total lamprey catches of the southern Baltic Sea originated from subdivision 26. No regular annual spawning of river lamprey occur at all known spawning sites in the German Baltic Sea region (Winkler *et al.*, 1999).

Additionally, these spawning populations are very small, comprising only of 20 to 100 individuals (Winkler *et al.*, 2002).

Considered threatened in the German Red List (Elliot and Hemingway, 2002).

Ireland

This species is included in the Irish Red Data Book and described as being of indeterminate status. More recent work commissioned by the Irish National Parks and Wildlife Services (King and Linnane 2004) has shown the species to be present in several rivers in Ireland. No overall classification is suggested but river lamprey appeared to meet relative biomass objectives (as defined by Cowx *et al.*,) in one large Irish River (River Slaney, Co. Wexford), but was probably deficient in a second large river (i.e. The Munster Blackwater, Co. Cork). This report is to be found at:

<http://www.npws.ie/en/PublicationsLiterature/Allpublications/d6792.en.v1.0.t4.PDF>

Italy

Considered endangered (EN) in Elliot and Hemingway (2002).

Norway

River lamprey occur in Norway but their status is unknown.

Poland

River lamprey were very common in Poland, but are now less numerous and may have disappeared in some rivers. A commercial fishery is still carried out in the Vistula River and its tributaries and the Vistula Lagoon. In the Polish Red Data Book of Animals, the river lamprey is classified as near threatened (NT) and vulnerable (VU) in Elliot and Hemingway (2002)

Spain

The river lamprey is considered extinct (EX) in Spain (Elliot and Hemingway, 2002).

Sweden

Lampetra fluviatilis seems to be more common than earlier believed and its IUCN classification is changed to near threatened (NT) in the latest Swedish Red List (Gärdenfors (ed.) 2005).

Switzerland

Considered extinct in Elliot and Hemingway (2002).

UK England and Wales

River lamprey (*Lampetra fluviatilis*) is known to have disappeared from a number of European rivers, but quantitative data indicating a decline in either the range or in the size of the population in England and Wales is lacking. The main threats to this species come from pollution, river engineering and various impassable barriers. Legislation: 11 SAC rivers in E&W.

UK N. Ireland

This species is known to be present in two river systems, the Lagan (east coast) and Bann/Lough Neagh system. The Bann/Lough Neagh system may contain freshwater, non migratory sup-populations.

UK Scotland

River lamprey (*Lampetra fluviatilis*) is known to have disappeared from a number of European rivers, but quantitative data on the size of the Scottish populations is lacking. The main threats to this species come from pollution, river engineering and various impassable barriers. Legislation: 6 SAC rivers in Scotland, including the River Endrick, which is the major spawning stream for a land-locked population of river lamprey present in Loch Lomond.

4.10 Sea lamprey – *Petromyzon marinus*

International

Sea lamprey are classified under the Texel-Faial system as being of global importance, sensitive and in decline. They are only listed in Annex II but not Annex V of the Habitats directive, while they are included under Annex III of the Bern Convention. They are not classified in the IUCN Red List.

Denmark

The species are regularly observed, and are found in many Danish regions, most frequently in the western part of the country. There are no quantitative data on the species, but it is known to spawn in some larger rivers and streams in Denmark. The species is listed on the National Yellow list (Berg, 1998b) No commercial or recreational fishery is taking place. It is not nationally protected. No conservation plan is envisaged for this species.

France

Considered vulnerable (VU) in the French Red List (Elliot and Hemingway, 2002).

Flanders

Considered extinct (EX) in the Flanders Red List (Elliot and Hemingway, 2002).

Germany

Sea lamprey (*Petromyzon marinus*) occurs in marine and brackish waters of the German North Sea and Baltic Sea region (Diercking and Wehrmann 1991; Gaumert and Kämmerleit 1993; Spratte and Hartmann 1998; Winkler *et al.*, 2002). Generally, lamprey populations have decreased in Germany since the mid 1950s (e.g. Imam *et al.*, 1958; Wilkens and Köhler 1977; Möller 1984). It is assumed that pollution of estuaries and the building of weirs and dams prevented lampreys from reaching their original spawning grounds (Lelek 1987).

Thiel and Salewski (2003) estimated that the anadromous spawning migration of river lampreys into the Elbe Estuary proceeds in autumn. Thiel and Salewski (2003) recorded only 10 individuals of sea lampreys in the Elbe Estuary from 1989–1995. In comparison, 2,217 river lampreys were caught in the same area during the same period. This indicates remarkable differences in the population densities of both lamprey species. Sea lampreys have never been very abundant in the southern North Sea region, e.g. in the Elbe Estuary (Kluge 1904; Bauch 1958). Nowadays, no actual reproduction of sea lamprey in the German Baltic Sea area is

known (Spratte and Hartmann 1998; Winkler *et al.*, 2002). Historically, the sea lamprey may have spawned in the River Trave system (Duncker 1960).

It is considered endangered (EN) in the German Red List (Elliot and Hemingway, 2002).

Ireland

This species is included in the Irish Red Data Book and described as being of indeterminate status. More recent work commissioned by the Irish National Parks and Wildlife Services (King and Linnane 2004) has shown the species to be present in several rivers in Ireland. No overall classification is suggested but sea lamprey appeared to meet relative biomass objectives (as defined by Harvey and Cowx, 2003) for at least one large Irish river (Munster Blackwater, Co. Cork) while being deficient in a second large river (River Slaney, Co. Wexford).

<http://www.npws.ie/en/PublicationsLiterature/Allpublications/d6792.en.v1.0.t4.PDF>

Italy

Considered critically endangered (CR) in Elliot and Hemingway (2002).

Lithuania

Considered endangered (EN) in Elliot and Hemingway (2002).

Norway

Sea lamprey occur in Norway but their status is unknown.

Poland

This species is very rarely observed and they are caught only occasionally.

Spain

Considered vulnerable (VU) in Elliot and Hemingway (2002).

Sweden

Using the IUCN criteria Sea Lamprey is considered Endangered (EN) in the latest Swedish Red List (Gärdenfors (ed.) 2005).

