Contents

Foreword

Executive summary

What are ‘fish ratings’?

1.1 What do we want to achieve by rating farmed fish?
1.2 How can fish ratings help you?
1.3 How can fish ratings help the aquaculture industries?

How do the MCS ratings work?

2.1 How ratings work
2.2 The decision-making process
2.3 When do rating updates take place?
2.4 How can ratings change?
2.5 Scope of the ratings

Our methodology in depth

3.1 Criteria categories
  3.1.1 Feed sustainability
  3.1.2 Ecological effects
  3.1.3 Fish health and welfare
  3.1.4 Management
3.2 Sources of information
3.3 Example rating explained

Figures and tables

Figure 1. Overview of ratings process
Table 1. Relationship between combined score and overall rating
Table 2. Methodology questions for feed sustainability
Table 3. Methodology questions for ecological effects
Table 4. Methodology questions for fish health and welfare
Table 5. Methodology questions for management

Appendices

Appendix I: Scientific and certification bodies
Appendix II: Members of Industry Review Group (IRG)
Appendix III: List of interest parties

Protecting our seas, shores and wildlife

Photos: © Dawn Purchase except Chapter one © Jen Steele
The Marine Conservation Society (MCS) is the UK charity dedicated to protecting our seas, shores and marine wildlife. Our coastal waters are under threat – too much is being taken out, too much thrown in and not enough protected. MCS works to turn the tide on the neglect of our oceans.

MCS believes consumers have a key role to play in safeguarding the future of our seafood and marine wildlife by making environmentally sustainable choices when buying fish and shellfish, avoiding those that are from poorly managed or regulated farms in favour of those from farms that produce low impact species and/or farm to responsible and sustainable production standards. MCS communicates these messages to the consumer via the FishOnline website and the Pocket Good Fish Guide.

The FishOnline website is a market-based tool designed to raise awareness of the environmental issues and ecological effects associated with aquaculture and fisheries to create demand for more responsibly produced farmed fish. The aim of rating seafood is to identify and promote the most responsible and sustainable choices available to consumers and the species consumers should be avoiding until production practices have improved.

This booklet aims to help MCS staff, consumers, retailers and the aquaculture industries understand how our ratings are derived and to provide transparency. If you have any questions or specific queries about our methodology or our ratings, or you would like to comment on or contribute to information in FishOnline, please contact MCS directly at the address below and we will be happy to help you.

Marine Conservation Society (MCS)
11A Chester Street,
Edinburgh,
EH3 7RF
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Aquaculture is set to remain one of the fastest growing animal food-producing sectors and, in the next decade, total production from both capture and aquaculture will exceed that of beef, pork or poultry.”

Food and Agriculture Organization of the United Nations (FAO)

“It has never been more important that we put the need for a healthy environment on which aquaculture depends before the desire for aquaculture growth.”

Marine Conservation Society (MCS)
Since the inception of the Marine Conservation Society’s (MCS) Fisheries Programme in 1998, MCS has campaigned for the responsible use of marine fish resources.

Following the publication of the Good Fish Guide in 2002 and launch of FishOnline website in 2004, the main aim of the MCS Consumer Awareness programme has been to raise awareness amongst consumers of the sustainability of eating fish.

The supply chain of fish and fish products is complex, and for this reason it is not easy for consumers to make straightforward, informed decisions about the sustainability of eating fish. This is changing, however, as interest in accreditation of fish farms and fisheries, leading to labeling of fish products as a measure to harness consumer support for conserving the marine environment, continues to develop.

With an increasing global human population, combined with an increase in consumption of fish, the urgency for ensuring the responsible and sustainability of eating fish is becoming more crucial and MCS believes consumers have a key role to play in achieving this.

The FishOnline website is a market-based tool designed to raise awareness of issues of sustainability and environmental impact associated with aquaculture and fishing to create demand for more responsibly produced fish. The aim of rating seafood specifically is to identify and promote the most responsible, sustainable, or best environmental choices available to consumers and the species consumers should be avoiding until improvements have taken place.

The ratings are obtained by reviewing available scientific and other information against MCS assessment criteria which are: feed sustainability; ecological effects; fish health and welfare; and management.

The most sustainable choices available to consumers - known as Fish to Eat (green) are those rated 1 and 2. These come from responsibly managed farms, or are farmed species with low environmental impact. Green indicates species that are, in MCS’s opinion, the best choice for consumers.

Fish to Avoid (red) are those rated 5. These are from unsustainable or poorly managed farms, or species that rely on unsustainable wild capture fisheries to supply juveniles for on-growing. Red indicates that, in MCS’s opinion, you should avoid these fish until the management of the farms in this region for this species improves, or reliance on unsustainable wild capture fisheries for juveniles is no longer required.

In achieving its aim to promote the most sustainable seafood available, MCS invites an exchange of information with industry to help identify the most responsible farming practices and latest innovations and developments. Such information may then be used to distinguish one production method for the same species from another and, any positive attributes for the production method recognised by a higher rating.

