Reviews in Fisheries Science

Title: Behind the signs — a global review of fish sustainability information schemes

Key (indexing) terms: Ecolabelling, fisheries, aquaculture, certification, recommendation lists, sustainable fisheries, market-based measures.

Graeme Parkes*[1], James A. Young[2], Suzannah F. Walmsley[1], Rigmor Abel[3], Jon Harman[4], Peter Horvat[5], Audun Lem[6], Alastair Macfarlane[7], Maarten Mens[8], Conor Nolan[9].

1 MRAG Ltd, 18 Queen Street, London W1J 5PN, UK
2 University of Stirling, Scotland
3 Norwegian Seafood Export Council, Norway
4 Seafish Industry Authority, UK
5 Fisheries Research and Development Corporation, Australia
6 Food and Agriculture Organization of the United Nations, Italy
7 The New Zealand Seafood Industry Council, New Zealand
8 Dutch Fish Product Board, The Netherlands
9 Bord Iascaigh Mhara, Ireland
* Corresponding author. Tel: +1 727 563 9070 Fax: +1 727 563 0207 Address: c/o MRAG Americas, 10051 5th Street N, Suite 105, St. Petersburg, FL 33702, USA Email: graeme.parkes@mragamericas.com

Abstract (197words)

This paper presents the results of a global review of organisations that provide sustainable fisheries information — including ecolabels, recommendation lists and supermarkets — to consumers and supply chain intermediaries. It examined 17 organisations and key supermarkets that communicate on the sustainability of world fisheries and aquaculture products. Certification schemes assess a relatively small number of specific fisheries and indicate sustainability through labels. Recommendation lists cover more species and areas but in less detail. FAO guidelines for fisheries ecolabelling and aquaculture certification constituted the benchmarks with which improving conformance was found. However, significant variation in fisheries' assessment exists, affecting the accuracy and precision of information and advice provided. Inconsistent approaches and contradictory advice among certification schemes and recommendation lists potentially increase consumer confusion and

reduce their credibility. The review identifies seven critical attributes schemes must address — scope, accuracy, independence, precision, transparency, standardisation and cost-effectiveness — and recommends that certification schemes and recommendation lists enhance their consistency and credibility through compliance with these attributes and FAO guidelines. Fish sustainability information schemes play an important role in securing a sustainable future for the oceans. Uptake of this review's recommendations should reduce consumer confusion and increase confidence in the benefits of sustainable purchasing.

Introduction

The benefits of sustainable fisheries and the need to mitigate the environmental and related impacts of fishing and aquaculture are increasingly in the public consciousness. With three-quarters of fish stocks being fully- or over-exploited (FAO, 2009), poorly implemented, government-run, command and control management schemes have often failed to curb fishing effort, prevent overfishing and avoid environmental degradation.

Market-based approaches that empower customer choice in seafood purchasing have shown promise in generating motivation for improved catching and culture practices. The past decade has witnessed a proliferation of national and supranational schemes designed to provide consumers and organisational buyers with more and better information to help make informed choices when purchasing seafood[1]. These encompass information on: the condition of fish stocks; the environmental impacts of fishing and aquaculture practices; the effectiveness of fisheries management measures; animal health and welfare; and social,

[1] Throughout this article the terms 'seafood' and 'fish' are used holistically to incorporate all kinds of fisheries products including shellfish, aquaculture and those from fresh water.

labour and ethical aspects. These fish sustainability information schemes take a variety of forms and cover: third party certification schemes that include the option of labelling products from specific fisheries and aquaculture operations; lists of 'good' and 'bad' fish species (in terms of buy or avoid) published by environmental NGOs; supermarkets and seafood brands providing advice directly to their customers on their sourcing policy and product lines; and standards and advisory services provided by national governments. Target recipients for these schemes are along the whole value chain from fishers through intermediaries to end consumers.

For these approaches to work effectively, good quality information is required about the provenance of the fish being purchased. However, with the rapid increase in the number and type of schemes there has been little opportunity for harmonisation of methods and advice. Particularly in the fisheries sector there is sometimes conflicting advice presented by third party certification schemes and NGO-sponsored recommendation lists about the sustainability of seafood products. In aquaculture certification, there has been greater movement towards standardisation and equivalence to counter this problem. A lack of consistency of approach and contradictory recommendations of the various schemes have the potential to confuse consumers, blur the differences between what is good and what is not, and erode the potential benefits of better information for purchasing decisions. Perceived inconsistencies will also tend to undermine the credibility of future information about sustainability.

This paper presents an objective review of a selection of certification schemes and recommendation lists for both capture fisheries and aquaculture (see Box 1), based on a review (FSIG & MRAG, 2009) commissioned by the Fish Sustainability Information Group, an international consortium representing a variety of national organisations concerned with

seafood marketing and overseen by the UN Food and Agriculture Organisation (FAO)[2]. The intention is to develop a clear picture of what constitutes current best practice for communicating fish sustainability information. The basis adopted for the review was the guidelines developed by FAO for ecolabelling/certification of capture fisheries and aquaculture (FAO *Guidelines for the Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries* (FAO, 2005a) and the draft FAO *Technical Guidelines on Aquaculture Certification* (FAO, 2008)). The FAO guidelines cover minimum substantive requirements (relating to the content of the standard against which fisheries or aquaculture operations are assessed) as well as institutional and procedural aspects such as governance, certification and accreditation procedures, transparency and stakeholder involvement.

This is a highly dynamic and rapidly-developing area. Although a number of reviews of fish sustainability information schemes, and of ecolabels in particular, have been carried out previously (Gardinier and Kuperan Viswanathan, 2004; Leadbitter and Ward, 2007; Monfort, 2007; Macfadyen and Huntington, 2007; Lankester, 2008; OFIMER, 2008; Sainsbury, 2008; Ward & Phillips, 2008; Washington, 2008; Roheim, 2008, 2009), the schemes are continuously improving and adapting their methodologies. As a result such reviews can become dated quite quickly; this review provides a snapshot of the current state-of-affairs of the sector.

Methodology

A list of certification schemes and other organisations that provide guidance on sustainable fisheries and seafood was compiled totalling 29 schemes from which 17 were selected for detailed review. The selection (Box 2) aimed to cover a range of different types of scheme to provide representative and informative coverage, and includes those that provide certification

[2] A full version of the report is available at: http://www.marketing.stir.ac.uk/News/FSIG_Report.pdf

and ecolabelling, organic certifiers, national standards and recommendation lists. The chosen schemes include aquaculture and capture fisheries across a wide geographic range, and schemes developed by trade associations, private/independent organisations, NGOs and governments. In addition to the 17 schemes, a separate analysis of the approaches taken by three leading supermarkets was undertaken, together with a review of the presentation of fish sustainability information on 25 supermarket websites.

