

The MSC: measuring fisheries sustainability and the implications for ICES

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Abstract

MSC has pioneered the development of fisheries certification and achieved rapid growth in its first ten years. In North Atlantic (ICES) waters and around the world, more and more fisheries are entering assessment against the MSC programme, with the aim of demonstrating their sustainability against the MSC Standard and to gain access to the MSC ecolabel. This paper emphasises the need for information to be available for these fisheries, relating to the status of target stocks, and on bycatch species, habitats and the wider ecosystem. The paper describes how the MSC has evolved since it was established 10 years ago, and outlines the MSC fisheries and supply chain standards and methodologies. The scope of the programme now includes ‘enhanced fisheries’; which involve some combination of wild harvest and culture. MSC’s new risk-based framework has also improved accessibility of the programme to small scale and data-limited fisheries in the developing world and elsewhere. The experiences of scientists working as assessment team members and peer reviewers within the assessment process are described, as is the way in which scientific information are used in MSC assessments. Against this background, the paper confirms the consistency of the MSC scheme with international guidelines, including the FAO 2005 Guidelines on ecolabelling and the ISEAL Code of Good Practice on Standard Setting. MSC’s work on monitoring and evaluating the impacts of the programme is covered in a companion paper.

Keywords: MSC; FAO ecolabelling guidelines; ISEAL; assessment standards and methodologies; certification

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Introduction

The MSC was formed as a joint initiative of the multinational company, Unilever PLC, and the environmental NGO, WWF international. Inspired by the establishment of the Forest Stewardship Council (FSC) in the mid-1990s, these organizations came together with different motivations but a shared interest, to ensure the long-term viability of global fish populations and the health of the marine ecosystem on which they depend.

The MSC was formally registered as a UK-based charity on 17 February 1997. An international consultation to establish the MSC Principles and Criteria followed, and the first MSC fisheries, Western Australia Rock Lobster and Thames herring, were certified in March 2000.

Since that time, the numbers of fisheries entering the programme and becoming certified have both grown each year to reach the current totals of 92 certified and 116 in assessment (Figure 1). The tonnages associated with these fisheries, as of June 2010, are estimated as 4.6m mt certified and 2.8m mt in assessment. This growth has been particularly rapid over the last three years.

The MSC is governed by a Board of Trustees, that receives guidance and advice from both a Technical Advisory Board and a Stakeholder Council (see <http://www.msc.org/about-us/governance/structure>). Stakeholder participation is recognized as critical to the transparency and credibility of the organization. Each of the governance bodies includes representatives from industry, environmental groups and the scientific community, and from different geographical regions. A global organization, the MSC's current staff of 70 is based in offices in the UK, USA, Australia, Japan, The Netherlands, Germany, France and South Africa.

The MSC's vision and mission were confirmed in 2009 as below:

- Our vision is of the world's oceans teeming with life, and seafood supplies safeguarded for this and future generations.
- Our mission is to use our ecolabel and fishery certification programme to contribute to the health of the world's oceans by recognising and rewarding sustainable fishing practises, influencing the choices people make when buying seafood, and working with our partners to transform the seafood market to a sustainable basis.

Against this brief background, this paper provides an overview of the fisheries and supply chain standards and methodologies, that form the basis of the MSC programme. The next section provides specific details of some of the key performance requirements that are expected in MSC fisheries. This illustrates the types of information needed for fisheries to demonstrate compliance with the MSC standards during an assessment, such as relating to the status and management of target stocks, bycatches, habitats and the wider ecosystem, as provided by ICES and similar agencies.

The paper concludes with a report on some of the experiences of scientists working as assessment team members and peer reviewers within MSC assessments, and on the consistency of the MSC scheme with international guidelines, including the FAO 2005 Guidelines on ecolabelling and the ISEAL Code of Good Practice on Standard Setting. The MSC's work on monitoring and evaluating the impacts of the programme is covered in a companion paper (Nunn et al, 2010).

The MSC standards and methodologies

The MSC has developed standards for both sustainable fishing and seafood traceability (see <http://www.msc.org/about-us/standards/standards>). These standards provide the basis for assessments of applicant fisheries by independent, third-party, accredited certification bodies (CBs). Actual assessments are guided by more detailed MSC methodologies, that:

- set out how the standards should be interpreted by certifiers conducting assessments;
- ensure that the performance of fisheries and businesses against the MSC standards is properly assessed during assessments; and
- ensure that all assessments against an MSC standard are carried out consistently, irrespective of where, when and by whom the assessment is carried out.

Summary details of the different standards and methodologies are provided in the following sections. More detailed information is available from the MSC website, via the links provided.

The Fisheries Standard (the MSC Principles and Criteria)

MSC's fisheries standard is defined in the MSC Principles and Criteria for Sustainable Fishing (see <http://www.msc.org/about-us/standards/standards/msc-environmental-standard>). This was developed following an international consultation with stakeholders between 1997 and 1999, that included eight regional workshops and two expert drafting sessions and involved more than 300 organisations and individuals around the world.

Three core Principles cover the requirements for target fish stocks, for the wider environment including other fish stocks that are caught and habitats, and for the overall management arrangements for the fishery (see Table 1). The three principles are supported by 23 detailed criteria, giving the specific expectations in each area. In summary terms, a sustainable fishery is defined, for the purposes of MSC certification, as one that is conducted in such a way that:

- it can be continued indefinitely at a reasonable level;
- it maintains and seeks to maximise, ecological health and abundance;
- it maintains the diversity, structure and function of the ecosystem on which it depends as well as the quality of its habitat, minimising the adverse effects that it causes;
- it is managed and operated in a responsible manner, in conformity with local, national and international laws and regulations;
- it maintains present and future economic and social options and benefits; and
- it is conducted in a socially and economically fair and responsible manner.

Issues involving the allocation of quotas and access to marine resources are considered to be beyond the scope of the Principles and Criteria.

The Principles and Criteria were initially prepared to apply only to wild capture fisheries. Aquaculture and the harvest of other species were not initially included. The scope of the programme was however extended in 2009 to include 'enhanced fisheries' usually involving some combination of wild harvest and culture. Criteria for eligibility of enhanced fisheries are defined in TAB Directive D-001 v2, available at <http://www.msc.org/documents/scheme-documents/directives>.

The Fisheries Assessment Methodology (FAM)

The Fisheries Assessment Methodology (FAM) provides the detailed operational interpretation of the fisheries standard (see <http://www.msc.org/about-us/standards/methodologies/fam>). Prior to the development of the FAM, CBs developed their own 'assessment trees' for each fishery. These included sets of Performance Indicators (PIs) and Scoring Guideposts (SGs) for each of the 23 criteria in the P&Cs. With variation appearing in such assessment trees for essentially similar fisheries, MSC developed the FAM to provide a standard, default assessment tree and associated guidance, designed to be generically applicable to most fisheries. Allowance is still made for certain types of fisheries (including the 'enhanced fisheries') to be assessed against modified versions of the FAM, but most fisheries now use the FAM without making changes.