MCS also provides advice on wild capture fish and shellfish, which is assessed using a different methodology and set of criteria, however the ratings system and communication tools are common for all seafood regardless of its method of production, i.e., farmed or wild-caught. For more information on wild-caught species please refer to our website www.fishonline.org.

MCS FishOnline Ratings also underpin the sustainability advice on fish offered by organisations such as Fish2Fork, the Sustainable Restaurant Association and Sustainable Fish City.

Commitment to responsible sourcing of fish has been achieved through various initiatives, such as the commitment to sustainable fish procurement adopted by the House of Commons and the London Olympics Committee. Various UK supermarkets have also responded to MCS advice and improved their sourcing policies by delisting Fish to Avoid and increasing the listings of Fish to Eat.

Executive summary

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Fish ratings are the nominal ‘score’ we allocate to various farmed fish relative to their sustainability. These ratings reflect how well, in general, fish farms in a region or country are managed and what the overall environmental impact of production is.

We use five different colours - from dark green to red - to represent each rating score. These overall scores (from 1-5 respectively) are generated through an assessment of a range of sustainability criteria which cover feed sustainability, ecological effects of production, fish health and welfare and management. The sustainability criteria are explained more fully in Chapter 2. The final rating is a combined total score of the different sustainability criteria. The higher the score, the better the rating and the more confidence you can have in eating sustainable seafood.

The criteria we assess in aquaculture species covers a broad spectrum as we are covering a diversity of species, farmed in an array of production systems produced in many countries and regions around the world. Some issues such as freshwater use, welfare or feed will have no relevance for some species but be key issues of concern for some others. Issues such as welfare, slaughter or disease outbreak may not have direct environmental impacts; as such their inclusion could be questioned, however they can be affected by the management practices on farms and they are key issues of concern for consumers who are informed by media sources, and as such we are often asked for our opinion on these issues.

1.1 What do we want to achieve by rating farmed fish?

Fish protein has played a central role in the diets of humans for millennia – from as far back as our distant ancestors who foraged for food along the seashore. Fish protein will continue to form a major constituent of our diets into the future, with demand for seafood set to continue to rise in line with an increasing world human population. To this end fish protein represents an essential component of global ‘food security’ (a reliable and sustainable supply of food that meets the need of current and future generations), as such the issue of its continued supply through effective and sustainable management must be ensured.

MCS recognises the vital importance of aquaculture – both from the perspective of providing a healthy and nutritious protein source, to the contribution aquaculture makes to the social and economic prosperity of producing countries. By demanding aquaculture industries address the critical issues of ecological sustainability, we aim to ensure marine ecosystems are in the best condition they can be in, in order to support economic production and healthy environments.

By rating fish we intend to achieve a number of objectives, all of which will contribute to increasing the sustainability of seafood and its availability. These will:

- Steer consumers towards sources of responsible and sustainable seafood
- Create consumer demand for responsible and sustainable seafood
- Generate dialogue, debate and understanding about the nature of seafood production
- Raise awareness of the value of the marine environment
- Highlight issues in those aquaculture production systems and species that are in need of support and change
- Create partnerships and projects that move aquaculture production towards more responsible and increasingly sustainable practices
1.2 How can fish ratings help you?

Seafood can come from a bewildering variety of sources and for this reason it is not easy for consumers to make straightforward and informed choices about the fish they are buying. Our Fish Ratings have been developed to help all those involved in the seafood supply chain make choices that support responsible, well-managed farmed fish production. If you like eating seafood then our ratings can help you make informed choices about the fish you eat, whilst helping achieve food security for future generations. Our ratings provide clear and unambiguous information that reflects the sustainability of each individual species. They are designed to promote the purchase and consumption of responsibly and sustainably produced fish, as well as to generate dialogue about sustainability issues within aquaculture production itself.

Our fish ratings can be obtained through the following resources:

- FishOnline
  www.fishonline.org
- Pocket Good Fish Guide (download)
  www.fishonline.org/pocket-goodfishguide
- Good Fish Guide App (download for iOS / Android)
  www.goodfishguide.co.uk/mobileApp

1.3 How can fish ratings help the aquaculture industries?

Aquaculture makes a major contribution to both a country’s economy and to society as a whole. To maintain this contribution, MCS wants to ensure that we have aquaculture production systems in place to supply the needs for all future generations to come. When fish farms are well managed, they are more profitable – which makes long-term business sense for all concerned.

We understand and accept that aquaculture has an essential role to play in producing fish protein for an increasing human population; we want to work with fish farmers and the wider aquaculture industry in finding solutions to problems inherent in the various ways fish are farmed. Some methods and species are less problematic than others – having little or no impact on the overall ecosystem – and we would like to see these methods and species adopted on a wider scale wherever possible.

MCS will continue to use fish ratings to identify those producers that need the most help to improve their practices, and we hope to be able to develop solutions to the problems they might face in partnership with the fish farmers themselves. Through the development, delivery and communication of appropriately-scaled Aquaculture Improvement Projects, we can generate a greater understanding and appreciation for the changes that can be made.