UK England and Wales

Sea lamprey (*Petromyzon marinus*) enters and spawns in many rivers around the UK coasts, but circumstantial evidence, for example in the Severn, indicates that the species was more abundant in the past. The main threats to this species come from the continual loss of access, the degradation of spawning habitat and poor water quality. Legislation: 12 SAC rivers in E&W.

UK Scotland

Sea lamprey (*Petromyzon marinus*) enters and spawns in many rivers around the UK coasts. The main threats to this species come from the loss of access, the degradation of spawning habitat and poor water quality. Legislation: six SAC rivers in Scotland.

UK N. Ireland

This species has been observed in small numbers from estuaries on all coasts. It has one known spawning site in the Bann downstream of an impassable weir some 10km from the tidal limit of the river. It has been recorded from estuaries and tributaries in the Foyle system, north coast. There is no numerical census data.

4.11 European sturgeon – *Acipenser sturio*

International

The species is classified under the Texel-Faial criteria as being of global and local importance, rare sensitive and in decline. It is included under Annex II and V of the habitats Directive, Appendix 1 of CITES and Annex III of the Bern Convention. It is recorded in the IUCN Red List as critically endangered (CR) with an A2d sub-classification indication that there has been an observed, inferred or suspected population size reduction of greater or equal to 80% over the last 10 years or three generations, where the reduction or its causes may not have ceased. In this case the cause indicated is actual or potential levels of exploitation.

Anadromous sturgeon (*Acipenser spec.*) populations were known from the North- and Baltic Seas and from larger rivers draining into these marine waters (Freyhof 2002). According to Debus (1995), the extinction of these sturgeon populations in German waters during the last century was caused mainly by overfishing, pollution, river regulation, and damming in the North- and Baltic Sea areas.

After 1950, sturgeons were only caught occasionally in the North- and Baltic Seas and in 1996 probably the last specimen in the Baltic Sea was caught. *Acipenser sturio* is considered extinct as a reproductive sturgeon species in Germany and is now reduced to a relict population in the French Gironde River (Kirschbaum and Gessner 2002). Archaeological and genetic studies have shown that about one thousand years ago, in the Baltic, *A. oxyrinchus* replaced *A. sturio*, which until then had been the dominant native species.

Denmark

Considered extinct (EX) in the Danish Red List (Berg, 1998a).

Flanders

Considered extinct (EX) in the Flanders Red List (Elliot and Hemingway, 2002).

Germany

Considered critically endangered (CR) in the German Red List (Elliot and Hemingway, 2002).

Italy

Considered extinct (EX) in Elliot and Hemingway (2002).

Lithuania

Considered extinct (EX) in Elliot and Hemingway (2002).

Poland

Considered extinct (EX) in Elliot and Hemingway (2002).

Sweden

This species has never reproduced in Sweden. However, new information says that the *Acipenser* species that reproduced in Sweden for more than 100 years ago was *Acipenser oxyrinchus*. European Sturgeon is therefore considered as Not Applicable (NA) in Sweden (Gärdenfors (ed.) 2005).

Spain

Considered critically endangered (CR) in Elliot and Hemingway (2002).

4.12 Atlantic sturgeon – *Acipenser oxyrinchus*

International

Atlantic sturgeon, *Acipenser oxyrinchus*, can be found along the entire western Atlantic coast from Labrador, Canada to Florida. They are anadromous, migrating from the ocean into coastal estuaries and rivers to spawn. Atlantic sturgeon may live up to 70 years old, with females reaching sexual maturity between the ages of seven to 30, and males between the ages of five to 24.

Since colonial times, Atlantic sturgeon have supported commercial fisheries of varying magnitude. Landings just prior to 1900 were estimated at seven million pounds per year. Over harvesting for its flesh and eggs continued through the 1990s until the states and federal government implemented a coastal-wide moratorium in late 1997 and early 1998. Because the population has been severely overfished, the Fishery Management Plan for Atlantic Sturgeon called for a rebuilding of 20 year classes, which was estimated to take 20 to 40 years from 1998.

Recent research has shown that the sturgeon species last recorded in individual catches in the Baltic in the 1990s was the Atlantic sturgeon *Acipenser oxyrinchus* Mitchill, 1815. Archaeological and genetic studies have shown that about one thousand years ago, in the Baltic, *A. oxyrinchus* replaced *A. sturio*, which until then had been the dominant native species. Because of this historic presence of *A. oxyrinchus* in the Baltic Sea, the re-introduction of this species would be justified and in line with respective legal guidelines.

Sweden

Considered as Regionally Extinct (RE) in Sweden. The species disappeared around 1900 (Gärdenfors (ed.) 2005).

4.13 Shortnose sturgeon – *Acipenser brevirostru*

Shortnose sturgeon, *Acipenser brevirostru*, are currently listed as endangered under the Endangered Species Act.

4.14 Houting – *Coregonus lavaretus oxyrinchus*

International

The species is classified under the Texel-Faial criteria as probably of global importance, rare, sensitive and in decline. It occurs under Annex II and V of the Habitats Directive and under Annex III of the Bern Convention. Its status relative to its prospects of extinction are not clear as it is regarded as data deficient (DD) under the IUCN Red List classification. A recent taxonomic review by Freyhof and Schöter (2005), suggests that fish generally described as

houting involve two quite different species with the one found formerly in the western North Sea from England to the Rhine now totally extinct.

Denmark

The species are found in three South-western Danish rivers, River Ribe Å, River Varde Å and River Vidå, but are only indigenous to River Vidå (and maybe River Ribe Å). Houting occur in other rivers as a result of stocking in the late 1980s, but since stockings were terminated these populations has declined again. A conservation plan on houting was instigated in 2003 and a number of measures are going to be implemented to secure the survival of the species. In the period 2005–2009 an EU-life project (LIFE NAT/DK/000153, total budget 13,4 mill. euro) on this species will be performed. The overall project objective is to restore and maintain a favourable conservation status for the houting in four Danish river systems. A major part of the project will focus improving habitats in the rivers involved, e.g. remove migration barriers and create spawning and nursery areas. The species is considered rare (R) in the National Red List (Berg, 1998a) and a national responsibility species (more than 20% of the world's total number of specimens breeding in Denmark) in the National Yellow List (Berg, 1998b). For these reasons houting are nationally protected.