A framework was developed to provide structure for the collection of information. This covered: the scope and type of organisation administering the scheme; what they claim; how the scheme is implemented (including assessment methodology, information sources and system integrity); what the results are in relation to claims of environmental, economic and social benefits; and organisational costs and funding. A basic list of questions under these five categories was developed for the scoping phase, and a more in-depth set of questions was generated to assess the schemes against the FAO guidelines for certification of capture fisheries and aquaculture (FAO, 2005a; FAO, 2008).

The FAO guidelines for ecolabelling of fish and fishery products from marine capture fisheries specify three essential components of a certification standard (the minimum substantive requirements), against which a fishery is assessed: the management system; the stock under consideration; and ecosystem considerations. A fish sustainability information scheme covering capture fisheries should include all three of these components. Indicators of the performance of a fishery should cover the type, amount and quality of information available, the way a management system responds to different circumstances and, crucially, the outcome, i.e. the actual status of the target stock and the rest of the affected ecosystem.

The draft FAO guidelines on aquaculture certification cover four relevant areas: animal health and welfare; food safety and quality; environmental integrity; and social responsibility. In this case, however, the draft guidelines currently state that an aquaculture certification scheme may address one or all of these issues. This is reasonable, given the disparate nature of the four issues, and there is on-going debate about whether social responsibility should be included at all in the guidelines.

With regard to procedural aspects, the FAO guidelines for both capture fisheries and aquaculture consist of three main components: setting of standards, accreditation of certifying bodies and certification to verify compliance with the standard. Standard-setting should be carried out by a specialised body, or a technical committee of independent experts. The FAO guidelines are intended for ecolabelling and certification schemes only; there are no equivalent guidelines specifically for recommendation lists. Nevertheless, the guidelines have significant relevance for recommendation lists, particularly with respect to aspects of best practice such as transparency, independence and stakeholder consultation. The minimum substantive requirements are also applicable because lists provide assessments of sustainability.

Extensive searches of secondary data were undertaken through desk-based research, and were used to provide a foundation for the primary data gathered via questionnaires, direct interviews and consultations with the schemes to obtain up-to-date information. The principal sources of information were the organisations themselves. The review of the supermarkets, as a group analysis covering 25 different organisations, could not go into the same level of detail as the review of the other 17 schemes for reasons of resource; instead it was based on publically-available information and did not involve direct consultation with each company. Interestingly this approach is more akin to that which might be made by the regular enquirer.

Results & Discussion

While certification schemes and recommendation lists function quite differently, they share the common purpose of trying to influence consumers and actors within the seafood value chain towards purchasing products that come from sustainable sources. The overarching goal is to modify market demand in a way that will support sustainability and ultimately benefit the environment.

The main markets for certified products are in Europe (Germany, Netherlands, UK, Italy, Switzerland and France), but the USA is also important for TQS, MSC, GlobalGAP, GAA and DEWHA. China and Japan are important markets for DEWHA-certified exports, and Japan is likely to be the main market for MEL-Japan-certified products. Schemes have had substantial success in increasing awareness of the issues associated with sustainable fishing and aquaculture within a limited number of mainly developed country markets. However, inconsistent approaches and contradictory advice among the schemes have the potential to increase consumer confusion, industry concern, retailer guardedness, and reduce confidence.

The review identified seven key attributes that all schemes must address in order to mitigate these problems: Scope; Accuracy; Independence; Precision; Transparency; Standardisation; and Cost-effectiveness. These key attributes align with FAO guidance and provide the structure for the discussion.

Conformance with FAO guidelines

Most of the schemes are improving their conformance with the FAO guidelines. In this regard, it is noted that the willingness of the selected organisations to participate in the review process was generally high.

All of the certification schemes reviewed that apply to fisheries include the three minimum substantive requirements in their standards (related to the management system; the state of the stock and ecosystem impacts) (Table 1). However there is significant variation in the way in which they assess performance: the extent to which the data used relate to the actual stock under consideration; how up-to-date the data are required to be; whether stock status reference points are explicitly considered; and whether the stock assessment data are peer-reviewed to verify their quality and applicability (Table 2). This has resulted, in some cases, in over-exploited stocks being certified, contrary to the FAO guidelines. Of the certification schemes, the MSC makes the most comprehensive, robust and transparent assessment of performance. In addition to the three components required by the FAO, FOS and Naturland both include social aspects in their standard for fisheries, while MSC and MEL-Japan do not. Because recommendation lists provide broader species coverage and in general do not assess on a stock-by-stock basis, they present less detailed information on individual stocks than certification schemes.

The aquaculture schemes are currently less consistent with the FAO guidelines than the fisheries schemes (Table 1), partly because the scope that aquaculture schemes should address is less clear than with fisheries and the FAO guidelines on aquaculture certification have not yet been finalised. The final version of these guidelines may not include all of the current minimum substantive requirements, indeed some may become optional. However the aquaculture certification schemes reviewed did address the four areas in the FAO guidelines, albeit to different extents (Table 3). Private sector and national standards for aquaculture certification cover food safety and quality most comprehensively, as might be expected for standards focussed on the export market.

Recommendation lists cover all the minimum substantive requirements for fisheries, but not for aquaculture (Table 4), where they tend to focus on environmental issues. Tables 5 and 6 summarise the current alignment of the recommendation lists with the FAO guidelines for fisheries and aquaculture respectively.

The data gathered show that the main fisheries certification schemes comply with the procedural aspects in the FAO guidelines (on setting of standards, accreditation of certifying bodies and certification to verify compliance with the standard). However, the level of independence among recommendation lists developed by NGOs is generally lower than for certification schemes. With respect to the verification of compliance with the standard, there is also a clear difference between the certification schemes and the recommendation lists: assessments for the latter are generally conducted in-house by the creators of the scheme themselves and not by independent bodies. Nevertheless, during the course of this review there was an increasing tendency of the recommendation lists to seek greater conformance with the guidelines.

Drivers

Certification schemes generally apply only to those fisheries or aquaculture facilities seeking to become certified. Most of the drive and initiative for improving sourcing policies has come from industry itself, including the fish catching sector, traders, processors, retailers (notably supermarkets), foodservice companies and their customers. Most sectors of the fishing industry are increasingly aware of issues related to overfishing and ecological impacts, and for some time have been making efforts towards sustainability. From the fishers' point of view, adopting responsible fishing practices can raise their profile, so that processors and retailers looking for sustainably and ethically-sourced products view them in a more favourable light. Other factors for the industry as a whole include individual and generic brand reputations, a need to assure clients along the supply chain of the legality and sustainability of supplies, their own sustainability policies towards environmental responsibility, and also the fact that a sustainable company requires a sustainable supply of fish. NGO campaigns for sustainable seafood have increased the pressure on industry to act and source responsibly.