MCS wants all fish protein available to the UK consumer to be sustainable. As a measure of the efficacy and value of the MCS Fish Lists we want to see an increase in the number of ‘green’ rated fish and a reduction in the ‘red’ listed species. We are working towards a day when we won’t need a red-list of ‘fish to avoid’. MCS wants sustainable seafood to be the only choice for consumers.

MCS also uses the fish ratings to highlight best practice for managing and producing farmed seafood and invites submissions from industry and others for consideration and potential inclusion in the information we present online.
Chapter two
How do the MCS ratings work?

At a first glance our ratings may appear simplistic, but they are informed and underpinned by scientific data and information from respected and peer-reviewed sources. Our farmed fish ratings are reviewed as new information about production methods, production standards or industry development and management comes to light. Updates to FishOnline for wild capture species take place twice a year (following release of key fisheries data from essential sources, such as that from the International Council for the Exploration of the Seas – ICES).

Each colour rating relates to a score that has been calculated using a methodology which we have illustrated below.

### Colour Ratings

<table>
<thead>
<tr>
<th>Dark Green</th>
<th>Light Green</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Green Ratings</strong> (dark &amp; light green)</td>
<td>Indicate species that are, in MCS's opinion, the best choice in sustainable seafood and come from well-managed farms in an area that uses responsible production methods that have limited environmental impacts.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Yellow</th>
<th>Orange</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amber Ratings</strong> (yellow &amp; orange)</td>
<td>Indicate species which MCS would like to encourage people to eat only occasionally until the production practices and/or management/regulation of the species improves. Production of these amber rated species may need to make improvement in either overall practices, such as feed sourcing or management practices, or may need to strengthen regulation or planning of the industry. There is much excellent work taking place within the aquaculture industry to move many of these 'amber' rated fisheries into the 'green-rating' column.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Red</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Red Ratings</strong> (red)</td>
</tr>
</tbody>
</table>

2.1 How ratings work

The ratings are based on robust data from trusted sources that are recognised by both the industry and academia alike. Similar to the review of any new product, (e.g. those for 'Which?' magazine) our ratings are derived using a number of criteria (which represent key issues of environmental concern for MCS) against which the species is assessed. Individual assessments against these criteria result in the combined overall 'score' that we use in our fish ratings list and corresponds to a colour – green, amber or red.

An overview of the ratings process for each species within a specific area and method of production we rate is presented in the figure below (Figure 1).

**Figure 1: Overview of ratings process**

*Most species and production methods generate data; a lack of data can result in a higher (or poorer) rating because we use the precautionary approach where, in the absence of information, we may have to exercise caution and mark that criteria data deficient. The overall methodology for calculating each individual combined score relies on data from a range of sources, is a positive scoring system (the higher the score, the better the rating). The process is completed for all new species and where new industry developments/scientific advice is available for existing species.*

The criteria against which we measure sustainability are:

- **Feed sustainability** – traceability, sourcing and inclusion of both marine and non-marine feed ingredients.
- **Ecological effects** – the impacts of production on freshwater; habitats; water quality and other species both indirectly and directly by reliance on juveniles.
- **Fish health and welfare** – welfare standards, including slaughter and regional disease outbreaks.
- **Management** – planning, strategic assessment, regulation, enforcement and third party certification standards.

The relationship between the combined criteria score and the overall rating is presented in the table overleaf (Table 1).
Table 1: Relationship between combined score and overall rating

<table>
<thead>
<tr>
<th>Combined criteria score</th>
<th>Overall rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 or more</td>
<td><strong>Dark Green</strong> (Best)</td>
</tr>
<tr>
<td>Between 4 - 8</td>
<td><strong>Light Green</strong> (Good)</td>
</tr>
<tr>
<td>Between -2 and 3</td>
<td><strong>Yellow</strong> (OK)</td>
</tr>
<tr>
<td>Between -10 and -3</td>
<td><strong>Orange</strong> (Requires improvement)</td>
</tr>
<tr>
<td>-11 or less</td>
<td><strong>Red</strong> (Unsustainable)</td>
</tr>
</tbody>
</table>

No weighting of criteria or assessment questions are used in the aquaculture assessment methodology due to the diversity of production systems and species each having their unique impacts.

2.2 The decision-making process

Once all the scientific advice and any other information has been collated and reviewed against MCS aquaculture assessment criteria, the species is rated. A database of ratings is maintained and any changes to the ratings are compiled and forwarded to an Industry Review Group (IRG) (See Appendix II for list of members) for comment. Ratings are then reviewed against these comments and any other information received.

The review process also provides an opportunity for industry and other key interests to submit information on developments and innovations within aquaculture, so that good practice and any conservation initiatives developed or being developed by industry and other stakeholders, such as standards holders, can be promoted and reflected within the ratings.

2.3 When do rating updates take place?

Ratings are reviewed as changes in practice or standards take place or to reflect significant changes in production. In general ratings are reviewed annually, although this does not mean that a species will be re-assessed, this will only happen if significant regional changes have taken place.