Finland

Whitefish *Coregonus lavaretus* (*s.lat.*) is a widespread freshwater species in many Finnish lake districts and a brackish water and anadromous species in the Baltic Sea. It has a great importance in the coastal and freshwater fisheries in Finland. The status of many anadromous stocks has declined after hydropower development, other environmental disturbances and intensive fisheries. There are various and sometimes large-scale stocking programmes for whitefish throughout Finland along with specific fisheries regulations and legislation concerning whitefish fisheries, e.g. on gear and fishing season.

Flanders

Considered extinct in Flanders Red List (Elliot and Hemingway, 2002).

France

Considered extinct in Elliot and Hemingway (2002).

Germany

The houting (*Coregonus oxyrinchus*) was a frequent anadromous fish in the coastal areas of the North Sea, especially in the Wadden Sea and the large German North Sea estuaries (Vorberg and Breckling 1999). Nowadays, the houting is very rare in the North Sea. Only a small population has survived in the River Vida (Denmark) where the species was rediscovered in 1982. A restitution programme, based on transferred fishes from the River Vida to the River Treene, the River Elbe basin, and to the lower River Rhine in Germany, has been running since the end of the 1980s (Jäger, 1999). However, none of these stocking projects have resulted in a self-sustainable population independent of stocking. Recent findings show that the relict stocks of houting from the North Sea basin are identical to the houtings living in the Southern Baltic, and that the original North Sea houting (*Coregonus oxyrinchus*) is a globally extinct species (Freyhof and Schöter 2005).

Reasons why the species vanished from the German North Sea areas are probably the same as for the extinction of sturgeons (Freyhof 2002). Kottelat (1997) associated the anadromous houting stocks of the German Baltic waters with *Coregonus maraena* (Bloch, 1779) from Lake Madü in Poland. According to Freyhof and Schöter (2005), the houtings from the Rivers

Ems, Elbe, Treene, Schlei, Peene, and from the Schlei Fjord and the Vänern also belong to the same species. Although the population has stabilised during the last 10 years (Winkler *et al.*, 2002), and restitution programmes have been underway, (for example, in the River Trave and in the Schlei Fjord using *C. maraena* from the Szczecin lagoon and adjacent waters since 1992) the species is very close to disappearing from several German Baltic waters (Freyhof 2002). However, the main Baltic distribution area of houting is the Szczecin lagoon and adjacent waters (Schulz 2001). A stocking programme was running there from 1996 to 2002, and resumed since 2005.

Norway

There are few populations of anadromous whitefish (*Coregonus lavaretus*) in Norway, which are generally considered to be in good condition, although the actual status of the whitefish is not well known.

Poland

Houting (Whitefish) *Coregonus lavaretus* wild stock still exists in Szczecin Lagoon however is supported by stockings from Germany and Poland. Wild population of *Coregonus lavaretus lavaretus* in Gulf of Gdansk, which was abundant till 1960s, is presently almost extinct. Since 1998 restocking based on material of Szczecin Lagoon origin is conducted here with good results. Regulatory measures are in force. This species has “High priority” classification on HELCOM list of endangered species.

Switzerland

Considered extinct in Elliot and Hemingway (2002).

UK England and Wales

Considered threatened in the UK Biodiversity Action Plan.

4.15 Whitefish/Vendace – *Coregonus albula*

International

This species complex is not included under the Habitats Directive Annex II and V, or the Bern Convention Annex III. Its status in relation to the possibility of extinction is not known as it is classified as data deficient (DD) in the IUCN Red List.

Denmark

Vendace is found in a small number of Danish lakes, mainly in the western part of the country (Jutland). There is very little data available on the status of these populations, and vendace is listed as rare (R) in the National Red List (Berg, 1998a). In one lake, Lake Knud, in the River Gudena catchment area, a small commercial fishery on vendace is catching ca. 1000 vendace per year. A fish survey in the lake has shown vendace to be common. Migrational behaviour of this species has never been observed in Denmark.

Sweden

Considered least concern (LC) in the latest Swedish Red List (Gärdenfors (ed.) 2005).

UK England and Wales

Considered a priority species under the UK Biodiversity Action Plan.

4.16 Acadian Whitefish /Cisco – *Coregonus huntsmanii*

International

This species is considered as vulnerable (VU) under the IUCN classification with a further D2 sub-classification that the population is very small or restricted with a very restricted area of occupancy (typically less than 20km) or number of locations (typically 5 or fewer) such that it is prone to the effects of human activities or stochastic events within a very short time period in an uncertain future, and is thus capable of becoming Critically Endangered (CR) or even Extinct (EX) in a very short time period.

Canada

Considered endangered under the Canadian Species at Risk Act (SARA).

4.17 Northern Whitefish – *Coregonus peled*

International

This species is considered as data deficient (DD) under the IUCN classification.

Sweden

Considered Critically Endangered (CR) in the latest Swedish Red List (Gärdenfors (ed.) 2005).

4.18 Bottom Whitefish – *Coregonus pidschian*

International

This species is considered as data deficient (DD) under the IUCN classification.

4.19 Smelt – *Osmerus eperlanus*

International

The smelt is not currently classified under the Texel-Faial criteria and is not included under Annex II and V of the Habitats Directive of Annex III of the Bern Convention. It is classified under Data Deficient in the IUCN Red list. Overexploitation, erection of barriers and water quality deterioration threaten many European smelt populations, and local populations are easily driven to extinction (Hutchinson and Mills 1987, Maitland and Lyle 1990). It is likely that the enforcement and strengthening of existing legislation coupled with the enforcement of international directives will be important to the future viability and survival of this species.

Denmark

Smelt is found in a number of freshwater lakes as well as in several brackish estuaries. Considered vulnerable (VU) in Elliot and Hemingway (2002), but is not included in the Danish National Red List (Berg, 1998a). Smelt is subject to commercial fishery, mainly in Ringkøbing and Nissum Fjord on the west coast of Jutland. Mean annual catch in the period 1997–2005 was 17.4 t/year.