Accuracy

The information used to conduct assessments for certifications and recommendation lists should be comprehensive, up-to-date and well-referenced, from published and peer-reviewed sources wherever possible. There are two key issues involved: firstly, the most recent and relevant information available must be used in the assessment of sustainability; and secondly there needs to be a clear procedure and timetable for updating the assessment as new information becomes available.

Recommendation lists involve much less detailed analysis of information than certification schemes and environmental NGOs may put wider campaign priorities ahead of fishery-specific, peer-reviewed outcomes from certification schemes. There is also significant variation in the way in which different certification schemes assess compliance with their standards, notably in the area of stock status. In some cases it has been found that seafood products are categorised differently by different organisations' recommendation lists, as well as having an ecolabel certification. Such situations clearly provide conflicting advice for consumers, as noted in some high profile cases. For example, Alaskan Pollock was placed on Greenpeace's Redlist because it is a trawl fishery, yet MCS (UK) classify it in the middle (second choice) category, whereas Seafood Choices Alliance and MBA have approved 'wild' Alaskan Pollock, and the MSC have certified several pollock fisheries.

Certification schemes generally have a well-defined timetable for the certification, annual audits, overall duration of a certificate and the procedure for re-certification. Some NGO recommendation lists also review their information regularly, but others have a less rigorous sunset policy or updating procedure, meaning that information may continue to circulate after it has ceased to be accurate.

Independence

Independence of fish information schemes is an important element of their credibility that applies at all levels of their development, governance and implementation. If they are to gain trust and credibility they should not be influenced by political or industrial interests, or wider campaign objectives. Providing certification is available to all fisheries that meet the standard, without discrimination, the decision of a fishery to seek certification is an active and voluntary decision. The producers of recommendation lists, by contrast, are free to assess any fishery they choose and have the option of 'blacklisting' those that do not meet their

sustainability criteria. In preparing recommendation lists, environmental NGOs may put campaign priorities (e.g. a global ban on bottom trawling) ahead of fishery-specific, peer-reviewed outcomes. Certification schemes consider the impacts of each fishery separately and have certified some fisheries that use bottom trawls. While the recommendation lists provide a simple message to consumers, the certification schemes' approach has greater scientific integrity, and produces a fairer and more independent result for the fishery.

To promote objectivity and independence (and in line with the FAO guidelines), certification schemes have de-coupled the certification process from the standard-setting, although in some cases the final certification decision still rests with the standard setter. In contrast, recommendation lists tend to be compiled unilaterally by each organisation, with assessments carried out in-house, and may be significantly driven by wider campaign objectives, hence introducing the potential for bias in the results.

Precision

The issue of precision represents perhaps the clearest divide between certification schemes and recommendation lists. Certification is normally carried out on a clearly defined unit (fish stock, gear type, fleet etc.) whereas recommendation lists in general do not assess on a stock-by-stock basis, instead assessing a fish species or group of species sourced from a region, and perhaps by an identified fishing or farming method. As a result they present more general and less detailed information at lower resolution than certification schemes. Commonly this lacks precision and can mask variations amongst both well-managed and poorly-managed fisheries that all become tarred with the same brush; in turn this may lead to advice that conflicts with certification scheme assessments. Such inconsistencies are unhelpful to information recipients and consumers and may have significant impacts on well-managed fisheries that should not be grouped together with other less-well-managed units. Certification schemes

thus have the advantage of being able to drill down to the practices of a particular fishery or aquaculture facility and hence assess the sustainability of a clearly defined and distinct unit.

Another aspect of precision is that where the certification involves labelling of products, there must be a certified chain of custody that ensures only fish from the certified unit are labelled as such. Certification schemes usually include such a requirement, whereas recommendation lists generally cannot. This can make it unclear to consumers which fish products are included in a particular listing (good or bad). Furthermore, the information available to consumers on packaging at the point of sale often does not help with this distinction — for example there is often nothing specific about the ocean or region from which the fish were sourced and the precise species also may not be shown. From the consumer's perspective there is potentially great advantage in certification and ecolabelling because of its direct and unambiguous signal at the point of purchase (providing of course the scheme itself conforms to FAO guidelines).

Transparency

To maintain credibility, there must be a high level of transparency at all stages in the process of developing and implementing the schemes. For certification schemes this includes publication of preliminary information on fisheries and aquaculture units to be assessed, so that stakeholders may provide timely input into the process, as well as the publication of assessment reports prior to the certification decision being taken. In the case of recommendation lists, the full assessment (i.e. scoring against criteria) for fisheries should be made publically available for comment. However, it is generally more difficult to trace exactly how a particular conclusion has been reached for recommendation lists than for certification schemes. The latter usually have more transparent procedures and/or peer review processes.

Standardisation

Different certification schemes certify different things, have different standards, and use different assessment methodologies. There has been little effort to date to seek equivalence between different, competing schemes, particularly in the capture fisheries sector.
Whilst it is not realistic to expect all certification schemes to address exactly the same issues, where possible, greater standardisation and harmonisation between schemes should be encouraged. This would enable increasing recognition of equivalence between standards and would be a measure that would facilitate business for industry. This is already happening in the organics sector where certification under one scheme can lead to that product's 'organic' status being recognised by other organic labels.

Greater standardisation and harmonisation should be encouraged as a longer-term goal to work towards, and could lead to recognition of equivalence between schemes. This process should be greatly facilitated by the FAO guidelines. Likewise, for recommendation lists, the development and application of common methodologies for scoring and compiling the lists would help minimise the consumer confusion that already exists surrounding sustainable seafood. Within a scheme, quality control of certifications is necessary to ensure consistent application of the standard and its consistent communication to consumers.

Cost-effectiveness

For certification schemes, there is a balance to be found between the scheme being comprehensive and robust, and the cost involved in assessing against a wide range of detailed criteria. A very complex scheme that requires a large amount of detailed information for the assessment may become too expensive to be accessible for the industry. On the other hand, a scheme which is very simple and has an assessment procedure that is quick and easy to

implement, and is therefore less costly, may not be sufficiently robust to inspire and maintain the confidence of industry, retailers and consumers. Both will fail to achieve their objectives since they will not achieve the necessary uptake.

The costs involved vary, but certification processes are often time consuming and costly. The decision to seek certification is both active and voluntary; a fishery or aquaculture facility will generally chose one certification scheme to promote its environmental credentials, based on an assessment of potential costs and benefits involved, together with market recognition and how they can take advantage of this.