2.4 How can ratings change?

Ratings will change in response to the availability of new scientific and other information for production practices, or a change to management or the way the industry is regulated, for example.

Changes to MCS ratings are communicated to the Interested Parties listed in Appendix III.

2.5 Scope of the ratings

The scope of the ratings for aquaculture species is limited to a species within a certain region, using a specific production method. For example we assess Atlantic salmon, farmed in Scotland, in Open Marine Pens. We do not rate individual farms or producers; we also do not rate companies. Farm/producer level assessments can only take place by certifiers against a production standard and who use external auditors to check compliance. Such standards include, for example, those held by the Aquaculture Stewardship Council (ASC), Organic standards such as the Soil Association, or other standard holders such as Global Aquaculture Alliance (GAA) and GlobalGap.
The complexity of the methodology lies in the allocation of values to methodology question within each sustainability criteria. We allocate values from 2 to -2 for each question, the higher the score the more sustainable the species under assessment.

3.1 Criteria categories

3.1.1 Feed sustainability

Rationale

Growth in aquaculture is dependent on natural resources, such as freshwater, space and proteins and oils to provide feeds. The production, and subsequent consumption, of feeds that rely on marine proteins and oils is a crosscutting issue across species of global concern as aquaculture continues to expand. The primary area of critical concern regarding feed fish management and feed production is with many of the Asian countries supplying the UK with popular farmed species such as warm water prawn and pangasius.

The increasing demand on aquaculture to fill the "the fish gap", combined with the static nature of wild capture fisheries to supply fish for marine proteins and oils for feed production, drives the increasing necessity for feed fisheries to be managed responsibly and increasingly sustainably. For aquaculture to continue to expand to meet this increasing demand for seafood, marine proteins and oils will need to be supplemented with an array of non-marine ingredients, such as vegetable proteins and oils; processed animal proteins (PAP’s), algae oils and other emerging innovative ingredients. MCS supports and encourages a partial substitution diet as it ensures the health benefits of marine ingredients in the diets of farmed fish are available to as many consumers as possible.

Table 2: Methodology questions for feed sustainability

<table>
<thead>
<tr>
<th>Question</th>
<th>Score range</th>
<th>Score details</th>
</tr>
</thead>
</table>
| Does the species rely on feed inputs?                                   | 0-6         | 6 = No. Award full points for this section and go to Question 6 – ecological effects.  
0 = Yes. Continue with the section scoring                               |
| Is the protein and oil component (marine, vegetable and terrestrial) of the majority of feed in the region known and traceable (to species level for marine components)? | 0 to -2     | 0 = Yes. Continue to questions 3 & 4.                                             
-2 = No or no information available. Skip questions 3 & 4.               |
3.1.2 Ecological effects

Encourage and incentivise sustainable fisheries management, Marine Stewardship Council (MSC) certified feed fisheries are also excluded from fishmeal or fish oil, whichever component creates the largest burden of wild fish in feed.

Feed Fish Dependency Ratio (FFDR) - the quantity of wild fish used per quantity of cultured fish produced. This measure can be calculated for:

- Question 3 (Are marine wild capture protein and oil components of the majority* of feed in the region sourced sustainably or responsibly in the region?)
  - 2 = Yes. The marine wild capture protein and oil components of the majority* of the feed are independently** certified as sustainable.
  - 1 = The majority of feed suppliers have a policy in place that ensures the responsible sourcing of the marine wild-capture protein and oil source and this can be independently verified***.
  - 0 = The majority of feed suppliers have an internal policy in place that addresses the responsible sourcing of the marine capture protein source but the effectiveness of this policy cannot be verified.
  - -1 = There is no independent certification or feed manufacturer’s policy to ensure the sustainability or responsible sourcing of the wild-capture protein component of the feed OR there is no information available.

- Question 4 (Are non-marine ingredients sourced sustainably or responsibly in the region?)
  - 2 = Yes. The vegetable/fat component of the feed is fully traceable and any soy or palm used is certified as sustainable* or not used at all.
  - 1 = The majority of feed suppliers in the region have verifiable traceability systems in place but soy and/or palm is used and it is not certified as sustainable.
  - 0 = The majority of feed suppliers in the region have no verifiable traceability systems in place and uncerified soy or palm is used.

- Question 5 (What is the overall Feed Fish Dependency Ratio for this species?)
  - 2 = The species has a FFDR* of less than 1.
  - 1 = The species has a FFDR* between 1.1 and 2.
  - 0 = The species has a FFDR* between 2.1 and 3.
  - -2 = The species has a FFDR* greater than 3.

**Wild fish includes both meal and oil produced from wild fish, but does not include by-products from processing (trimmings). In order to encourage and incentivise sustainable fisheries management, Marine Stewardship Council (MSC) certified feed fisheries are also excluded from this calculation.

FFDR meal = (% fishmeal in feed) (eFCR)

FFDR oil = (% fish oil in feed) (eFCR)

eFCR = (Feed, kg or MT)

Net aquaculture production, kg or MT (wet weight)

3.1.2.1 Ecological effects

Rationale

Construction

The construction and operation of aquaculture facilities can have an adverse impact on the surrounding environment; this can include sensitive habitat destruction, or disturbance and/or impacts on other species. In some production systems in certain areas it can also include degradation or depletion of freshwater supplies by extraction or salinisation.