Finland

Smelt *Osmerus eperlanus* is widespread along the Baltic coast and inland lakes in Finland. Their conservation status is unknown, but the stocks are believed to be generally abundant and healthy. Legislation: no species-specific legislation.

France

Considered vulnerable in the French Red List (Elliot and Hemingway, 2002).

Flanders

Considered threatened in the Flanders Red List (Elliot and Hemingway, 2002).

Ireland

The Irish Red Data Book (Whilde 1993) suggests that although there are no recent records of smelt in Ireland, it is likely to occur in the Shannon while unconfirmed reports suggest that they still occur in the River Suir and possibly the Rivers Nore and Barrow, along Ireland South Eastern coast. Its status is described as vulnerable (VU).

Quigley *et al.* (2004) note that smelt have recently been recorded from all rivers entering the Shannon estuary, the Foyle Estuary, inshore waters at Larne Co. Antrim, Belfast Lough Co. Down, the Rivers Barrow and Suir (Co. Waterford) and the River Blackwater (Co. Cork). However they conclude that as spawning populations are only known from the Shannon/Fergus estuary there is a need to investigate the distribution of smelt in Ireland in a systematic manner and determine the status of the species nationally and with more accuracy. The main threats appear to be the construction and operation of dams, water regulating weirs and poor water quality.

Norway

Although freshwater smelt is common in some part of the country, anadromous smelt is extremely rare, it is believed that there is one population in the River Drammenselv, SW Norway but its status is not defined.

Poland

These occur in lakes in northern part of Poland and coastal waters and Szczecin and Vistula lagoons. Their status has not been described.

Sweden

Considered as Least Concern (LC) in the latest Swedish Red List (Gärdenfors (ed.) 2005).

UK England and Wales

Smelt *Osmerus eperlanus* is widespread along the east coast of the UK and around the Solway Firth, where they enter estuaries to spawn. The species has been lost from about 25% of estuaries and rivers from which it had been recorded historically. Anadromous populations exist in the Thames and Conway and possibly on the Welsh Dee. Their conservation status is unknown, and the main threat comes from poor water quality. Legislation: no species-specific legislation.

UK N. Ireland

There is only one known location for this species, in the Foyle estuary, where it is recorded impinging on power station intake screens. No species specific conservation designations are in place.

UK Scotland

Spawning populations of Smelt (Sparling) *Osmerus eperlanus* still occur in the lower main-stems and estuaries of three Scottish rivers (Cree, Forth and Tay). Several other rivers formerly held spawning populations, which are now extinguished. All three extant Scottish populations still support commercial fishing. Legislation: no species-specific legislation.

4.20 Three-spine stickleback – *Gasterosteus aculeatus*

International

The three-spined stickleback is probably widespread, occurring in fresh, brackish and saline waters. It is not included in any of the classifications previously described.

Denmark

Three-spined stickleback is very common in Denmark, especially in estuaries, but it is also found in many rivers and lakes. Until ca. 50 years ago, it was subject to traditional commercial fisheries in some parts of the country. No species-specific legislation.

Finland

Three-spine stickleback *Gasterosteus aculeatus* is common in Finland. Legislation: no species-specific legislation.

Ireland

No thought to be threatened with extinction. The species has a wide range of habitats and occurs in most major freshwater and brackish environments.

Italy

Considered to be potentially endangered (EN) in Elliot and Hemingway (2002).

Norway

This species occurs in Norway but its status is unknown.

Poland

Very common in brackish waters and fresh water in northern and middle part of Poland.

Spain

Considered to have insufficient information to gauge its status (Elliot and Hemingway, 2002).

Sweden

Considered as Least Concern (LC) in the latest Swedish Red List (Gärdenfors (ed.) 2005).

UK England and Wales

Three-spine stickleback *Gasterosteus aculeatus* is ubiquitous and common in England and Wales. Legislation: no species-specific legislation

UK N. Ireland

The three spined stickleback is ubiquitous in lowland freshwater rivers, lakes and brackish regions of estuaries. There are also marine populations in coastal areas, particularly in pools on rocky shores. The extent of any diadromous behaviour is not known. No species specific conservation designations are in place.

UK Scotland

Three-spine stickleback *Gasterosteus aculeatus* is ubiquitous and common in Scotland. Legislation: no species-specific legislation

4.21 Nine-spined stickleback – *Pungitus pungitus*

International

Nine-spined stickleback is not included in any of the classifications previously described.

Denmark

Nine-spined is a very common fish species in Denmark. No fisheries interests and no species-specific legislation.

Finland

Nine-spined stickleback *Pungitus pungitus* is common and very widespread in Finland. Legislation: no species-specific legislation

Ireland

This species has a more limited distribution in Ireland than the three-spined stickleback. Populations have been recorded in the Killarney Valley area historically and its presence was confirmed in the late 1980s (Bracken, J.J. 1998).

Norway

This species occurs in Norway but its status is unknown.

Poland

This species is common in Polish waters but less numerous than three-spine stickleback. It is not observed in southern part of Poland.

Spain

Insufficient known to categorise this species (Elliot and Hemingway, 2002)

Sweden

Considered Least Concern (LC) in the latest Red List (Gärdenfors (ed.) 2005).

UK England and Wales

Nine-spined stickleback *Pungitus pungitus* is not as widespread as the above, but common nevertheless. Legislation: no species-specific legislation

UK Scotland

Populations of nine-spined stickleback *Pungitus pungitus* are much localised in Scotland, the few waters containing them are mainly in the Glasgow area. Legislation: no species-specific legislation

UK N. Ireland

This species is less widespread than the three spined but is nevertheless locally abundant in freshwater. The extent of any diadromous behaviour is not known. No species specific conservation designations are in place.

4.22 Striped Bass — *Morone saxatilis*

Striped bass, *Morone saxatilis*, have formed the basis of one of the most important fisheries on the US Atlantic coast for centuries. Regulations for striped bass have been in place since European settlement of North America. More recently, the Atlantic striped bass management program has enjoyed successes like no other. In a little more than 15 years, the resource has rebuilt from a historic low of about 20 million pounds to an historic high of 160 million pounds. The stock is no longer overfished.