Work is currently under way to develop supplementary guidance for the assessment of different types of enhanced fisheries.

In addition to reducing variability in the application of the MSC fisheries standard, the FAM was developed to simplify the assessment structure and make it more transparent. As illustrated in Figures 2 and 3, the 31 default PIs in the FAM are grouped into a number of ‘components’ within each principle. For each of the main ecological components (species, habitats, ecosystem), PIs are included to provide for scoring of:

- the ‘outcome’ or current status of the component;
- the management applied to the component; and
- the availability and quality of information used in managing the component.

For Principle 1, these three scoring areas are covered in more detail, with seven individual PIs, reflecting the higher requirement needed for the target species being assessed.

For each PI, Scoring Guideposts (SGs) are defined for three scoring levels: ‘60’, ‘80’ and ‘100’. These provide thresholds in the scoring system, as outlined below:

- 60 – defines the minimum, ‘conditional’ pass mark. Any PI that scores below 60 indicates an unsatisfactory performance level and results in the failure of the fishery. Fisheries scoring at least 60 but less than 80 are assigned conditions to improve their performance for that PI during the certification period.
- 80 – defines the ‘unconditional’ pass mark. The weighted average scores for all of the PIs under each Principle must average to 80 or higher. While there may be some PIs that only achieve conditional passes, there must thus be sufficient other PIs with higher (>80) scores to achieve at least the average 80 level for each Principle.
- 100 – defines the upper boundary of the scoring and represents the level of performance on an individual performance indicator that would be expected in a theoretically ‘perfect’ fishery.

Specific details of the PIs and SGs that have the most significant implications for ICES are provided in the following section.

Version 1 of the FAM was released in July 2008. A second version incorporating the Risk Based Framework (RBF, see below) and some other changes was released in July 2009. With 83 fisheries assessed against pre-FAM assessment trees, and 135 fisheries having adopted the FAM to date, the FAM is already the basis for the majority of fisheries in the MSC programme.

As with the Principles and Criteria, the FAM was developed during extensive stakeholder consultations. A core guiding principle in developing the FAM was that the ‘bar’ set in the new default assessment tree should neither raise nor lower the average standards established in the previous assessments against pre-FAM assessment trees.

The Risk-Based Framework (RBF)

The MSC promotes equal access to its certification programme irrespective of the scale of the fishing operation. Since 2009, MSC has provided a new Risk-Based Framework (RBF) as part of its efforts to improve the accessibility of the programme to small scale and data-limited fisheries in the developing world and elsewhere. The RBF is a set of assessment methods, now contained in the FAM (v2), that may be used in defined circumstances when insufficient data are available to score a PI using the standard Scoring Guideposts. Such fisheries may not have traditional stock-assessments or other forms of quantitative analysis, but may be operating at a sufficiently low intensity to demonstrate a low risk of adverse impact to stocks, habitats and ecosystems. The RBF methodologies place the emphasis on stakeholder consultation and semi-quantitative

methods, and have been designed with additional precaution to compensate for the more limited data available. The RBF is heavily based on the Ecological Risk Assessment for the Effects of Fishing, developed by CSIRO in Australia (Hobday et al, 2006), and scientists from CSIRO were involved in its development. A set of 'FAQs' for the RBF is available at: <http://www.msc.org/about-us/standards/methodologies/fam/rbf-faqs>.

The Fisheries Certification Methodology (FCM)

An assessment of a fishery against the Principles and Criteria and the FAM (or RBF) is governed by the MSC Fisheries Certification Methodology (FCM v6, see <http://www.msc.org/about-us/standards/methodologies/msc-fishery-certification-methodology>). This outlines the steps that must be taken to assess a fishery, the requirements for consultation with stakeholders, the submission of reports at specific stages, and other procedures. Specific aspects of the assessment process have been updated in recent years by a number of Technical Advisory Board (TAB) Directives, for example strengthening the requirements for stakeholder consultation and improving the objections procedure.

A fishery that successfully meets the MSC fisheries standard is issued a certificate that is valid for 5 years. During this period the performance of the fishery is reviewed at least once a year to check that it continues to meet the MSC standard. After 5 years, the fishery must be reassessed in full to continue to be certified.

The Chain of Custody Standard and Methodology

Once a fishery has been certified, all companies in the supply chain that take the fish 'from boat to plate' must also be certified as meeting the MSC Chain of Custody standard for seafood traceability (see <http://www.msc.org/about-us/standards/standards/chain-of-custody>). The Chain of Custody standard ensures that the MSC label is only displayed on seafood that has originated from an MSC-certified sustainable fishery.

To get Chain of Custody certification, businesses must be audited to show they have effective storage and record-keeping systems. Companies have to demonstrate, for example, that they can keep certified fish separate from non-certified fish, and that they can trace every delivery of certified fish to another Chain of Custody certified supplier. As with the fisheries programme, Chain of Custody assessments are conducted by independent, accredited CBs, and a Chain of Custody Certification Methodology provides the basis for assessments.

Requirements for scientific information in MSC assessments – Implications for ICES

At the time of writing, one hundred 'fisheries'¹ are involved in the MSC programme within the ICES Northeast Atlantic region, nearly half of the global total of 208. Of these, 35 fin-fish fisheries have been certified, and another 39 are currently in assessment (Table 2a). In contrast, only 4 shellfish fisheries have been certified, and 22 are in assessment (Table 2b). Some ICES-assessed fish stocks are targeted by multiple MSC fisheries, with different client groups having entered assessment at different times, some of these stimulated by the market advantages being experienced by the early movers. There are for example currently: 4 fisheries targeting the Eastern Baltic cod stock; 5 on Atlanto-Scandian herring; 6 on North Sea saithe, 7 on North Sea herring; and 10 on NE Atlantic mackerel.

¹ A 'fishery' in the MSC programme is defined by default to comprise a single fish stock exploited by a defined client group. Some 'fisheries' include more than one gear type. These are assessed separately as different 'Units of Certification', but are counted as part of the same fishery. For further information, see <http://www.msc.org/track-a-fishery/what-is-a-fishery>.

The stocks involved in many, but not all of these fisheries are assessed by ICES scientists and working groups (assessed stocks are listed in bold in Tables 2a and 2b). The models and data used in stock assessments vary between stocks, roughly in proportion to their value. The MSC takes a non-prescriptive approach towards the alternative approaches that may be used in stock assessments and management, emphasizing instead that management should be appropriate to the size, scale and intensity of the fishery and can deliver on the performance outcomes determined in the methodology.