Chemicals and organic waste

The unregulated or misuse of chemicals and/or therapeutants in some areas, combined with water pollution from nutrients and benthic impacts from faeces and uneaten feed, is a key concern within global aquaculture production. It is essential that these impacts are monitored, managed and reduced as far as possible.

Ranching

The reliance on wild stock for the provision of juveniles for on-growing (ranching) is un-sustainable if those stocks are over-exploited, for example species such as European eel (Anguilla anguilla) and the Bluefin tuna (Thunnus thynnus). If the production system relies on these over-exploited species, that are rated by MCS wild capture methodology, then the species is an automatic fail (red rating).

Disease transfer

The risk of disease and parasite transfer can be a problem in a number of systems for a number of species. This risk can be minimized by effective management and mitigation measures; however in some cases there is no information available to ascertain that this is the case, or widespread disease outbreaks are seen.

Escapes

Escapes from production sites are not only a financial loss for the farmer but can also have an adverse effect on the surrounding ecosystem, including species, particularly in the case where the cultured species may be a non-native. Escapes can be prevented by either the type of production system in place or by management measures such as barrier use. However, in some cases escapes can be significant in both number and impact.

Predator control

MCS would like to see all aquaculture facilities relying solely on non-lethal predator control measures. There are a number of non-lethal management measures available to deter predators which MCS advocates the use of. It is a particular concern when lethal control measures are used for species that are protected or listed as threatened or endangered.

Table 3: Methodology questions for ecological effects

<table>
<thead>
<tr>
<th>Question</th>
<th>Score range</th>
<th>Score details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are marine wild capture protein and oil components of the majority* of feed in the region sourced sustainably or responsibly in the region?</td>
<td>2 to -1</td>
<td>2 = Yes. The marine wild capture protein and oil components of the majority* of the feed are independently** certified as sustainable. 1 = The majority of feed suppliers have a policy in place that ensures the responsible sourcing of the marine wild-capture protein and oil source and this can be independently verified***. 0 = The majority of feed suppliers have an internal policy in place that addresses the responsible sourcing of the marine capture protein source but the effectiveness of this policy cannot be verified. -1 = There is no independent certification or feed manufacturer’s policy to ensure the sustainability or responsible sourcing of the wild-capture protein component of the feed OR there is no information available.</td>
</tr>
<tr>
<td>Are non-marine ingredients sourced sustainably or responsibly in the region?</td>
<td>1 to -1</td>
<td>2 = Yes. The vegetable/fat component of the feed is fully traceable and any soy or palm used is certified as sustainable* or not used at all. 1 = The majority of feed suppliers in the region have verifiable traceability systems in place but soy and/or palm is used and it is not certified as sustainable. 0 = The majority of feed suppliers in the region have no verifiable traceability systems in place and uncerified soy or palm is used.</td>
</tr>
<tr>
<td>What is the overall Feed Fish Dependency Ratio for this species?</td>
<td>2 to -2</td>
<td>2 = The species has a FFDR* of less than 1. 1 = The species has a FFDR* between 1.1 and 2. 0 = The species has a FFDR* between 2.1 and 3. -2 = The species has a FFDR* greater than 3.</td>
</tr>
<tr>
<td>Do the production systems for this species in this region deplete freshwater supplies and/or degrade freshwater bodies by salinisation**?</td>
<td>1 to -1</td>
<td>1 = No**. 0 = Depletion of supplies and/or degradation by salinization but with limited*** adverse effects. -1 = Severe depletion of supplies and/or degradation of freshwater bodies (surface and groundwater) by salinisation.</td>
</tr>
<tr>
<td>Do the production systems for this species in this region require land/seabed alteration?</td>
<td>0 to -2</td>
<td>0 = No, or alteration is very minor, such as an anchor point, or small-scale alterations or alterations in areas of low ecological sensitivity*. -1 = Yes, alterations in areas of moderate ecological sensitivity** or areas of medium to long-term degradation but where documented reforestation or restoration is taking place. -2 = Yes, large-scale alteration (such as dredging ponds in mangrove areas and deforestation) in areas of high ecological sensitivity*** and where no reforestation programs are in place.</td>
</tr>
<tr>
<td>Do the majority of production systems in this region rely on chemical* usage?</td>
<td>1 to -2</td>
<td>1 = No or yes but within a full containment system. 0 = Yes, but the use of chemicals* is within an effective** regulatory framework***. -1 = Yes, but the use of chemicals is within an ineffective regulatory framework which leads to a negative environmental effect. -2 = Yes, there is an unregulated, illegal or unnecessary**** use or discharge of chemicals or the use of chemicals is unknown due to data deficiency.</td>
</tr>
</tbody>
</table>
### Question Score range Score details