Species for which no information was made available

Gizzard shad	<i>Dorosoma cepedianum</i>
Mummichug	<i>Fundulus heteroclistus</i>
Four-spined stickleback	<i>Apeltes quadracus</i>
Brook trout	<i>Salvelinus fontinalis</i>
Rainbow smelt	<i>Osmerus mordax</i>

Discussion

It was noted that ICES on the request of OSPAR had reviewed and updated the Texel-Faial Criteria applied to three diadromous species (Sea lamprey *Petromyzon marinus*, Houting Coregonus *Coregonus laveratus oxyrinchus*, and Allis Shad *Alosa alosa*) in 2003 (Working Group on Fish Ecology (ICES CM 2003/G:04). The DFC noted that to apply these criteria to other species would involve a formal nomination of a species by a member state or national institute to OSPAR which would be reviewed by its Bio-diversity Committee. OSPAR may then seek assistance from ICES (as they had done in 2003) to evaluate the status of this species in relation to the Texel-Faial criteria. Similarly, the IUCN have a specific format and requirement to have new species listed or existing species reviewed under the IUCN Red List of Threatened Species™ including assessment of any submission by at least two members of the Red List Authority.

Therefore, this document should be used primarily as guidance to the status of specific diadromous fish species using existing criteria in preparation for any request which might be made to ICES from OSPAR or any other client regarding these species. Table 4 provides a rough summary of the status of the species based on knowledge available. A number of species are clearly in great difficulty such as the European sturgeon, allis and twaite shads and houting. Other species clearly have problems in specific areas. Even species such as Atlantic

salmon and sea trout appear to be compromised in some areas. In contrast, the European eel, which is widely known to be in decline, is not well represented as few countries have formally registered its status with the IUCN.

A more complete assessment of the implications of these classifications and mitigation measures for rare and endangered diadromous fish species is available from Elliot and Hemmingway (2002). Summary information provided by these authors suggests that species that migrate through estuaries were more threatened than freshwater and marine species whose distribution extended into estuaries. This is thought to be due to water quality barriers which have been created in estuaries and the widespread and intense human alteration of estuaries which occurs by habitat loss or modification. Several remedial actions are suggested including

- Reconstruction of backwaters;
- Removal of physical migration barriers;
- Provision of fish passes;
- Reductions in/elimination of exploitation.

In extreme cases restocking and reintroduction programmes could be considered provided the main reason for the species decline was identified and removed and the threat of genetic introgression with remnant wild stocks and disease parasite transfer were minimised. Clearly, there will be local problems for specific populations and these would need to be investigated and addressed individually. Specific case studies for a number of species are available e.g. shads, houting and smelt and also for entire ecosystems e.g. the Elbe estuary in Germany (Elliot and Hemmingway, 2002).

Finally, it was noted that there are several classification schemes being operated for widely overlapping purposes and even different versions of the same classification being applied by various workers. This can be confusing and even misleading and the need for a globally acceptable and applied system is urged.

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Table 1: List of species with existing Texel - Faial classification (explanation of classification in Annex 1).

English name	Scientific name	OSPAR or		TEXEL-FAIAL CRITERIA					
		N.America	ICES North Atlantic and Baltic Countries	Global Importance	Local Importance	Rarity	Sensitivity	Keystone Species	Decline
Allis Shad	<i>Alosa alosa</i>	II,III,IV	Irl, UK, Spa, Fra, Ger,Port,Swe,Den, Bel, Fin, Swz	Y		Y	Y		Y
Twaite shad	<i>Alosa fallax spp.</i>	II,III,IV	Irl, UK, Spa, Fra, Ger,Port,Swe,Den, Bel, Chk, Fin, Nthl, Pol, Swz						
Alewife	<i>Alosa pseudoharengus</i>	N. America	Can,US						
American shad	<i>Alosa sapidissima</i>	N. America	Can,US						
Blueback herring	<i>Alosa aestivalis</i>	N. America	Can,US						
Hickory shad	<i>Alosa mediocris</i>	N. America	Can,US						
Gizzard shad	<i>Dorosoma cepedianum</i>	N. America	Can,US						
American eel	<i>Anguilla rostrata</i>	N. America	Can,US						
European eel	<i>Anguilla anguilla</i>	I,II,III,IV	All countries						
Sea char	<i>Salvelinus alpinus</i>	I,II,III,IV	Ice, Greenland,Nor, Russ, Can, Fin, Swz						
Brook trout	<i>Salvelinus fontinalis</i>	N. America	Can,US						
Sea trout	<i>Salmo trutta</i>	All areas	Can, US, Spa, Fra, Irl, UK, Den, Nor, Swe, Fin, Ice, Lith, Lux, Nthl						
Atlantic salmon	<i>Salmo salar</i>	AllAreas	Can, US, Spa, Port, Fra, Irl, UK, Den, Ger, Fin, Swe, Nor, Russ, Lith, Lux, Nthl						
River lamprey	<i>Lampetra fluviatilis</i>	All	Can, US, Port, Fra, Irl, UK, Den, Ger, Fin, Swe, Nor, Russ, Bel, Ita, Pol						
Sea lamprey	<i>Petromyzon marinus</i>	I,II,III,IV	Can,Spa, Port, Fra, Irl, UK, Den, Ger, Fin, Swe, Nor, Russ, Ita, Lith, Lux, Nthl, Sw	Y			Y		Y
European sturgeon	<i>Acipenser sturio</i>	II,IV	Ger, Spa	Y	Y	Y	Y		Y
Striped bass	<i>Morone saxatilis</i>	N. America	Can, US						
Houting	<i>Coregonus lavaretus oxyrhynchus</i>	II	Den,Nor	?	Y	Y	Y		Y
Whitefish (Vendace)	<i>Coregonus albula</i>	I,II,III,IV	Den,Est,Fin,Fran,Ger,Ire,Lat,Li,Nor,Po,Ru,Slovak,Swe,UK, Swz						
Acadian whitefish (Cisco)	<i>Coregonus huntsmani</i>	N. America	Can, (N.Scotia)						
Northern whitefish	<i>Coregonus peled</i>	I,II,III,IV	Bul,Den,Fin,Ger,Lith,Po,Ru,Swe, Swz						
Bottom whitefish	<i>Coregonus pidschian</i>	I,II,III,IV	Can, Fin,It,Li,Rus,Swe,Swi,US						
Smelt	<i>Osmerus eperlanus</i>	I,II,III,IV	Spa,Port,Fra,Irl,UK,Fin, Swe, Nor,Den, Bel, Ita, Swz						
Rainbow smelt	<i>Osmerus mordax</i>	N. America	Can,US						
Three-spine stickleback	<i>Gasterosteus aculeatus</i>	I,II,III,IV	Can,Spa, Port, Fra, Irl, UK, Den, Ger, Fin, Swe, Nor, Russ, Ita, Swz						
Four-spined stickleback	<i>Apeltes quadracus</i>	N. America	Can, US						
Nine-spined stickleback	<i>Fungitus pungitus</i>	I,II,III,IV	Can,Spa, Port, Fra, Irl, UK, Den, Ger, Fin, Swe, Nor, Russ, Swz						
Banded killifish	<i>Fundulus diaphanous</i>	N. America	Can						
Mummichug	<i>Fundulus heteroclistus</i>	N. America	US						