An example of this flexibility in approach is the MSC's RBF for 'data-limited' fisheries, described above. To date, at least eleven² MSC fisheries within the ICES region have elected to use the RBF for elements of their MSC assessment. These have mainly been on what ICES considers 'non-pressure stocks' such as lobster or sardines. In Europe, only the sardine fisheries in Cornwall and Brittany have so far passed the MSC assessment using the RBF, with others still in the assessment process.

While there is underlying flexibility, as noted the FAM does specify the overall outcomes that must be achieved for each component of the fishery, and requires certain levels of management and information that must be applied to maintain the fishery in its healthy state. The following sections provide details on some of the specific PIs in Principles 1, 2 and 3 that are critical for fisheries aiming to demonstrate compliance with the MSC standard.

Principle 1 Outcome – Sustainability of the target fish stocks

Principle 1 of the MSC standard (Principles and Criteria) requires that the target fish stocks (those to which it is intended to apply the logo, if the assessment is successful) are not over-fished and are managed to avoid depletion (Table 1). In the FAM, there are three Principle 1 PIs relating to stock status and four relating to management (Figure 3).

The three Outcome PIs jointly require that target stocks are managed in order to maintain biomass at a level that fluctuates around a target level consistent with B_{MSY} (or a higher level where justified), and that has a low probability of dropping significantly towards the point where recruitment could be impaired, whether due to recruitment overfishing or through genetic effects or imbalances in sex ratio.

The scoring guideposts (SGs) for the Stock Status PI (1.1.1) and the Reference Points PI (1.1.2) are based on the standard concepts of limit and target reference points (LRPs and TRPs). PI 1.1.1 requires at the unconditional SG80 level that it is 'highly likely' that the stock is above the level that recruitment is impaired (Table 3a). This is used as the minimum standard for the LRP, as scored in PI 1.1.2. The guidance on PI 1.1.2 identifies default LRPs for stocks with average productivity as being $\frac{1}{2}B_{MSY}$ or 20% of B_0 . The FAM also recognises that for some short-lived stocks, the actual point at which there is an appreciable risk that recruitment is impaired may be lower than 20% B_0 and for some long-lived species it may be higher than this. Where reference points are analytically determined specific to an individual stock, those values should be used.

Noting the uncertainties inherent in stock assessments, the 'highly likely' requirement at the SG80 level for PI 1.1.1 is associated with an 80% probability that the stock is above the point where recruitment could be impaired. At the SG60 level, if a target stock falls below a 70% probability ('likely' rather than 'highly likely') that the true status of the stock is higher than the point at which there is an appreciable risk of recruitment being impaired, then the assessment may fail on this PI (by not achieving the minimum 60 score required for each PI). Although these probabilities are defined in the FAM for use in cases where quantitative measures are

² Five single stock fisheries plus the six ray species included in the Bristol Channel fishery.

available, this does not imply that quantitative measures are always required. Rationale based on qualitative arguments may also be acceptable in some cases.

In addition to the LRP requirements, PIs 1.1.1 and 1.1.2 require at the SG80 level that the stock is “at or fluctuating around a defined target reference point”, and that such TRP is “consistent with B_{MSY} or some measure or surrogate with similar intent or outcome”. The FAM notes that the magnitude of fluctuation may be influenced by the biology of the species. At SG80, there must be evidence that the stock is at the TRP now or has fluctuated around the TRP for the past few years. At the higher SG100 level, the stock must have fluctuated around the TRP for longer periods of time.

The MSC has recently released clarified its interpretation of the phrase “consistent with B_{MSY} ” in relation to the scoring of the TRP in PI 1.1.2 (see Policy Advisory 12, available at: <http://www.msc.org/documents/scheme-documents/policy-advisories>). CBs have thus been advised that the B_{pa} and F_{pa} threshold levels often used in ICES-managed stocks are not necessarily consistent with B_{MSY} . It is noted that the latest ICES advice now includes estimates of F_{MSY} where possible. Such information will assist CBs in scoring these PIs, however if management uses fishing mortality (F) reference points, CBs are not necessarily to consider that biomass will be at or fluctuating around a level consistent with B_{MSY} even if F_{MSY} is the target fishing mortality. Even though fishing at F_{MSY} should eventually lead to biomass levels of B_{MSY} , in many cases it will take several years for the stock to rebuild to this level.

If a target stock can not be said to be fluctuating around its TRP, but is still ‘likely’ to be above the LRP, it is classed as ‘depleted’ and the stock rebuilding PI (1.1.3) must then be scored (Table 3a). This requires that rebuilding strategies are in place that are expected to restore the stocks to target levels within specified timescales. Such depleted stocks should always have a score of at least 60 for the Stock Status PI (1.1.1), and would receive a condition to ensure stock recovery. Stocks whose status is currently below the point at which recruitment is impaired are not eligible for certification, even if there are recovery plans in place, until such time as the stock status again meets the SG60 level. In cases where stocks were not depleted at the time of assessment, but then become depleted during a period of MSC certification, rebuilding strategies and monitoring must be put in place within a maximum of 1 year after the availability of the determination of a depleted status. MSC is currently working to provide guidance on what rebuilding timeframes would be acceptable to meet the 60 and 80 levels for this PI – these are not currently specified but will likely be framed as some multiples of the natural (unfished) rebuilding rate of a species.

The FAM assumes that all management systems will have reference points of some form. Even if these are not all stated explicitly they should be implicit within the decision rules or management procedures, and the fishery should be assessed on these implicit reference points. An explicit use of only a TRP should thus include some implicit consideration of a LRP, and vice versa. In these cases, the stock status must still be assessed in terms of the overall outcome objectives, i.e. at SG80 that the stock status is highly likely to be above the point at which there is an appreciable risk that recruitment is impaired, and is at or around a level consistent with B_{MSY} .

To ensure precaution in relation to the ecological role of target species, the FAM requires that consideration is given to the trophic position of those species in the setting of TRPs. This applies particularly in the case of ‘Low Trophic Level’ species that occupy positions low in the food chain. For recent work by MSC on this topic, see Smith and Bartholomew (2010).

Although the default PIs and SGs for stock status are framed in terms of biomass, this does not mean that the MSC is only accessible to large industrial fisheries with formalised stock assessments and biomass based reference points. The FAM includes specific examples of other measures or surrogate reference points that may be acceptable. In these cases, the SGs in PI 1.1.1 and 1.1.2 (Table 3a) may be assessed either qualitatively (e.g. through analogy with similar situations, plausible argument, empirical observation of sustainability and qualitative risk

assessment) or quantitatively (e.g. through measured data from the relevant fishery, statistical analysis, quantitative risk assessment and quantitative modelling).

Principle 1 Harvest Strategy – Management of the target fish stocks

The Harvest Strategy PIs in Principle 1 (and the Management PIs in Principle 2) relate to the management tools, measures and strategies that are used to manage the impact the fishery is having on the target stocks specifically. Broader management and fisheries policy considerations are captured in Principle 3 (see below).