Certification is primarily industry-funded, although other funding mechanisms exist. Governments have provided financial support to help fisheries go through private certifications, but this is not common. The industry generally bears the cost of preparing documentation and meeting any imposed conditions. Certification costs need to be kept under control to avoid costs becoming too high such that certain fisheries (e.g. small-scale fisheries or those in developing countries) are priced out of the system and cannot benefit from certification.

Certification of products coming from developing world fisheries and aquaculture operations is less frequent than from developed countries because of high costs and because the production systems are more likely to be small-scale and data-poor. Certification schemes may therefore result in products being sourced preferentially (but unintentionally) from developed countries. Uptake of certification schemes in developing countries varies, but all schemes are seeking to improve this. There are varying approaches to making certification costs accessible to small-scale producers and to producers in developing countries, such as group certification, keeping audit costs low, or accessing public sector or grant funding.

Recommendations

The FAO draft guidelines for aquaculture should be completed and finalised as soon as possible. All fisheries and aquaculture certification standards and information schemes should voluntarily undertake to comply fully with the relevant FAO guidelines (either capture fisheries or aquaculture as appropriate) and this compliance should be independently verified periodically.

Certification schemes and producers of recommendation lists should enhance their consistency and credibility by seeking greater standardisation and harmonisation. Given the generally higher level of scrutiny provided by certification schemes, recommendation list owners should better align their lists with the outcomes of the schemes, providing the schemes conform well to FAO guidelines. Where conflicts between certification schemes and recommendation lists persist, recommendation lists should give clear justification for their difference of view. This will encourage increasing recognition of equivalence between certification standards and recommendation lists and will simplify procedures for industry; ideally complying with one sustainability standard should be sufficient, rather than having to go through the expense of numerous assessments against different standards. Greater equivalence is an achievable outcome as schemes align themselves better and more transparently with the FAO guidelines.

In line with FAO Guidelines, recommendation lists should have an independent standard-setting procedure and should distance themselves from undertaking assessments of fisheries and aquaculture operations against their standards, for example through having assessments conducted by independent assessment bodies or groups of experts. The standard should be

based on sound science and should not be biased by wider campaign objectives or the objectives of their funding bodies.

Certification schemes and recommendation lists should all ensure that the data they are utilising are as current as possible, and are appropriate to the fisheries or aquaculture units being assessed. Recommendation lists in particular need to improve their control of information, with specific indication of the publication date of each list and a clear procedure for updating when new information becomes available. In essence, each scheme must have a clear, scientific and documented procedure for accessing, processing, verifying, updating and presenting comprehensive and relevant information in a balanced, unbiased way. In particular, recommendation lists need to define more clearly the units of listing and make their work available for peer review.

With the growing number and variety of ecolabels, and consumers' general lack of awareness of labels and fish sustainability issues, retailers must increasingly take responsibility for selecting and promoting trustworthy ecolabels on behalf of their customers. They have an important role which is likely to increase in importance in the future. Supermarkets' own responsible sourcing policies are important and they should continue developing and coordinating these with existing schemes.

The market is increasingly demanding sustainable seafood products, but the volume of certified supplies is not sufficient to meet market demand. Certification schemes and recommendation lists should continue their efforts to improve the applicability of their schemes to products from small-scale and data-deficient fisheries and aquaculture operations (particularly those in the developing world) so that these products do not suffer unintentional market access barriers. The development of less data-oriented assessment methodologies and

efforts to reduce the costs of certification are important in this respect. Initiatives that support fisheries improvement plans to bring these fisheries within the scope of certification should also be given a high priority. Similarly, transitional fisheries (fisheries that do not yet reach the required standards for certification schemes, but which wish to improve) should be encouraged and supported in their efforts to move towards sustainability.

Before committing to a certification scheme, industry and producers need to weigh up potential costs and benefits. The costs involved vary and the more demanding the certification requirements and standards are, the more expensive the conformity assessment process becomes, but the more robust and reliable the label itself is, generally. Consideration needs to be given to whether industry is in a position to undertake the work necessary to take advantage fully of the market recognition associated with certification and labelling.

Conclusions

Fish sustainability information schemes cover a convergent, but still varied, range of forms of communication. Certification schemes generally provide a clear and unambiguous signal at the point of purchase regarding sustainability, and are able to provide detailed information on particular stocks. However, recommendation lists fill an important niche because the number and availability of certified, labelled products is still relatively low. Recommendation lists therefore may help direct consumers towards a wider range of choices in their seafood purchasing decisions of uncertified or unlabelled products.

The scope of sustainability criteria used by certification schemes and recommendation lists is expanding. As our understanding of human impacts on natural systems improves, so the need for a more holistic approach to support genuinely ethical sourcing is increasingly recognised. Examples of criteria include impacts of land-based processing, labour standards and animal

welfare and food miles. As issues of climate change, carbon footprint, Life-Cycle Analysis (LCA) and Life-Cycle Costs (LCC) continue to gain prominence, additional criteria for labelling will arise and guidelines for certification will be needed. However, additional criteria will inevitably lead to greater complexity, and ways of communicating these issues to consumers in a clear and meaningful way that does not add to confusion will need to be found.

There is a high level of consensus in both commercial seafood firms and the NGO community regarding the importance of these schemes, and a strong level of commitment among all parties to a sustainable future for the oceans. Uptake of these recommendations should help reduce consumer confusion surrounding which fish to eat and which to avoid and lead to a growth in confidence throughout the supply chain in the benefits of genuine sustainable sourcing. The challenge now is to maximise the value of fish sustainability information schemes in contributing to the overarching goal of a sustainable future for the oceans, by providing consumers and businesses with clearer, more accurate and more recent data, so that they can make properly informed choices when buying seafood.

References

FAO. Guidelines for the Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries. Directives pour l'étiquetage écologique du poisson et des produits des pêches de capture marines. Directrices para el ecoetiquetado de pescado y productos pesqueros de la pesca de captura marina. 90p.Rome/Roma, FAO (2005a). *Available at* http://www.fao.org/ docrep/ 008/a0116t/a0116t00.htm

FAO. Review of the state of world marine fishery resources. FAO Fisheries Technical Paper 457. 235p. Rome, FAO (2005b). *Available at* http://www.fao.org/docrep/009/y5852e/y5852e00.htm

FAO. Technical Guidelines on Aquaculture Certification. Fourth Session, Sub-Committee on Aquaculture, Committee on Fisheries, Puerto Varas, Chile, 6–8 October 2008. COFI/AQ/IV/2008/Inf.7. Rome, FAO (2008). *Available at* ftp://ftp.fao.org/docrep/fao/meeting/014/ai770e.pdf

FAO. The State of World Fisheries and Aquaculture 2008. Rome, FAO (2009).