Table 2: Diadromous fish species with classification based on Habitats directive, Bern Convention, CITES, IUCN. Explanation of classification in Annex 2.

English name	Scientific name	OTHER INTERNATIONAL CRITERIA			
		Habitats Directive	CITES	Bern Convention	IUCN v3.1 Red List Category
Allis Shad	<i>Alosa alosa</i>	Annexes II, V		Annex III	DD
Twait shad	<i>Alosa fallax</i> spp.	Annexes II, V		Annex III	DD
Alewife	<i>Alosa pseudoharengus</i>				
American shad	<i>Alosa sapidissima</i>				
Blueback herring	<i>Alosa aestivalis</i>				
Hickory shad	<i>Alosa mediocris</i>				
Gizzard shad	<i>Dorosoma cepedianum</i>				
American eel	<i>Anguilla rostrata</i>				
European eel	<i>Anguilla anguilla</i>				
Sea char	<i>Salvelinus alpinus</i>				
Brook trout	<i>Salvelinus fontinalis</i>				
Sea trout	<i>Salmo trutta</i>				
Atlantic salmon	<i>Salmo salar</i>	Annex II*, V*		Annex III*	
River lamprey	<i>Lampetra fluviatilis</i>	Annex II, V		Annex III	LC/NT
Sea lamprey	<i>Petromyzon marinus</i>	Annex II**		Annex III	
European sturgeon	<i>Acipenser sturio</i>	Annexes II, IV	Appendix 1	Annex II	CR (A2d)
Striped bass	<i>Morone saxatilis</i>				
Houting	<i>Coregonus lavaretus oxyrhynchus</i>	Annexes II***, IV		Annex III	DD
Whitefish (Vendace)	<i>Coregonus albula</i>				DD
Acadian whitefish (Cisco)	<i>Coregonus huntsmani</i>				VU (D2)
Northern whitefish	<i>Coregonus peled</i>				DD
Bottom whitefish	<i>Coregonus pidschian</i>				DD
Smelt	<i>Osmerus eperlanus</i>				DD
Rainbow smelt	<i>Osmerus mordax</i>				
Three-spine stickleback	<i>Gasterosteus aculeatus</i>				
Four-spined stickleback	<i>Apeltes quadracus</i>				
Nine-spined stickleback	<i>Fungitus pungitius</i>				
Banded killifish	<i>Fundulus diaphanous</i>				
Mummichug	<i>Fundulus heteroclistus</i>				

* = freshwater only
** = except Swedish pops
***=except Finnish pops.

Table 3: Diadromous fish species with national classification or summary status, legal protection etc. (1) = information provided for this report, (2) = Elliot and Hemingway, 2002, (3) = Aprahamian *et al*, 2003, (4) = Gärdenfors, U., 2005, (5) = Berg, S. 1998 (a and b).

English name	Scientific name	OTHER NATIONAL CRITERIA											
		Belgium (3)	Canada SARA (1)	Czech Rep (2)	Denmark (5)	Denmark (3)	Denmark (2)	Finland (2)	Finland (3)	France Redlist (2)	Flanders Red List (2)	Germany (3)	Germany Red list (2)
Allis Shad	<i>Alosa alosa</i>	EN		EX	EN	CR	EX		NE	VU	EN	EN	
Twaite shad	<i>Alosa fallax</i> spp.	EN			EN	CR	EX		NE	VU	EN	VU	
Alewife	<i>Alosa pseudoharengus</i>												
American shad	<i>Alosa sapidissima</i>												
Blueback herring	<i>Alosa aestivialis</i>												
Hickory shad	<i>Alosa mediocris</i>												
Gizzard shad	<i>Dorosoma cepedianum</i>												
American eel	<i>Anguilla rostrata</i>												
European eel	<i>Anguilla anguilla</i>												
Sea char	<i>Salvelinus alpinus</i>							EN					
Brook trout	<i>Salvelinus fontinalis</i>												
Sea trout	<i>Salmo trutta</i>												
Atlantic salmon	<i>Salmo salar</i>		Endangered****		R EN		EN	EN EN		VU VU	EX ? EX ?		EN EN
River lamprey	<i>Lampetra fluviatilis</i>				Indet					VU	NT		EN
Sea lamprey	<i>Petromyzon marinus</i>									VU	EX		EN
European sturgeon	<i>Acipenser sturio</i>				EX		EX				EX		EN CR
Striped bass	<i>Morone saxatilis</i>												
Houting	<i>Coregonus lavaretus oxyrinchus</i>				R					EX ?	EX		
Whitefish (Vendace)	<i>Coregonus albula</i>				R								
Acadian whitefish (Cisco)	<i>Coregonus huntsmani</i>		Endangered*****										
Northern whitefish	<i>Coregonus peled</i>												
Bottom whitefish	<i>Coregonus pidschian</i>												
Smelt	<i>Osmerus eperlanus</i>						VU			VU	NT		
Rainbow smelt	<i>Osmerus mordax</i>												
Three-spine stickleback	<i>Gasterosteus aculeatus</i>												
Four-spined stickleback	<i>Apeltes quadracus</i>												
Nine-spined stickleback	<i>Fungitus pungitus</i>												
Banded killifish	<i>Fundulus diaphanous</i>		*****Special concern										
Mummichug	<i>Fundulus heteroclistus</i>												