There are four performance indicators that assess the performance of the harvest strategy (Figure 3). In addition to a performance indicator which considers the overall performance of the harvest strategy, three further performance indicators consider key elements of harvest strategies: the control rules and tools in place, the information base and monitoring, and the assessment method.

The Harvest Strategy PI (1.2.1) scores the overall performance of the harvest strategy, particularly the way that the different elements work together to keep the stock at levels consistent with reference points. The Harvest Control Rules and Tools PI (1.2.2) assesses the control rules and actions that management takes in response to changes in the fishery and/or changes in status in relation to reference points. As shown in Table 3a, PI 1.2.2 requires that the harvest control rules take into account uncertainty and ensure that the exploitation rate is reduced as LRPs are approached.

Harvest Control Rules and/or management tools need to be based on plausible hypotheses about resource dynamics and be reasonable and practical, meaning that those measures possess a substantial likelihood of success. The basis for plausibility and practicality of design should be considered in relation to the scale and intensity of the fishery, for instance utilising empirical information, relevant science or model based testing approaches.

The requirement that a Harvest Control Rule reduces exploitation rates as the LRP is approached should not be interpreted as requiring the control rule to deliver an exploitation rate that is a monotonically decreasing function of stock size. Any exploitation rate function may be acceptable so long as it acts to keep the stock above the LRP and attempts to maintain the stock at the TRP.

While much flexibility in stock assessment approaches is allowed, as noted earlier, the Assessment of Stock Status PI (1.2.4) requires at the SG80 level that the assessment is appropriate for the stock and for the harvest control rule, is evaluating stock status relative to reference points, and takes uncertainty into account (Table 3a). It is also required that the assessment is subject to peer review.

For some harvest strategies, stock assessment methods may not be model based but based on stock status relative to empirical reference points (e.g. catch rate, density, survey abundance, among other things), and decision rules may be constructed of rules using these indices rather than analytical assessments. Other harvest strategies may utilise complex analytical models. In all cases the assessment methods should have been tested and evidence should be presented as to their reliability.

Principle 2. Environmental impacts

Principle 2 of the MSC fisheries standard covers the impacts of the fishery on environmental components other than the target stocks. In the FAM, Principle 2 issues have been categorised into five Components, as listed below:

1. Retained species: Species that are retained by the fishery under assessment (usually because they are commercially valuable or because they are required to be retained by

management rules), but are not covered under Principle 1 because they are not included in the Unit of Certification.

2. Bycatch species: Species that have been taken incidentally and are not retained (usually because they have no commercial value).
3. ETP species: Endangered, Threatened or Protected species are those that are recognised by national legislation and/or binding international agreements (e.g. CITES) to which the jurisdictions controlling the fishery under assessment are party.
4. Habitats: The habitats within which the fishery operates.
5. Ecosystem: Broader ecosystem elements such as trophic structure and function, community composition, and biodiversity.

The separation of these Components enables assessments to be focused clearly on the different objectives and expectations of management, and the different strategies used to manage a fishery's impact. To avoid duplicate scoring, any Principle 2 species should only be considered within one of the Retained species, Bycatch species or ETP species Components. The Retained and Bycatch species components are separated since information on species which are typically discarded and therefore of no value to a fishery is usually more difficult to obtain than for the commercially valuable retained species. Although the FAM requirements are similar, these two Components are often managed in quite different ways.

As noted earlier, each of the five Principle 2 Components is assessed against three PIs:

1. Outcome status – the impact or the risk that the fishery poses to that Component;
2. Management Strategy – the basis, reliability and implementation of the management strategy for the Component; and
3. Information/monitoring – the nature, extent, quality and reliability of the monitoring and information that is relevant to (i) developing and implementing the management strategy and (ii) measuring the outcomes of the strategy.

The Outcome PIs in Principle 2 provide a measure of the status of each Component. For most fisheries, these PIs will reflect the interactions of the fishery with many species or species groups within the Component. Rules are provided within the FAM for aggregating the scores across these multiple species. For the Retained and Bycatch Species Components, both the SG60 and SG80 scoring levels require scoring to cover the “main” species caught in the fishery, based on consideration of their weight, value or vulnerability.

The Outcome PIs in Principle 2 are structured with reference to avoiding “serious or irreversible harm” to the Component from fishing (see Table 3b). The term “biologically based limit” in the SGs for Retained and Bycatch species refers to the point of serious or irreversible harm, equivalent to the LRP used in Principle 1. Similar to Principle 1, such limits may be specified in a range of different forms. In contrast, however, the probability interpretations for the ‘likely’ and ‘highly likely’ terms, are set 10% lower in Principle 2 than in Principle 1. The ‘highly likely’ requirement in Principle 2 at SG80 thus requires a 70% probability of being above the limit level, compared to 80% in Principle 1. These differences are intentional and reflect the difference levels of understanding of the different Components, variations in legal requirements in some jurisdictions and precedents set in the assessment trees defined prior to the FAM.

The PIs and SGs for both the Retained and Bycatch Species Components require that the fishery “does not hinder recovery and rebuilding” of the affected stocks. The use of this term in Principle 2 emphasizes the focus on the impact of the fishery rather than the absolute status of the Component. Principle 2 thus recognizes that these Components may be subject to human impact from sources other than the assessed fishery. Retained or Bycatch species may for example be target species in other fisheries, while habitats and ecosystem processes may be impacted by coastal zone or other development or introduced species. The SGs in Principle 2 are structured to first address the status of the Component. If the status is low, for whatever reason, then the

operative Principle 2 assessment issue is then whether the fishery is hindering recovery. This is different to the treatment of target species in Principle 1, where low status would preclude certification irrespective of the cause of that low status.

For the ETP (Endangered, Threatened or Protected) species Component in Principle 2, the SGs require that the fishery is within limits specified in any national or international requirements to which the fishery is subject. These may in some cases be different to the limits defined elsewhere in the FAM but recognize the sovereignty of individual states in setting such requirements.

For the Habitats and Ecosystem Components, the concept of serious or irreversible harm in the Outcome PIs (Table 3b) refers to changes caused by the fishery that could fundamentally alter the capacity of the Component to maintain its function or recover from the impact. This may also be interpreted as seriously reducing the ecosystem services provided by the Component to the fishery, and to other fisheries and human uses. Examples of serious or irreversible harm include local or global extinction, recruitment overfishing, habitat loss on scales that have widespread detrimental consequences for the ecosystem services provided by the habitat (e.g. gross change in species composition of dependent species or of required habitat complexity necessary to maintain those services), and loss of resilience resulting in trophic cascades, fishery mediated regime shifts, etc. Other examples of ecosystem impacts are given in the FAM.