FSIG & MRAG. Review of Fish Sustainability Information Schemes. Final Report. MRAG Ltd, London, 180p. (2009).

Leadbitter, D. and T. J. Ward. An evaluation of systems for the integrated assessment of capture fisheries. *Mar. Pol.* 31: 458–469 (2007).

Gardinier, P. R. and K. Kuperan Viswanathan. Ecolabelling and Fisheries Management. Worldfish Center Studies and Reviews 27, 44p. (2004).

Lankester, K. A comparison of on-pack seafood labels for sustainable fisheries. August 2008. A report to the World Wildlife Fund, United States (not for public release; kindly provided with permission) (2008).

Macfadyen, G. and T. Huntington. Potential costs and benefits of fisheries certification for countries in the Asia Pacific region. Report prepared for the APFIC Regional Workshop on Certification Schemes for Capture Fisheries and Aquaculture, HCM City, Viet Nam, 18-20 September 2007, 63p. Poseidon Aquatic Resource Management Limited, Lymington, UK (2007).

Monfort, M.C. Ecolabelling Schemes for Fisheries Products. March 2007. Marie Christine Monfort, Consultant (2007).

OFIMER. Etude de Faisabilite de la Mise en Place d'un Ecolabel Dans la Filiere des Produits de la Peche Maritime. Rapport Final au 08/02/08. Etude réalisée par: Pôle Filière Produits Aquatiques et Bureau Veritas. Projet cofinance par L'Union Europenne. Office National Interprofessionnel des Produits de la Mer et de l'Aquaculture (OFIMER) (2008).

Roheim, C.A. The Economics of Ecolabelling, pp. 38-57. In *Seafood Ecolabelling: Principles and Practice.* (Ward, T. and B. Phillips, Eds.) Oxford, UK: Blackwell Publishing (2008).

Roheim, C.A. An Evaluation of Sustainable Seafood Guides: Implications for Environmental Groups and the Seafood Industry. *Mar. Res. Econ.* 24:301–310 (2009).

Sainsbury, K. Review of Guidelines for Ecolabelling of Fish and Products from Capture Fisheries, and Recommended Minimum Substantive Requirements. Report for the Expert Consultation on Ecolabelling Guidelines for Fish and Fishery Products, Rome, 3–5 March 2008 (being developed as an FAO Technical Paper) Rome: FAO (2008).

Ward, T. and B Phillips (Eds), *Seafood Ecolabelling: Principles and Practice.* Oxford, UK: Blackwell Publishing (2008).

Washington, S. Ecolabels and Marine Capture Fisheries: Current Practice and Emerging Issues. April 2008. GLOBEFISH Research Programme, Vol. 91, 52p. Rome: FAO (2008).

Box 1: Types of Fish Sustainability Information Scheme

Fish sustainability information schemes come in many different forms, but they are generally of two main types:

Certification schemes assess the status and characteristics of specific fisheries and/or aquaculture operations and may lead to an ecolabel on retail packs or (to a lesser extent) restaurant menus, designed to confirm that the specific seafood product has come from a sustainable source. Third party certification schemes include Friend of the Sea (FOS), and the Marine Stewardship Council (MSC). Typically, participants in these schemes pay to undergo independent certification against a set of criteria or standards and, if successful, are permitted to use the ecolabel on their products. Other labels that make a variety of claims about responsible sourcing are also used by organic certifiers, national governments and supermarkets on their own brand products.

Recommendation lists provide consumers with a traffic light or similar system to indicate the sustainability, or otherwise, of particular fish or shellfish species. These lists are typically prepared by environmental NGOs such as the Marine Conservation Society (MCS), Greenpeace and WWF, often as part of wider campaigns that advocate sustainable fishing and aquaculture practices. The creators of the lists decide which products to cover and inclusion in a list is not generally at the discretion of those involved in the fisheries and aquaculture operations from which those products originate. Lists advising consumers on sustainability are also compiled by non-campaigning organisations such as the Sustainable Fisheries Partnership (SFP) and national government bodies (e.g. NOAA Fisheries in the US).

Box 2: Fish Sustainability Information Schemes reviewed

Certification Schemes	
Friend of the Sea (FOS)	Sets a standard for third-party certification of both capture fishery and aquaculture products. Provides a label for final products. Fisheries and aquaculture products are assessed from all over the world, including a significant number from developing countries.
Marine Ecolabel Japan (MEL-Japan)	A non-profit, private sector organisation which is part of the Japan Fisheries Association. It sets a standard for certification of capture fisheries. Currently it assesses Japanese product for the Japanese market. Certification process is not third party.
Marine Stewardship Council (MSC)	Sets a standard for third-party certification of capture fisheries. MSC licences its label for use on certified product. It assesses fisheries from around the world although so far predominantly from developed countries.
Global Aquaculture Alliance (GAA)	A non-profit, trade association that developed Best Aquaculture Practices (BAP) certification standards. GAA sets standards for aquaculture products, including shrimp hatcheries, processing plants, and shrimp, tilapia and catfish farms. Standards can be applied to product from all around the world. Provides a label for final products.
GlobalGAP	An independent, private sector organisation that sets voluntary standards for the certification of agricultural products, including aquaculture, but not capture fisheries. It is a business-to-business scheme and has no consumer label. It serves as a practical manual for Good Agricultural Practice that can be used globally.

Naturland	An independent 'organic farmers association' where certification is only one of many activities. Sets standards for organically-produced agriculture products, including aquaculture and wild capture fisheries, and provides a label on final product. Not fully third-party certification since certification decision is taken by Naturland not the certification body.
DEWHA Environment Protection and Biodiversity Conservation Act	The Department for Environment, Water, Heritage and the Arts (DEWHA) provides a government-run compulsory scheme that assesses all Australian Commonwealth-managed and State-managed fisheries in accordance with the 'Guidelines for the Ecologically Sustainable Management of Fisheries'. This is required for product to be permitted for export. There is no label for final product.
Thai Quality Shrimp	An initiative by the Department of Fisheries of Thailand, delivered by the Marine Shrimp Culture Research Institute. The government sets the standard and assesses farms against the standard. Product assessed is only from Thailand and only from aquaculture. It is voluntary.
Recommendation Lists	
Australian Marine Conservation Society	An Australian marine conservation NGO which produces a 'Sustainable Seafood Guide' using a traffic light colour coding scheme. Products are restricted to those available in Australia and include both wild fishery and aquaculture products.
Greenpeace	An international campaigning NGO with many individual national branches. Greenpeace assess capture fishery and aquaculture products according to its own methodology. Produces an international and several national 'red lists' of fisheries and aquaculture products they