**** Inner bay of Fundy only
 ***** Nova Scotia
 ***** Terra Nova

Table 3 Continued: Diadromous fish species with national classification or summary status, legal protection etc. (1) = information provided for this report, (2) = Elliot and Hemingway, 2002, (3) = Aprahamian *et al*, 2003, (4) = Gärdenfors, U., 2005, (5) = Berg, S. 1998 (a and b).

English name	Scientific name	OTHER NATIONAL CRITERIA						
		Ireland Whilde 93	Italy (2)	Lithuania (2)	Luxembourg (3)	Netherlands (3)	Poland (2)	Portugal, (3)
Allis Shad	<i>Alosa alosa</i>	EN	EX		EX	EN	EX	VU
Twaite shad	<i>Alosa fallax</i> spp.	VU		EN	EX	EX	EN	VU
Alewife	<i>Alosa pseudoharengus</i>							
American shad	<i>Alosa sapidissima</i>							
Blueback herring	<i>Alosa aestivialis</i>							
Hickory shad	<i>Alosa mediocris</i>							
Gizzard shad	<i>Dorosoma cepedianum</i>							
American eel	<i>Anguilla rostrata</i>							
European eel	<i>Anguilla anguilla</i>							
Sea char	<i>Salvelinus alpinus</i>							
Brook trout	<i>Salvelinus fontinalis</i>							
Sea trout	<i>Salmo trutta</i>			VU				
Atlantic salmon	<i>Salmo salar</i>	Int. Important		VU			EX	
River lamprey	<i>Lampetra fluviatilis</i>	Indet	EN				VU	
Sea lamprey	<i>Petromyzon marinus</i>	Indet	CR	EN				
European sturgeon	<i>Acipenser sturio</i>		EX	EX			EX	
Striped bass	<i>Morone saxatilis</i>							
Houting	<i>Coregonus lavaretus oxyrhynchus</i>							
Whitefish (Vendace)	<i>Coregonus albula</i>							
Acadian whitefish (Cisco)	<i>Coregonus huntsmani</i>							
Northern whitefish	<i>Coregonus peled</i>							
Bottom whitefish	<i>Coregonus pidschian</i>							
Smelt	<i>Osmerus eperlanus</i>	VU						
Rainbow smelt	<i>Osmerus mordax</i>							
Three-spine stickleback	<i>Gasterosteus aculeatus</i>		Potent. EN					
Four-spined stickleback	<i>Apeltes quadracus</i>							
Nine-spined stickleback	<i>Fungitus pungitus</i>							
Banded killifish	<i>Fundulus diaphanous</i>							
Mummichug	<i>Fundulus heteroclistus</i>							

Table 3 Continued: Diadromous fish species with national classification or summary status, legal protection etc. (1) = information provided for this report, (2) = Elliot and Hemingway, 2002, (3) = Aprahamian *et al*, 2003, (4) = Gärdenfors, U., 2005, (5) = Berg, S. 1998 (a and b).

		OTHER NATIONAL CRITERIA						
English name	Scientific name	Spain (2)	Sweden (1)	Sweden from 2005 (4)	UK (3)	UK WCA (1)	UK BD Action Plan (1)	USA (1)
Allis Shad	<i>Alosa alosa</i>	EN		NA	EN	Schedule 5 section9(4)a	Priority	
Twait shad	<i>Alosa fallax spp.</i>	EN		NA	VU	Schedule 5 section9(4)a	Priority	
Alewife	<i>Alosa pseudoharengus</i>							*FMPASRH
American shad	<i>Alosa sapidissima</i>							*FMPASRH
Blueback herring	<i>Alosa aestivalis</i>							*FMPASRH
Hickory shad	<i>Alosa mediocris</i>							*FMPASRH
Gizzard shad	<i>Dorosoma cepedianum</i>							
American eel	<i>Anguilla rostrata</i>							
European eel	<i>Anguilla anguilla</i>	VU		CR			Of concern	
Sea char	<i>Salvelinus alpinus</i>			LC				
Brook trout	<i>Salvelinus fontinalis</i>							
Sea trout	<i>Salmo trutta</i>	VU		LC				
Atlantic salmon	<i>Salmo salar</i>	EN	VU	LC *			Of concern	Endangered
River lamprey	<i>Lampetra fluviatilis</i>	EX		NT			Of concern	
Sea lamprey	<i>Petromyzon marinus</i>	VU	VU	EN			Of concern	
European sturgeon	<i>Acipenser sturio</i>	CR	EX	NA				
Striped bass	<i>Morone saxatilis</i>							
Houting	<i>Coregonus lavarefusus oxyrinchus</i>						Threatened	
Whitefish (Vendace)	<i>Coregonus albula</i>			LC		Schedule 5 section9(4)a	Priority	
Acadian whitefish (Cisco)	<i>Coregonus huntsmani</i>							
Northern whitefish	<i>Coregonus peled</i>			CR				
Bottom whitefish	<i>Coregonus pidschian</i>							
Smelt	<i>Osmerus eperlanus</i>			LC			Of concern	
Rainbow smelt	<i>Osmerus mordax</i>							
Three-spine stickleback	<i>Gasterosteus aculeatus</i>	Insuff. Known		LC				
Four-spined stickleback	<i>Apeltes quadracus</i>							
Nine-spined stickleback	<i>Fungitus pungitus</i>	Insuff. Known		LC				
Banded killifish	<i>Fundulus diaphanous</i>							
Mummichug	<i>Fundulus heteroclistus</i>							
				A population in Lake Vänern is considered Endangered (EN)		WCA = Wildlife and Countryside Act	BAP = Biodiversity Action Plan	*Fishery Management Plan for American Shad and River Herring

Table 4: Summary of classifications for each species. Possible no. indicates the total number of countries which could have provided a classification for that species e.g. for allis shad, five countries have classified it as extinct, 7 as critically endangered or endangered and 2 as vulnerable out of a possible 14 countries identified where the species occurs or was known to occur. Data deficient and least concern species are not included and in some instances, a country may not have a specific classification.