The Ecosystem Component does not repeat the scoring of the other Components in P2, but rather considers the wider ecosystem structure and function. It is noted that relatively few fisheries will have the information needed to address ecosystem issues quantitatively, and usually they would be assessed using surrogates, analogy, general observations, qualitative assessment and expert judgment. Harm to ecosystem structure is normally inferred from those impacts on populations, species, functional groups etc. that can be measured directly.

The Management Strategy PIs in Principle 2 are generally similar for each Component. As shown in the Retained Species (PI 2.1.2) example in Table 3b, these require that there is some form of strategy in place (where necessary) that is expected to achieve the defined outcomes. It is also required that there is some objective basis for confidence that the strategy will work and some evidence that it is being implemented successfully. Increasingly comprehensive management arrangements are required across the 60, 80 and 100 SG levels. At the SG80 level, the requirement for a “partial strategy” represents a “cohesive arrangement which may comprise one or more measures, an understanding of how it/they work to achieve an outcome and an awareness of the need to change the measures should they cease to be effective”.

The Information/monitoring PIs in Principle 2 vary in form between Components, but have some common aspects. For the Retained Species (PI 2.1.3) example in Table 3b, these require at the SG80 level that at least some quantitative information is available on the amount of main retained species taken by the fishery; and that information is sufficient to estimate the outcome status with respect to biologically based limits and adequate to support management needs. For this and the other Components, it is also required that sufficient data continue to be collected to detect any increases in risk levels.

Principle 3. The Management Framework

The intent of Principle 3 is to ensure that there is an institutional and operational framework, appropriate to the size and scale of the fishery, which is capable of delivering the outcomes articulated in Principles 1 and 2. The Principle 3 Assessment Tree in the FAM divides the nine PIs into two Components as shown in Figure 3 and summarized below.

1. The “Governance and Policy” component captures the broad, high-level context of the fishery management system within which the fishery under assessment is found.

2. The “Fishery Specific Management System” Component relates to the management system directly applied to the fishery undergoing assessment.

Examples of key PIs and 80-level SGs in Principle 3 are given in Table 3c with additional comments provided below.

In the Governance and Policy Component, the Consultation, Roles and Responsibilities PI (3.1.2) requires at the SG80 level that the organisations and individuals involved in the management process have been identified and their functions, roles and responsibilities defined. In relation to consultation, the focus for scoring should be on the effectiveness of the consultation processes implemented by fisheries managers to obtain information from a wide range of sources, including local knowledge, and on its use in informing the range of decisions, policies and practices within the management system.

The Incentives for Sustainable Fishing PI (3.1.4) requires that the management system provides for incentives that are consistent with achieving the outcomes expressed in Principles 1 and 2, and seeks to ensure that perverse incentives do not arise. In assessing whether the fishery “provides for incentives”, it may be asked whether the system has attributes, policies or principles that would tend to incentivise fishers to fish sustainably or engender a sense of stewardship of the resources. Examples of these are provided in the FAM. This PI also expects that the system seeks to ensure that perverse incentives do not arise, such as by not including subsidies that obviously contribute to unsustainable fishing.

In the Fishery-Specific Management System Component, the Compliance and Enforcement PI (3.2.3) requires at the SG80 level that a “monitoring, control and surveillance system has been implemented in the fishery under assessment and has demonstrated an ability to enforce relevant management measures, strategies and/or rules”. Noting that it may be difficult to demonstrate an ability to enforce relevant management measures, strategies and/or rules when violations are either rare or not well detected, independent and credible information from relevant compliance and enforcement agencies or individuals and/or stakeholders should be used to inform scoring.

PI 3.2.4 in the same Component, requires that a “research plan provides the management system with a strategic approach to research and reliable and timely information sufficient to achieve the objectives consistent with MSC’s Principles 1 and 2”. A strategic approach is defined as one that is pro-active, anticipatory and identifies information gaps in advance and is driven by management needs. At the SG80 level, the reference to a “research plan” indicates the existence of an actual, written document that includes a specific research plan relating to the fishery under assessment. The extent of the document should be relevant to the scale and intensity of the fishery and the issues requiring research.

The Monitoring and Management Performance Evaluation PI (3.2.5) requires that “the fishery has in place mechanisms to evaluate key parts of the management system and is subject to regular internal and occasional external review”. At the SG80 level, such systems should be relevant to the whole system not just management outcomes. “External” review means external to the fisheries management system. Depending upon the scale and intensity of the fishery, reviews could be conducted by another department within an agency, or another agency or organisation within the country, or through a government audit that is external to the fisheries management agency, or a peer organisation nationally or internationally, or external expert reviewers. “Occasional” and “regular” should also be interpreted in the context of the intensity of the fishery.

Experiences of scientists working on MSC assessments

Scientists participate in MSC fishery assessments in a variety of capacities. The assessment team is comprised of independent scientists with expertise in stock assessments, ecosystem impacts, and fisheries management. These assessment teams, typically three scientists, are responsible for evaluating fisheries against the MSC Performance Indicators. In addition, each assessment is peer reviewed by a further two fisheries experts. The evaluation by the assessment team, once complete, is reviewed and amended to reflect the peer reviews. There are several scientists who have served both as assessment team members and as peer reviewers on different assessments. A third important way in which scientists are involved in MSC assessments is during information gathering and scoring, when government scientists and others are asked to provide information for use in the assessment by way of meetings with the assessment team or submission of reports and articles.

In the first 152 MSC assessments reaching the peer review stage, there have been 133 scientists involved as assessment team members, and 101 involved as peer reviewers. Overall, there have been 202 different scientists serving in these two capacities.

In order to effectively participate in MSC assessments in either of these capacities, in addition to being experts in their respective disciplines and specific fisheries, these scientists need to understand the MSC system to a certain degree in order to apply their expertise appropriately. Assessment team members are contracted by the Certification Bodies, who are responsible for ensuring team members are adequately trained to perform this role. Peer reviewers, however, come into the role with varying levels of experience and understanding of the MSC system. While all peer reviews have been very valuable, due to the specificity of the requirements involved in the MSC assessment process, MSC has acknowledged that peer reviews could be improved if reviewers had access to a minimum level of training before undertaking their first review. Developing and providing this training is an area of current work at MSC.

Consistency of the MSC scheme with international guidelines

The extent to which the operations of an ecolabelling organisation are underpinned by the principles of transparency, accountability, accessibility, inclusiveness and impartiality is a measure of its credibility and determines the extent to which the scheme will likely succeed both in terms of its scope for influence and potential to lead to environmental improvements.