	consider to be unsustainable.
Marine Conservation Society (MCS) UK	An NGO that campaigns on a range of marine issues. It provides advice to consumers through its 'Fishonline' website and 'Pocket Good Fish Guide'. A traffic light system is used to categorise them against the methodology which they developed. Includes both farmed and wild-caught products.
Monterey Bay Aquarium (MBA)	MBA run the 'Seafood Watch' programme which provides sustainable fisheries and aquaculture information to businesses and consumers. It assesses products internationally using a methodology that it developed.
NOAA Fishwatch	The National Marine Fisheries Service (sector of the National Oceanic and Atmospheric Administration (NOAA)) operates the 'Fishwatch' initiative, which provides information on the management and state of USA-managed fish stocks. It is only a small component of NOAA's activities. It focuses on capture fisheries and includes some aquaculture information.
North Sea Foundation (NSF)	NSF run the 'Goede VIS' programme, which focuses on providing information on commercially sustainable fisheries in the Netherlands. NSF and WWF collaborated to produce their methodologies which the fisheries and aquaculture products are assessed against.
Sustainable Fisheries Partnership (SFP)	An independent, global NGO that provides strategic and technical guidance to businesses with the aim of influencing supplier behaviour and catalysing or encouraging fisheries improvement projects. SFP has developed 'FishSource' — a web-based information resource that

	summarises the available scientific and technical information on selected capture fisheries (does not cover aquaculture).
World Wide Fund for Nature (WWF) International and WWF Hong Kong	An international environmental NGO which provides a fish recommendation list as part of their work on sustainable fisheries. They developed a methodology (in collaboration with NSF) to assess international capture fisheries and aquaculture products. A traffic light system is used to categorise them. The information is available for consumers online through the international and national websites. WWF was also involved in the initiative to create the MSC and is now working to create the Aquaculture Stewardship Council (ASC).
Retailers	
Supermarkets	Carrefour, Tesco and Wal-Mart were reviewed, and a further assessment was undertaken of the websites of 25 supermarket retailers from Europe and North America.

Table 1 Summary characteristics of certification schemes

						For fisheries			For aquaculture													
Scheme	3rd party certifier (3rd) or National Standard (NS)	Wild fisheries	Aquaculture	Dedicated to seafood	Seafood as part of broader product certification	Stock status	Ecosystem impacts	Management system	Animal health and welfare	Food safety and quality	Environmental integrity	Social responsibility	Source of information	Frequency of re-certification (for fisheries/aquaculture)	Independent accreditation body?	Independent certification bodies? (i.e. 3rd party)	Certification process allows stakeholder input/challenge	Traceability included	Small-scale and/or data deficient certified?	No of fisheries certified	No of aquaculture operations certified	Indicative cost of certification/audit (€)
FOS	3rd	✓	✓	✓		✓	✓	✓	Ind	Ind	✓	✓	FAO, RFMO or NMRA	3–5 years	✓	✓	✓	✓	✓	~65[1]	~25	8,000
MSC	3rd	✓	×	✓		✓	✓	✓					SA	5 years	✓	✓	✓	✓	Few	55		30,000
MEL-Japan	3rd	✓	×	✓		✓	✓	✓					Japan national SA	5 years	×	✓	✓	✓	×	1		15,000

GlobalGAP	3rd	×	✓		✓				✓	✓	✓	✓	Audit	Annual	✓	✓	×	✓	✓			400
GAA	3rd	×	✓	✓					✓	✓	✓	✓	Audit	Annual [2]	×	✓	✓	✓	✓		72[3]	3,175[4]
Naturland	3rd	✓	✓		✓	✓	✓	✓	✓	Ind	✓	✓	Local SA	Annual	×[5]	✓/×[6]	F: ✓ A: ×	✓	✓	1	?	750
TQS	NS	×	✓	✓					✓	✓	✓	✓	Audit	Annual	×	×	✓/×[7]	✓	✓		250	0
DEWHA	NS	✓	×	✓		✓	✓	✓					Australia national SA	0–5 years	×	×	✓	×	✓	121		0

Notes:

3rd = Third-party certifier; NS = National Standard; SA= Stock assessment from the fishery; Ind = indirectly i.e. issue is not specifically addressed and is considered to be beyond the scope and remit of the scheme, but some aspects are indirectly addressed through other measures.

1 Counts individual species within a single audit as separate fisheries. Count by country and species was 30 for fisheries. In practice, some are mixed fisheries (e.g. line fisheries for swordfish, kingfish, kawahai, tarahiki and trevally in NZ).

2 Not specified, but none of the ‘certified until’ dates for certified farms, hatcheries or processing plants were more than one year in the future.

3 Refers to the number of hatcheries (15) and farms (57) certified. In addition 91 processing and 7 repacking facilities have also been certified.

4 Relates to cost of membership or registration and the cost of certification audit or annual inspection.

5 Accreditation is not to Naturland’s procedures, but to ISO65.

6 Naturland certification committee takes the certification decision, not the certification body.

7 Review indicated ‘there is the possibility for peer review and debate but not necessarily resulting in an improved outcome.’

Table 2 Summary assessment of fishery certification standards against the minimum substantive requirements in FAO (2005a)	**Management system**	**State of the stock**	**Ecosystem impacts**
FOS	Includes management system (e.g. fishery follows advice of scientific advisory bodies, has an adaptive management plan, makes data available for scientific monitoring and fishery management), but does not assess whether the data collected by the management system are sufficient for scientific monitoring.	Stock may not be overfished, depleted, recovering or data deficient according to most recent stock assessment by FAO, regional fisheries management organisation (RFMO) or national marine research agency (NMRA); however, will certify overfished stocks in certain circumstances; stock	Assesses against specific criteria e.g. impacts on seabed, sensitive habitats, biodiversity, ecosystem, endangered, threatened and protected (ETP) species, predator-prey relationships, selectivity/bycatch, fuel efficiency and carbon footprint. References cited do not always relate to the

Table 2 Summary assessment of fishery certification standards against the minimum substantive requirements in FAO (2005a)	Management system	State of the stock	Ecosystem impacts
	Includes precautionary principle.	assessments are not independently reviewed as part of the certification process. 'Stock assessment' used does not always relate to the stock under consideration, especially where taken from FAO (2005b), and can also be out of date (up to 6 years). Other data sources (RFMO, NMRA) better, where available/used.	specific fishery being assessed.