<table>
<thead>
<tr>
<th>Question</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>9</strong></td>
<td>Do the majority of production systems in this region discharge directly into the aquatic system?</td>
</tr>
<tr>
<td><strong>10</strong></td>
<td>What is the main source of juveniles and/or broodstock of this species in the region?</td>
</tr>
<tr>
<td><strong>11</strong></td>
<td>Is there a risk of disease/parasite transfer to wild species or surrounding environment?</td>
</tr>
<tr>
<td><strong>12</strong></td>
<td>Is there a risk of escapes or introductions of exotic species from this type of production, and if so, would escape cause negative ecological effects?</td>
</tr>
<tr>
<td><strong>13</strong></td>
<td>In general, does this type of production have direct negative ecological impacts on local wildlife in the region?</td>
</tr>
</tbody>
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**Question 6** * Degradation of freshwater in this question does not refer to any kind of organic pollution (Q9) or chemical contamination (Q8).** Open or closed seawater systems, re-circulating freshwater systems, plentiful freshwater supply and no salinisation occurring.*** Limited adverse effects: effect either short term in nature and/or can be remedied within the natural system (no accumulative long term impacts).
Table 4: Methodology questions for fish health and welfare

<table>
<thead>
<tr>
<th>Question</th>
<th>Score range</th>
<th>Score details</th>
</tr>
</thead>
</table>
| 14 Does the production and harvest systems for this species in this region include provisions for animal welfare* and humane slaughter** | 1 to -1     | 1 = Yes or Not applicable***  
0 = Either provisions for animal welfare or humane slaughter** are provided but not both.  
-1 = No, or unknown. |
| 15 Is the species in this regional assessment subject to regular or widespread viral or bacterial* disease outbreaks that threaten the viability of the whole region? (parasites are covered in Q 11)** | 1 to -1     | 1 = No.  
0 = Yes, but rarely, not widespread or cause minimal mortalities.  
-1 = Yes. |

(Required)

*Compromised animal welfare leads to physical damage, aggression and pre-harvest mortalities. Culture conditions that lead to physical deformities can compromise animal welfare and should be included in this question. This question only refers to the culture species.

**Human slaughter (RSPCA definition: “An animal must be either killed instantly or rendered insensible to pain until death supervenes” generally only applicable to electrical or mechanical stunning followed by bleeding. **Applicable to vertebrates only (based on current EU legislative guidelines). Provisions for slaughter not applicable to live sales.

(Question 15 * E.g. I.S.A. in Chilean salmon, whitespot in shrimp. This question concerns disease events that are happening regularly and could have been prevented.)

3.1.4 Management

Rationale

Alongside the impacts of individual fish farms there is a need to understand both the cumulative impacts and the cumulative carrying capacity (not applicable to land based systems) of aquaculture operations in a given area, be it loch, lake, or river basin. The impacts and carrying capacity can be determined by the use of strategic environmental assessments and spatial planning.

Robust regulations can ensure the establishment, structure and function of aquaculture facilities does not adversely affect sensitive habitats, species, water quality or other marine users. It is therefore imperative that a robust regulatory framework is in place in the region under assessment.

Robust regulations are meaningless unless there is effective enforcement in place. If, for instance, there was a regulation to prevent the introduction on non-native species, yet it was recorded that non-natives were prevalent in an area, this would indicate enforcement was ineffective or absent.

Independent, 3rd party audited production standards ensure that many, if not all the issues of environmental concern including the criteria used in this assessment, are addressed. Consumer facing eco-label schemes have the added advantage of directing consumers to the most responsibly produced farmed seafood, and in turn drive and support the market for these products.

Table 5: Methodology questions for management

<table>
<thead>
<tr>
<th>Question</th>
<th>Score range</th>
<th>Score details</th>
</tr>
</thead>
</table>
| 16 Are fish farms in this region subject to any strategic environmental planning (e.g. spatial planning, integrated coastal zone management, river basin planning, strategic environmental assessment, cumulative capacity planning)? | 1 to -1     | 1 = Yes, and planning provides sufficient protection for ecological values of the area, or not applicable*.  
0 = Yes, but the planning does not provide sufficient protection for ecological values of the area.  
-1 = No, or not enough information. |
| 17 Is there a regulatory framework for this species in the region that includes/addresses the following issues: Environmental Impact Assessment (EIA); Protection of valuable Habitats; Use of Land and Water Resources; Use of Chemicals; Discharge of Effluents / Water Pollution; Bio-Security & Disease Management; Species Introduction. | 2 to -2     | 2 = There is a regulatory framework for all issues of concern.  
1 = There is a regulatory framework for 5 or more of the issues of concern.  
0 = There is a regulatory framework for between 3 and 5 of the issues of concern.  
-1 = There is a regulatory framework but it covers less than 3 of the issues of concern or there is no information available. |
| 18 Is the regulatory framework for the species in this region effective in minimising negative impacts? | 1 to -2     | 1 = Yes, Systems/measures are fully effective.  
0 = Yes, Systems/measures are partially effective.  
-1 = There is insufficient information to assess effectiveness.  
-2 = No, Systems/measures are hardly effective or not at all. |
| 19 Are the majority of producers of this species in the region producing to independent on-site audited, 3rd party certification standards? | 2 to -1     | 2 = Yes, majority of producers farm to the Aquaculture Stewardship Council (ASC) Standard.  
1 = Yes, majority of producers farm to an audited standard. (Please name certifying body).  
0 = Majority of producers are working towards achieving standard requirements.  
-1 = No, efforts to implement improvements in production practices have not been taken. |

(Question 16 * Not applicable: Land based recirculation systems that are subject to terrestrial planning and have no direct discharge, or small-scale shellfish farms.)