These important attributes are all embedded within a range of international guidelines which provide a global framework for best practice in fisheries ecolabelling. These guidelines include instruments such as the FAO Guidelines on Ecolabeling of Fish and Fishery Products from Marine Capture Fisheries (see <http://www.fao.org/docrep/008/a0116t/a0116t01.htm>), the FAO Code of Conduct for Responsible Fishing, the International Social and Environmental Accreditation and Labelling Alliance (ISEAL) Code of Good Practice on Standard Setting (see <http://www.isealliance.org/content/standard-setting-code>), International Standards Organisation (ISO) guides such as ISO 65 - (General requirements for bodies operating product certification systems) and the World Trade Organisation (WTO) Technical Barrier to Trade Annex 3 - Code of Good Practice for the Preparation, Adoption and Application of Standards. Collectively, these instruments provide guidance on the institutional arrangements and processes that should characterise a fishery certification and ecolabelling organisation. The importance of these international guidelines lies in their role in ensuring that the use of market mechanisms as a tool to drive change in fisheries management is applied in a manner that is equitable and non-discriminatory.

The development of the MSC and its evolution over the years has been informed by these international requirements and the MSC remains committed to ensuring that its programme is consistent with international best practice in standard setting, certification, accreditation and labelling. Measures to ensure this included developing the MSC's Principles and Criteria for

sustainable fishing largely on the basis of the FAO Code of Conduct for Responsible Fishing. Established in 1995 this outlines principles and standards for the conservation, management and development of global fisheries and provides universally accepted reference points on acceptable standards for responsible fishing.

The FAO ecolabelling guidelines adopted by the FAO in 2005 outline a set of requirements for procedural and institutional aspects of fisheries ecolabeling schemes. The guidelines also prescribe a three pronged, minimum standard for fishery ecolabels that considers the health of the stock, the impact on the ecosystem and the management system. At a minimum the guidelines require stocks to be at levels that maintain availability for present and future generations, and when depleted stocks will be rebuilt within appropriate timeframes; they require ecosystem impacts to be appropriately assessed and addressed, and management systems to be based on good practice and to take account of the best scientific evidence available. The three principles of the MSC standard mirror the three components outlined in the FAO's minimum criteria and requirements. The operational interpretation of the MSC standard as outlined in the Fisheries Assessment Methodology (FAM) is also consistent with the intent of the FAO guidelines and the MSC's scoring and assessment procedure includes a mechanism that encourages improvement in fisheries to performance levels that are higher than the minimum thresholds prescribed in the FAO guidelines.

The procedural requirements outlined in the FAO ecolabelling guidelines are designed to ensure that the process by which fisheries are assessed and determined to be sustainable are objective, impartial, transparent, participatory and non discriminatory. Further, FAO guidelines require access to certification services to be open to all types of fisheries and that access to certification should not be conditional upon the size or scale of the fishery. The guidelines also require that ecolabels convey truthful information and thus achieve their stated ecological objectives.

Consistency of the MSC programme with FAO's procedural requirements for certification and assessment is demonstrated in the MSC's Fishery Certification Methodology (FCM) and Chain of Custody Methodology. These documents describe the procedures to be used by Certification Bodies to audit and certify fishery certification units and supply chains. The MSC's fishery certification methodology include compulsory requirements for stakeholder engagement, use of best scientific information, transparency, competency of members of the auditing team and other requirements to ensure impartiality.

Some of the specific institutional arrangements required in the FAO ecolabelling guidelines include separation between the accrediting and standard setting entities and requirements for fishery audits to be conducted by third party independent certifying entities. MSC assessments are conducted by third party certification bodies that set up assessment teams with the requisite training and technical knowledge required for performing assessments for fisheries and supply chains. In 2006 the MSC's commitment to consistency with international and professional benchmarks led the MSC to review and revise accreditation arrangements within the programme. Following the review the MSC divested itself of the accreditation function and outsourced this function to an entirely separate body, thus ensuring full consistency with the then newly adopted FAO guidelines.

A key activity of any ecolabelling organisations is the process of setting the standard against which fisheries will be assessed for certification. Requirements for how ecolabeling organisations should set standards are provided in the FAO ecolabelling guidelines and the ISEAL code of Good Practice for Setting Social and Environmental Standards. These both include requirements for transparency, inclusiveness, balanced participation and consultation in the process of setting up standards. These requirements guide the approach adopted by the MSC for its standard setting and policy review processes.

With the growth in the uptake of ecolabelling there has been an interest by external stakeholders in how market based initiatives claiming to promote fisheries sustainability perform in relation to existing international guidelines. In a major independent review conducted by Accenture Development Partnerships, (see http://wwf.panda.org/what_we_do/how_we_work/conservation/marine/publications/) the MSC was found to be the topmost ranking wild capture seafood certification and ecolabel programme. Another independent study involving the review of fish sustainability market based schemes noted that of all the certification schemes reviewed, the MSC had the most comprehensive, robust, and transparent assessment of performance (see http://www.marketing.stir.ac.uk/News/FSIG_Final_report_Jan2010.pdf).

The aim of the MSC is to continue to maintain consistency with these best practices and in doing so to ensure its certification programme effectively delivers on its overarching objective of contributing to global efforts to promote sustainable use of fisheries resources.

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Table 1. The three Principles underpinning the MSC Fisheries Standard, and their associated intent statements.

<p>Principle 1. Sustainable target fish stocks</p> <p>A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery.</p> <p><u>Intent:</u></p> <p>The intent of this principle is to ensure that the productive capacities of resources are maintained at high levels and are not sacrificed in favour of short term interests. Thus, exploited populations would be maintained at high levels of abundance designed to retain their productivity, provide margins of safety for error and uncertainty, and restore and retain their capacities for yields over the long term.</p>
<p>Principle 2. Environmental impacts</p> <p>Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends.</p> <p><u>Intent:</u></p> <p>The intent of this principle is to encourage the management of fisheries from an ecosystem perspective under a system designed to assess and restrain the impacts of the fishery on the ecosystem.</p>
<p>Principle 3. Management framework</p> <p>The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable.</p> <p><u>Intent:</u></p> <p>The intent of this principle is to ensure that there is an institutional and operational framework for implementing Principles 1 and 2, appropriate to the size and scale of the fishery.</p>

Table 2a. List of finfish fisheries (stock-client group combinations) currently certified and in assessment against the MSC programme within the ICES focus area (FAO Area 27 - Northeast Atlantic). Stocks for which ICES currently conducts stock assessments are listed in bold.