Table 2 Summary assessment of fishery certification standards against the minimum substantive requirements in FAO (2005a)	**Management system**	**State of the stock**	**Ecosystem impacts**
MSC	Includes assessment of the management system, its effectiveness and implementation. Only scheme that specifically requires the data and information to be sufficient for achieving the other objectives (stock status and ecosystem impacts). Includes precautionary principle.	Uses stock assessment data specific to the stock under consideration. Reference point must be set above the level at which there is an appreciable risk of impairing future viability of the stock. Will not certify a stock below limit reference point ('overfished'). If stock is below target reference point and has	Considers potential direct impacts in the categories of retained species, bycatch species, ETP species, habitats, plus any additional indirect impacts on the ecosystem; requires management responses that address significant impacts.

Table 2 Summary assessment of fishery certification standards against the minimum substantive requirements in FAO (2005a)	Management system	State of the stock	Ecosystem impacts
		not been consistently fluctuating around it, a recovery plan should be in place. Stock assessment data are peer-reviewed.	
MEL-Japan	Requires there to be an 'effective' management system but does not provide further details; instead, specific guidelines are developed by the certification body on a case-by-case basis.	Target resource is maintained at the 'level of sustainable use', although this is not explicitly defined. Uses data used in Japan's national stock assessments, not independently reviewed	Requires that 'appropriate measures should be taken for the conservation of the ecosystem', against the 'most probable adverse impacts'.

Table 2 Summary assessment of fishery certification standards against the minimum substantive requirements in FAO (2005a)	Management system	State of the stock	Ecosystem impacts
	Does not include precautionary principle.	as part of the certification process. Data relatively up-to-date (2 years). Would certify overfished stocks if managed under a recovery plan and showing progress towards stock recovery.	
Naturland	Includes management system; detailed requirements set for each fishery. Requires data to be collected but does not mention	Use stock assessment results from local research agency. Not independently reviewed as part of the certification process.	Assess against specific criteria e.g. no use of poisons or explosives. Also develop specific criteria for individual assessments.

Table 2 Summary assessment of fishery certification standards against the minimum substantive requirements in FAO (2005a)	Management system	State of the stock	Ecosystem impacts
	requirement for a full stock assessment or actions to maintain sustainability of the stock based on scientific data. Does not include precautionary principle.		
DEWHA	Includes assessment of the management system, its effectiveness and implementation. Includes precautionary	Uses stock assessment data specific to the stock under consideration. Would certify an overfished stock if the	Considers most serious potential impacts and requires management responses that address those impacts.

Table 2 Summary assessment of fishery certification standards against the minimum substantive requirements in FAO (2005a)	Management system	State of the stock	Ecosystem impacts
	principle.	management system was considered capable of ensuring recovery.	

Table 3 Summary assessment of aquaculture certification standards against the minimum substantive requirements in FAO (2008)

	Animal health and welfare	Food safety and quality	Environmental integrity	Social issues
GlobalGAP	Yes, fish must be treated in such a way as to protect from pain, stress, injury and disease. Drugs to be used only in accordance with applicable regulations.	Yes, prevention of water contamination, requirement for a food quality manual and written hygiene plan, effective waste management, location of facilities must ensure safe production of food, feed quality and contamination controls, hygiene standard based on Hazard Analysis and Critical Control Points (HACCP).	Potential environmental impacts must be identified and monitoring carried out. However, does not mention requirement for mitigation of impacts. Requires action plan to prevent contamination/ salinisation of water. Restrictions on wild seed. Minimise escapees. Environmental impact assessment (EIA) required.	Shrimp standard includes an optional social standard. Worker health and safety, no forced labour, freedom to associate, wages must meet legal or industry minimum. Group certification option for small-scale producers.
GAA	Yes, for tilapia and	Yes, including	Includes	Includes

	Animal health and welfare	Food safety and quality	Environmental integrity	Social issues
	catfish (operations have animal welfare in mind, harvesting and transport to minimise stress), but not included for shrimp (in line with current World Organisation for Animal Health (OIE) welfare recommendations).	food safety for harvest and transport, drug and chemical management, microbial sanitation, location of facilities must ensure safe production of food, feed quality and contamination controls, hygiene standards.	identification of potential environmental impacts, siting of farms not to displace important natural habitats, effluents monitored for water quality parameters, minimise escapees, responsible use of wild seed.	(voluntary) code of practice for community and employee relations for shrimp farming. Farms must not block access to public areas. Worker safety, comply with national labour laws, pay minimum wage.
FOS	Does not include animal health and welfare (e.g. minimising stress) — FOS consider this beyond the remit of a sustainability label. Does include disease prevention	No, considered beyond the scope of an ecolabel. Some aspects covered indirectly e.g. choice of adequate sites to avoid disease and pest problems.	Specific criteria for environmental issues of most concern e.g. infrastructure to minimise escapees, minimise use of wild broodstock, minimise pollution, water	Included. No child labour, no forced labour, wages meet national minimum legal standard. Communities continue to have access to fishing grounds and fresh

	Animal health and welfare	Food safety and quality	Environmental integrity	Social issues
	measures. Drugs and chemicals to be used only when clearly justified, but does not mention only approved substances.		quality of effluents, EIA required.	water.
Naturland	Yes, animals must be able to behave in a natural way. No hormones or chemo-synthetic drugs to be used, natural curative methods preferred. Conventional medicine only permitted after veterinary advice, must wait twice the legal time before harvest after drug use.	No, although does require a cold chain to be maintained and that the cleaning regime ensures hygiene.	Specific criteria for environmental issues of most concern e.g. siting of farm, prevent risk of escapees, local species preferred, water quality of waste water, wild seed collection must be in line with FAO Code of Conduct for Responsible Fisheries (CCRF), minimise feed wastage and reduce	Included, no forced labour, freedom to associate, no child labour but children can work on family or neighbours' farms subject to conditions, wages must meet national minimum wage. Basic benefits must be covered e.g. maternity, sickness,

	Animal health and welfare	Food safety and quality	Environmental integrity	Social issues
			use of fishmeal. EIA not required but criteria cover many EIA aspects.	retirement. Fishers' access to natural water courses maintained.
TQS	Yes, assessed indirectly through checks for medication and prophylaxis residues.	Yes, includes location of facilities with respect to food safety, general good hygiene, feed contamination avoidance, carry-over of potential hazards to human health. Scheme is focussed on meeting US, EU and Japan import requirements. Includes HACCP.	Yes, except does not require EIA to have been carried out. Details of environmental requirements not provided by Dept of Fisheries.	Includes labour rights e.g. no forced labour, wages must meet national minimum legal standard. International Labour Organization (ILO) convention issues such as child labour, forced labour, are not included in the scheme, but are dealt with by other departments.