3.2 Sources of information

MCS relies upon an array of information to inform our aquaculture assessments. These include, but are not limited to, the following:

- Food and Agriculture Organisation of the United Nations (FAO)
- Environment Agency
- Europa – website of the European Union
- CEFAS
- SEPA
- Standard holders and Certification bodies, such as ASC, GAA and GlobalGap
- Marine Scotland
- Scientific Journals
- Industry contacts
3.3 Example rating explained

Species and aquaculture system under assessment

Name: Arctic char (Salvelinus alpinus).
Type of system: Freshwater tanks with recirculation.
Location/Region: Ireland. Organic production.
Scoring: Feed 3, Ecological effects 8, Fish health and welfare 2, Management 5.
Total Assessment Score: 18. Rating: 

Assessment Questions

Feed

Question 1: Do the farmed species in this region rely on feed inputs?
   Answer: Yes.

Question 2: Is the protein and oil component of the majority of the feed in the region known and traceable?
   Answer: Yes.

Question 3: Are the marine wild-capture protein and oil components of the majority of the feed in the region sourced sustainably or responsibly?
   Answer: The majority of feed suppliers have an internal policy in place that addresses the responsible sourcing of the marine wild-capture protein source but effectiveness of this policy cannot be verified.
   Rationale: IOFGA Irish Organic certified feed requires that marine proteins and oils come from trimmings. However, those trimmings don’t have to be MSC or IFFO RS certified.

Question 4: Are the vegetable/grain components of the majority of the feed in the region sourced sustainably and fully traceable?
   Answer: Yes.
   Rationale: IOFGA Irish Organic certification requires all non-marine ingredients to be organic.

Question 5: What is the overall Fish-in Fish-out ratio calculated as Feed Fish Dependency Ratio (FFDR) for the species in this region?
   Answer: The species has a FFDR of less than 1.
   Rationale: eFCR 1.15. Fishmeal 32%. Fish Oil 28.5%. However all marine proteins and oils are from trimmings, therefore FFDR = 0.
   Reference: Company direct.

Ecological effects

Question 6: Do the production systems for this species in this region deplete freshwater supplies and/or degrade freshwater bodies by salinisation?
   Answer: No.
   Rationale: Land based recirculation system in a country with a plentiful freshwater supply.

Question 7: Do the production systems for this species in this region require land/seabed alteration?
   Answer: No.
   Rationale: Land based system.

Question 8: Do the majority of production systems in this region rely on chemical usage?
   Answer: No or yes but within a full containment system.
   Rationale: Any chemicals used are limited by organic standards and used within a full containment system.
   Reference: IOFGA Organic standards.

Question 9: Do the majority of production systems in this region discharge directly into the aquatic system?
   Answer: No (closed containment system) or yes in the case of zero-input farming system based on natural production (no inputs of fertilisers and feed).
   Annotations: Land based, closed containment systems.
   Reference: IOFGA Organic standards.

Question 10: What is the main source of juveniles and/or broodstock for this region?
   Answer: All juveniles are from hatchery based production.
   Reference: Company information and auditor.

Question 11: Is there a risk of disease/parasite transfer to wild species or surrounding environment?
   Answer: There is a minimal risk of escapes (fully closed system).
   Rationale: Organic standard and Company information.
   Reference: Land based closed system with no predator interaction.

Question 12: Is there a risk of escapes or introductions of exotic species from this type of production, and if so, would escape cause negative ecological effects?
   Answer: There is a minimal risk of escapes (fully closed system).
   Rationale: Organic standard and Company information.

Question 13: In general, does this type of production have direct negative ecological impacts on local wildlife in the region? *This question is about predator control*
   Answer: The production system has no negative impacts on wildlife.
   Reference: Land based closed system with no predator interaction.
Fish health and welfare

Question 14: Does the production and harvest system for this species in this region include provisions for animal welfare and humane slaughter?

Answer: Yes. [Score 1]

Rationale: IOFGA Standards, sections 5.02.34 – 38.

Question 15: Is the species in this regional assessment subject to regular or widespread viral or bacterial disease outbreaks that threaten the viability of the whole region?

Answer: No. [Score 1]

Annotations: Fish are grown in tanks in land based systems fed from a groundwater spring that is pathogen free. All production takes place in one location.

Management

Question 16: Are fish farms in this region subject to any strategic environmental planning (e.g. spatial planning, coastal zone management; river basin planning; strategic environmental assessment; cumulative capacity planning)?