Species	Stock	MSC Fisheries – certified	MSC Fisheries – currently in assessment
Finfish stocks			
Angler/monk	English Channel		Channel and Western Sustainable Trawling Group [UK] (2 species / fisheries)
Bass	North Sea	North Eastern Sea Fisheries Committee [UK]	Dutch rod and line
	South West/Celtic		Bristol Channel [UK]
Cod	NE Arctic offshore	Domstein Longliner Partners [Norway] Norway	
	NE Arctic inshore		Norway
	Barents Sea		Barents Sea [Russia]
	Eastern Baltic		Denmark Germany Kustenfischer Nord eG Heiligenhafen [Germany] Sweden
	Iceland		Longline, handline and Danish seine [Iceland]
Haddock	NE Arctic offshore	Domstein Longliner Partners Norway	
	NE Arctic inshore		Norway
	Barents Sea		Barents Sea [Russia]
	Iceland		Longline, handline and Danish seine [Iceland]
	North Sea		Scottish Fisheries Sustainable Accreditation Group
Hake	Northern		Cornish gill net [UK]
	Southern		Grupo Regal Spain longline
Herring	Atlanto Scandian (spring spawning)	Danish Pelagic Producers Organisation Faroese Pelagic Organisation Norway Scottish Pelagic Sustainability Group	Pelagic Freezer Trawler Association [Netherlands]
	Baltic Sea		Sveriges Pelagiska Producent Organisation [Sweden] Western Baltic spring spawning [Germany]
	North Sea	Astrid Fiske [Sweden]	

	(autumn spawning)	Danish Pelagic Producers Organisation Hastings fleet pelagic [UK] Norway Pelagic Freezer Trawler Association [Netherlands] Sveriges Pelagiska Producent Organisation [Sweden] Scottish Pelagic Sustainability Group	
	Skaggerak	Norway	
Mackerel	NE Atlantic	Danish Pelagic Producers Organisation Hastings fleet pelagic [UK] Irish Pelagic Sustainability Association (IPSA) Irish Pelagic Sustainability Group (IPSG) Norway trawl, purse-seine and handline Pelagic Freezer Trawler Assoc. trawl [Netherlands] South West handline [UK] Scottish Pelagic Sustainability Group	Faroese Pelagic Organisation Sveriges Pelagiska Producent Organisation [Sweden]
Megrim	English Channel		Channel and Western Sustainable Trawling Group [UK]
Plaice	North Sea	Ekofish North Sea otter trawl [Netherlands]	Cooperative Fishery Organisation [Netherlands] Denmark Osprey Trawlers twin-rigged trawl [UK]
Rays (6 species)	Celtic Sea		Bristol Channel [UK] (6 fisheries)
Saithe	NE Arctic	Norway	
	North Sea	EURONOR [France] Germany North Sea trawl Norway	Denmark Scapêche and Compagnie de Pêche de St. Malo [France] UK Fisheries/DFFU/Doggerbank Group
Sardine	North Atlantic	Cornwall [UK] South Brittany purse seine [France]	
	Iberian	Portugal purse seine	
Sole	English Channel		Channel and Western Sustainable Trawling Group [UK]
	North Sea	Hastings fleet trammel net [UK] Hastings fleet trawl and gill-net [UK]	Cooperative Fishery Organisation gill net [Netherlands]
Sprat	Baltic Sea		Sveriges Pelagiska Producent Organisation [Sweden]
Wolffish	Iceland		Longline, handline and Danish seine [Iceland]

Table 2b. List of shellfish fisheries (stock-client group combinations) currently certified and in assessment against the MSC programme within the ICES focus area (FAO Area 27 - Northeast Atlantic). Stocks for which ICES currently conducts stock assessments are listed in bold. Stock structures for several of these shellfish stocks are not well known.

Species	Stock	MSC Fisheries – certified	MSC Fisheries – currently in assessment
Shellfish stocks			
Brown shrimp	North Sea / Wadden Sea		Germany North Sea [Netherlands]
Cockle	Burry Inlet, UK	Burry Inlet [UK]	
Edible crab	Shetland inshore (?)		Shetland inshore pot [UK]
Lobster	North Sea (?)		North East England lobster pot
	Channel Is / NW France (?)		Normandy and Jersey [France/UK]
	Shetland inshore (?)		Shetland inshore pot [UK]
Mussel	Irish Sea		North Menai Strait [UK]
	Limfjord, Denmark	Denmark blue shell	Limfjord blue shell rope grown [Denmark] Limfjord blue shell dredge [Denmark]
	Zeeuswe delta and Wadden Sea, Neth.s		Netherlands blue shell Netherlands suspended culture
Nephrops	North Sea (several units)		Scottish Fisheries Sustainable Accreditation Group Southern North Sea [UK]
	Western Scotland (several units)	Loch Torridon creel [UK] Stornoway nephrops trawl [UK]	Clyde creel [UK] Clyde trawl [UK]
Northern shrimp/prawn	Skagerrak and Norwegian Deeps		Skagerrak, Kattegat and Norwegian Deeps [Denmark]
Oyster	Blackwater R, UK		Blackwater native [UK]
	Limfjord [Denmark]		Limfjord dredge [Denmark]
Scallop (king)	Shetland inshore (?)		Shetland Inshore scallop dredge [UK]
Scallop (queen)	Faroe Islands		Faroe Islands
	Irish Sea		Isle of Man trawl and dredge
Velvet crab	Shetland inshore (?)		Shetland inshore pot [UK]

Table 3a. Selected key 80-level (unconditional) scoring guideposts (SGs) associated with selected Principle 1 (target species) performance indicators (PIs) in the FAM. The text “...” indicates that some scoring issues have been omitted from the table. For the full set of PIs and SGs, including those at 60 and 100 scoring levels, see the FAM v2.1 .

Performance Indicator (PI)	Selected 80-level scoring guideposts (SGs)
Component: Outcome	
PI 1.1.1 [Target] Stock Status	<ul style="list-style-type: none"> • It is highly likely [80% probability] that the stock is above the point where recruitment would be impaired. • The stock is at or fluctuating around its target reference point.
PI 1.1.2 Reference Points	<ul style="list-style-type: none"> • ... • The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity. • The target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome. • For low trophic level species, the target reference point takes into account the ecological role of the stock.
PI 1.1.3 Stock rebuilding	<ul style="list-style-type: none"> • Where stocks are depleted rebuilding strategies are in place. • There is evidence that they are rebuilding stocks, or it is highly likely based on simulation modelling or previous performance that they will be able to rebuild the stock within a specified timeframe.
Component: Harvest strategy (management)	
PI 1.2.2 Harvest control rules and tools	<ul style="list-style-type: none"> • Well defined harvest control rules are in place that are consistent with the harvest strategy and ensure that the exploitation rate is reduced as limit reference points are approached. • The selection of the harvest control rules takes into account the main uncertainties. • Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the harvest control rules.
PI 1.2.4 Assessment of stock status	<ul style="list-style-type: none"> • The assessment is appropriate for the stock and for the harvest control rule, and is evaluating stock status relative to reference points. • The assessment takes uncertainty into account. • The assessment of stock status is subject to peer review.

Table 3b. Selected key 80-level (unconditional) scoring guideposts associated with selected Principle 2 (ecosystem) performance indicators in the FAM.