Table 4 Summary characteristics of recommendation lists

					For fisheries			For aquaculture							
	Wild fisheries	Aquaculture	Dedicated to seafood	Seafood as part of broader environmental campaign	Stock status	Ecosystem impacts	Management system	Animal health and welfare	Food safety and quality	Environmental integrity	Social responsibility	Frequency of updates	Is the information source clear i.e. referenced?	Process allows stakeholder input and/or challenge	Small-scale and developing country assessed
AMCS[1]	✓	✓		✓	–	–	–	–	–	–	–	–	–	–	–
Greenpeace	✓	✓		✓	✓	✓	✓	×	×	✓	✓	On receipt of new information and annually	✓	✓	✓
MBA	✓	✓		✓	✓	✓	✓	Ind	×	✓	Ind	6-monthly	✓	✓	✓
MCS UK	✓	✓		✓	✓	✓	✓	✓	×	✓	×	~ Annually	✓	✓	✓
NOAA: FishWatch	✓	×	✓		✓	✓	✓					Constantly under review	✓	✓	×

NSF: Goede VIS	✓	✓	✓		✓	✓	✓	×	×	✓	×	~ Annually	✓	✓	-
SFP	✓	×	✓		✓	✓	✓					Constantly under review	✓	✓	×
WWF	✓	✓		✓	✓	✓	✓	✓	×	✓	×	Funding-dependent; some national guides annually	✓	✓	✓

Notes:

– = information not received from organisation; Ind = indirectly i.e. issue is not specifically addressed and is considered to be beyond the scope and remit of the scheme, but some aspects are indirectly addressed through other measures.

1 AMCS did not provide any details on their assessment processes and scoring criteria.

Table 5 Summary assessment of fishery recommendation lists against the minimum substantive requirements in FAO (2005a)

	Management system	State of the stock	Ecosystem impacts
Greenpeace	Assesses whether the system uses an ecosystem-based management approach. Does not cover compliance and the monitoring of the systems to applicable regulations and laws.	A stock is not considered sustainable if the stock levels cannot be maintained. Uses species vulnerability rating on 'Fishbase'.	Specifically asks if species are from 'sensitive deep-water habitats'. Red-lists a fishery if it uses destructive methods; high discards; catches a high % of juveniles; non-target species caught; ecosystem alteration; fully traceable back to boat.
Goede VIS	Methodology developed together with WWF's 2008 methodology — see WWF below.		
MBA	Includes whether the system uses independent scientific assessments, if it regularly collects and analyses stock data, assesses what level the systems set the quotas at i.e. recommended by scientists, if bycatch	Considers species; vulnerability to fishing pressure e.g. maturity and behaviour; level of exploitation in relation to maximum sustainable yield (MSY), occurrence of overfishing, degree of	Considers the condition of the habitat without fishing impacts, quantity and consequences of bycatch, damage caused by the fishing method, resilience to disturbance.

	Management system	State of the stock	Ecosystem impacts
	reduction plans are included, if the system addresses its impacts and includes conservation measures, enforcement.	uncertainty, biomass (combination of these factors which leads to the classification category assigned to the fishery).	
MCS UK	Assesses whether there are management plans, management measures e.g. mesh size; enforcement, precautionary approach.	Level of exploitation must be assessed, categorisation depends on: if the fishery is MSC-certified (other schemes not recognised), mortality and biomass above precautionary levels, fishing pressure and vulnerability, IUCN red-listed.	Assesses the impacts of the fishing method.
NOAA FishWatch[1]	Provides a summary of the management system, including management measures, management plans and transboundary issues. Refers readers to source documents for more	Provides a summary of the stock sustainability status, including biomass, whether it is overfished and whether overfishing is occurring. Refers readers to source	Includes brief information on ecosystem impacts as a result of the gears used (habitat impacts) and bycatch. Covers whether there are measures in

	Management system	State of the stock	Ecosystem impacts
	details.	documents for more details.	place to address essential fish habitat issues.
SFP FishSource[1]	Provides information on quality of management, including stock assessment, scientific advice, manager's decisions and compliance.	Provides information on stock status, including whether reference points have been set, status and trends.	Provides information on environment and biodiversity including ETP species, bycatch species, habitat and marine reserves.
WWF	Rates effectiveness against overfishing or destructive methods, fails a fishery if stock assessments are not factored in, scoring the fishery higher the more 'precautionary' it is. Asks if the system works for stock recovery and maintaining ecosystem integrity, and if it uses ecosystem-based management. Assesses the factors that the system considers i.e. monitoring. Does not address	Would not consider a fishery sustainable if it was overfished or if the spawning stock biomass is below precautionary levels. Considers its vulnerability rating from Fishbase and whether the characteristics of the species make it vulnerable to fishing pressure.	Addresses several ecosystem issues: discards, % landed catch, fishing method damage, if the fishery has caused any changes to the ecosystem.

	Management system	State of the stock	Ecosystem impacts
	compliance and monitoring of the systems to regulations and laws.		

1 NOAA and SFP do not have a scoring system. SFP does have ‘SFP’s Metric Systems’ which buyers can use to calculate which fish they can purchase to fit in with their sustainable sourcing schemes; this has not been assessed as part of this review.

NB. AMCS is not been included in the table because information about the scoring system was not made available.

Table 6 Summary assessment of aquaculture recommendation lists against the minimum substantive requirements in FAO (2008)

	Animal health and welfare	Food safety and quality	Environmental integrity	Social issues
Greenpeace	Not within remit, does consider disease transfer to the wild.	Not covered.	Covers most environmental issues, sourcing from the wild, siting considerations in sensitive areas, feed.	Only one question covered about human rights abuses.
MBA	Not addressed explicitly although many are implicit in other criteria.	Not covered.	This is the focus of the assessment, includes use of marine resources, disease transfer, escapees, use of feed, pollution/habitat, and management.	No, although some are implicit in other criteria.
MCS UK	Includes optimising welfare standards.	Not covered.	Covers environmental issues in depth, including siting of farms, sources of feed, minimising effects of marine pollutants, minimising ecosystem effects and environmental management.	Not covered.
NSF: Goede VIS	Not covered.	Not covered.	Includes consideration of the production system	Not covered.

	Animal health and welfare	Food safety and quality	Environmental integrity	Social issues
			(water, discharge and energy), siting, ecosystem effects, feed and management.	
WWF	Only one question regarding if the system decreases the health of the fish at any stage.	Not covered.	This is the focus of the assessment, includes all of the main points and also disease transfer to the wild, depletion of water, land/sea alteration.	Not covered.

NB. NOAA and SFP do not cover aquaculture products.