English name	EX	CR/EN	VU	Possible No.
Allis Shad	5	7	2	14
Twaite shad	3	5		14
Alewife				1
American shad				1
Blueback herring				1
Hickory shad				1
Gizzard shad				
American eel				
European eel		1	2	14
Sea char				7
Brook trout				2
Sea trout	1	2	4	14
Atlantic salmon	3	4	3	16
River lamprey	2	3	2	15
Sea lamprey	1	4	2	17
European sturgeon	6	2		8
Striped bass				2
Houting	3	2		5
Whitefish (Vendace)				15
Acadian whitefish (Cisco)		1		1
Northern whitefish		1		9
Bottom whitefish				8
Smelt			3	12
Rainbow smelt				2
Three-spine stickleback		1		14
Four-spined stickleback				2
Nine-spined stickleback				13
Banded killifish				1
Munnichug				1

Annex 1: Texel-Faial criteria

1	Global importance: Global importance of the OSPAR area for a species. Importance on a global scale, of the OSPAR Area, for the species is when a high proportion of a species at any time of the life cycle occurs in the OSPAR Area.
2.	Regional importance: Importance within the OSPAR Area, of the regions for the species where a high proportion of the total population of a species within the OSPAR Area for any part of its life cycle is restricted to a small number of locations in the OSPAR Area.
3.	Rarity: A species is rare if the total population size is small. In case of a species that is sessile or of restricted mobility at any time of its life cycle, a species is rare if it occurs in a limited number of locations in the OSPAR Area, and in relatively low numbers. In case of a highly mobile species, the total population size will determine rarity.
4.	<p>Sensitivity: A species is “very sensitive” when:</p> <ul style="list-style-type: none"> a. it has very low resistance (that is, it is very easily adversely affected by human activity); and/or b. it has very low resilience (that is, after an adverse effect from human activity, recovery is likely to be achieved only over a very long period, or is likely not to be achieved at all). <p>A species is “sensitive” when:</p> <ul style="list-style-type: none"> a. it has low resistance (that is, it is easily adversely affected by human activity); and/or b. it has low resilience (that is, after an adverse effect from human activity, recovery is likely to be achieved only over a long period).
5.	Keystone species: a species which has a controlling influence on a community.
6.	Decline: means an observed or indicated significant decline in numbers, extent or quality (quality refers to life history parameters). The decline may be historic, recent or current. ‘Significant’ need not be in a statistical sense.

Annex 2: Other criteria used in classifying the status of diadromous fish species

AUTHORITY/SYSTEM	CRITERIA FOR SELECTION	BASIC DESCRIPTION
Habitats Directive	<i>Annex II</i>	Animal and plant species whose conservation requires designation of an SAC
Council Directive 92/43/EEC	<i>Annex IV</i>	Animal and plant species in need of strict protection
	<i>Annex V</i>	Animal and plant species subject to management measures
CITES	<i>Appendix I</i>	Threatened with extinction - trade only in exceptional circumstances
<i>The Convention on International Trade in Endangered Species of Wild Flora and Fauna</i>	<i>Appendix II</i>	Not necessarily threatened but future survival may be compromised
	<i>Appendix III</i>	Protected in at least one country requiring assistance with controlling trade
Bern Convention	<i>Annex II</i>	Strictly protected fauna species
<i>Convention on the Conservation of European Wildlife and Natural Habitats</i>	<i>Annex III</i>	Protected fauna species
IUCN		
<i>The World Conservation Union</i>	Catagorey 1	EX Extinct
	Catagorey 2	EW Extinct in the wild
	Catagorey 3	CR Critically endangered
	Catagorey 4	EN Endangered
	Catagorey 5	VU Vulnerable
	Catagorey 6	LR Lower risk
	Catagorey 7	DD Data deficient
	Catagorey 8	NE Not evaluated
Irish Red Data Book Criteria		EX Extinct (CITES Criterion)
IUCN Criteria prior to 1990		EN Endangered
		V Vulnerable
		R Rare
		I Indeterminate
		II Internationally Important

AUTHORITY/SYSTEM	CRITERIA FOR	BASIC DESCRIPTION
Habitats Directive	<i>Annex II</i>	Animal and plant species whose conservation requires designation of an SAC
<i>Council Directive 92/43/EEC</i>	<i>Annex IV</i>	Animal and plant species in need of strict protection
	<i>Annex V</i>	Animal and plant species subject to management measures
CITES	<i>Appendix I</i>	Threatened with extinction - trade only in exceptional circumstances
<i>The Convention on International Trade in Endangered Species of Wild Flora and Fauna</i>	<i>Appendix II</i>	Not necessarily threatened but future survival may be compromised
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Bern Convention	<i>Annex II</i>	Strictly protected fauna species
<i>Convention on the Conservation of European Wildlife and Natural Habitats</i>	<i>Annex III</i>	Protected fauna species
IUCN		
<i>The World Conservation Union Version 3.1, 2001</i>	Catagorey 1	EX Extinct
	Catagorey 2	EW Extinct in the wild
	Catagorey 3	CR Critically endangered
	Catagorey 4	EN Endangered
	Catagorey 5	VU Vulnerable
	Catagorey 6	NT Near threatened
	Catagorey 7	LC Least concern
	Catagorey 8	DD Data deficient
	Catagorey 9	NE Not evaluated
Irish Red Data Book Criteria	EX	Extinct (CITES Criterion)
IUCN Criteria prior to 1990	EN	Endangered
	V	Vulnerable
	R	Rare
	I	Indeterminate
	II	Internationally Important

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