Answer: Not applicable to land based farms that are subject to terrestrial planning and have no direct discharge. [Score 1]

Question 17: Is there a regulatory framework for this species in the region that includes/addresses the following issues:

- Environmental Impact Assessments
- Protection of valuable habitats
- Use of land and water resources
- Use of chemicals
- Discharge of effluents/water pollution
- Bio-security and disease management
- Species introduction

Answer: There is a regulatory framework for all issues of concern. [Score 2]

Annotations: Land based system subject to terrestrial planning and environmental management.

Question 18: Is the regulatory framework for the species in this region effective in minimizing the negative impacts?

Answer: Yes. Systems/Measures are fully effective. [Score 2]

Annotations: Land based systems subject to terrestrial planning and environmental management.

Question 19: Are the majority of producers of this species in this region producing to independent on-site audited, 3rd party certification standards?

Answer: Yes, majority of producers farm to an audited standard. [Score 1]

Annotations: Irish Organic Food Growers Association Standard.
Appendix I
Scientific and certification bodies

- Aquaculture Stewardship Council (ASC) [www.asc.org](http://www.asc.org)
- Centre for Environment, Fisheries and Aquaculture Science (CEFAS) [www.cefas.defra.gov.uk](http://www.cefas.defra.gov.uk)
- Environment Agency (EA) [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)
- Fishbase [www.fishbase.org](http://www.fishbase.org)
- Fishsource (Aquaculture and Fishery Improvement Projects) [www.fishsource.com](http://www.fishsource.com)
- Food and Agriculture Organisation (FAO) [www.fao.org](http://www.fao.org)
- Freedom Foods [www.freedomfood.co.uk](http://www.freedomfood.co.uk)
- Global Aquaculture Alliance [www.gaallinace.org](http://www.gaallinace.org)
- GlobalGap [www.globalgap.org](http://www.globalgap.org)
- International Union for Conservation of Nature (IUCN) [www.iucn.org](http://www.iucn.org)
- Marine Stewardship Council (MSC) [www.msc.org](http://www.msc.org)
- Marine Management Organisation (MMO) [www.marinemanagement.org.uk](http://www.marinemanagement.org.uk)
- Marine Scotland Science [www.scotland.gov.uk](http://www.scotland.gov.uk)
- OSPAR (List of Threatened and/or Declining Species and Habitat) [www.ospar.org](http://www.ospar.org)
- Seafish Industry Authority (Seafish) [www.seafish.org](http://www.seafish.org)
- Soil Association [www.soilassociation.org](http://www.soilassociation.org)
Appendix II
Members of Industry Review Group (IRG)

<table>
<thead>
<tr>
<th>Name</th>
<th>Company/Organisation</th>
</tr>
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<tbody>
<tr>
<td>Peter Stagg</td>
<td>Fawsitt Fish Billingsgate</td>
</tr>
<tr>
<td>Stephen Munnings</td>
<td>Flatfish Ltd</td>
</tr>
<tr>
<td>Andrew Pillar</td>
<td>Interfish</td>
</tr>
<tr>
<td>Estelle Brennan</td>
<td>Lyons Seafood</td>
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<tr>
<td>Mike Berthet</td>
<td>M &amp; J Seafood</td>
</tr>
<tr>
<td>Claire Pescod</td>
<td>Marine Stewardship Council (MSC)</td>
</tr>
<tr>
<td>Lucy Blow</td>
<td>New England Seafood</td>
</tr>
<tr>
<td>Charles Redfern</td>
<td>Organico</td>
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<tr>
<td>Nigel Edwards</td>
<td>Seachill</td>
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<tr>
<td>Alex Caween</td>
<td>Seafish</td>
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<tr>
<td>Karen Green</td>
<td>Seafish</td>
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<tr>
<td>William Lart</td>
<td>Seafish</td>
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<tr>
<td>Philip MacMullen</td>
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<tr>
<td>Tom Pickerell</td>
<td>Seafish</td>
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<tr>
<td>Jess Sparks</td>
<td>Seafood Scotland</td>
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<tr>
<td>Nathan De Rozarieux</td>
<td>Tegen Mor</td>
</tr>
<tr>
<td>Mike Mitchell</td>
<td>Young's Seafood</td>
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</tbody>
</table>
Interested parties to whom rating changes are communicated:

- 3663
- Compass Group
- Dorset WT
- FalFish
- Fish Choice
- Fish2Fork
- Good Catch
- Green Gourmet
- Hospitality & Catering News
- Keo Films
- National Aquarium
- New Under Tens Fishermen’s Association
- Rick Stein
- Sam’s Brasserie
- Scottish Pelagic Fishermen’s Association
- Seafood Holdings
- Selfridges
- Soil Association
- South Lanarkshire Council
- South Western Fish Producer Organisation
- Southbank Fresh Fish
- Squid and Pear
- Sustain
- Sustainable Restaurant Association (SRA)
This methodology has been developed by the Marine Conservation Society, drawing in part on a common methodology framework jointly developed between the Marine Conservation Society, North Sea Foundation and WWF in 2010.

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