Performance Indicator (PI)	Selected 80-level scoring guideposts (SGs)
Component: Retained species	
PI 2.1.1 Outcome Status	<ul style="list-style-type: none"> • Main retained species are highly likely [70% probability] to be within biologically based limits, or if outside the limits there is a partial strategy of demonstrably effective management measures in place such that the fishery does not hinder recovery and rebuilding.
PI 2.1.2 Management strategy	<ul style="list-style-type: none"> • There is a partial strategy in place, if necessary that is expected to maintain the main retained species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding. • There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or species involved. • There is some evidence that the partial strategy is being implemented successfully.
PI 2.1.3 Information / monitoring	<ul style="list-style-type: none"> • Qualitative information and some quantitative information are available on the amount of main retained species taken by the fishery. • Information is sufficient to estimate outcome status with respect to biologically based limits. [Unless RBF used] • Information is adequate to support a partial strategy to manage main retained species. • Sufficient data continue to be collected to detect any increase in risk level (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the strategy).
Component: Bycatch species	
Largely equivalent to retained P2 species, but focus on mitigation instead of management.	
Component: Endangered, Threatened and Protected (ETP) species	
PI 2.3.1 Outcome Status	<ul style="list-style-type: none"> • The effects of the fishery are known and are highly likely to be within limits of national and international requirements for protection of ETP species. • Direct effects are highly unlikely to create unacceptable impacts to ETP species. • Indirect effects have been considered and are thought to be unlikely to create unacceptable impacts.
Component: Habitats	
PI 2.4.1 Outcome Status	<ul style="list-style-type: none"> • The fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.
Component: Ecosystem	
PI 2.5.1 Outcome Status	<ul style="list-style-type: none"> • The fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.

Table 3c. Selected key 80-level (unconditional) scoring guideposts associated with selected Principle 3 (management framework) performance indicators in the FAM.

Performance Indicator (PI)	Selected 80-level scoring guideposts (SGs)
Component: Governance and policy	
PI 3.1.2 Consultation, roles and responsibilities	<ul style="list-style-type: none"> • Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for key areas of responsibility and interaction. •
PI 3.1.4 Incentives for sustainable fishing	<ul style="list-style-type: none"> • The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2, and seeks to ensure that perverse incentives do not arise.
Component: Fishery-specific management system	
PI 3.2.3 Compliance and enforcement	<ul style="list-style-type: none"> • A monitoring, control and surveillance system has been implemented in the fishery under assessment and has demonstrated an ability to enforce relevant management measures, strategies and/or rules. • ...
PI 3.2.4 Research plan	<ul style="list-style-type: none"> • A research plan provides the management system with a strategic approach to research and reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2. • Research results are disseminated to all interested parties in a timely fashion.
PI 3.2.5 Monitoring and management performance evaluation	<ul style="list-style-type: none"> • The fishery has in place mechanisms to evaluate key parts of the management system and is subject to regular internal and occasional external review.

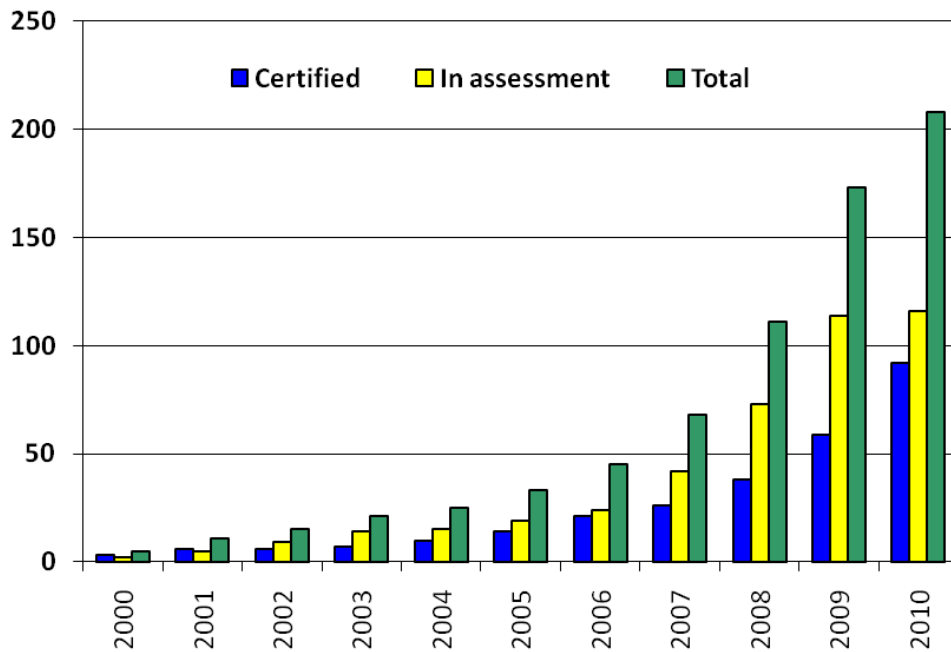


Figure 1. Number of fisheries in assessment and certified against the MSC fisheries standard each year from 2000 to 2010 (last year only including up to 31 July 2010).

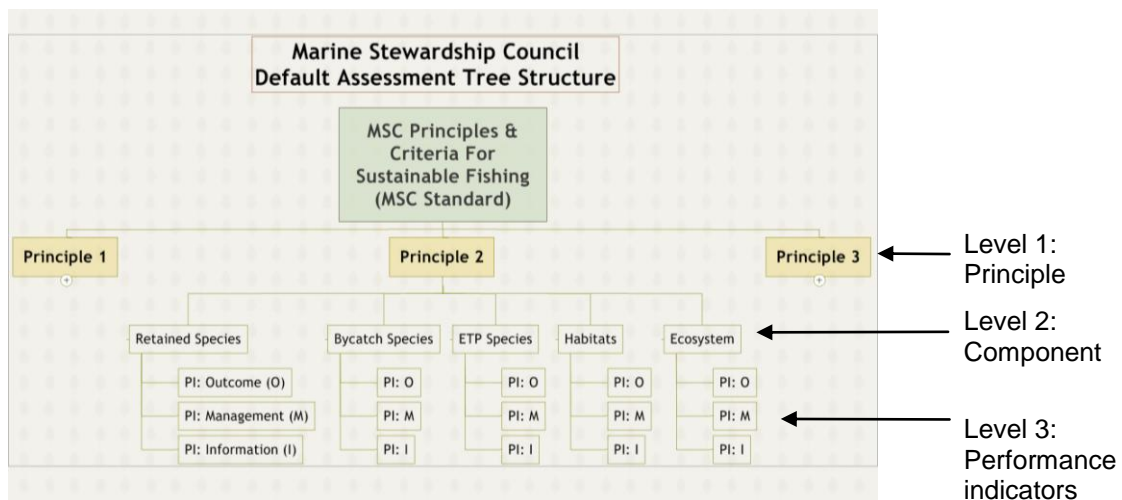


Figure 2. Assessment Tree Levels in the Fisheries Assessment Methodology (FAM). Note components and PIs not shown here for Principles 1 and 3 – for full tree, see Figure 3.

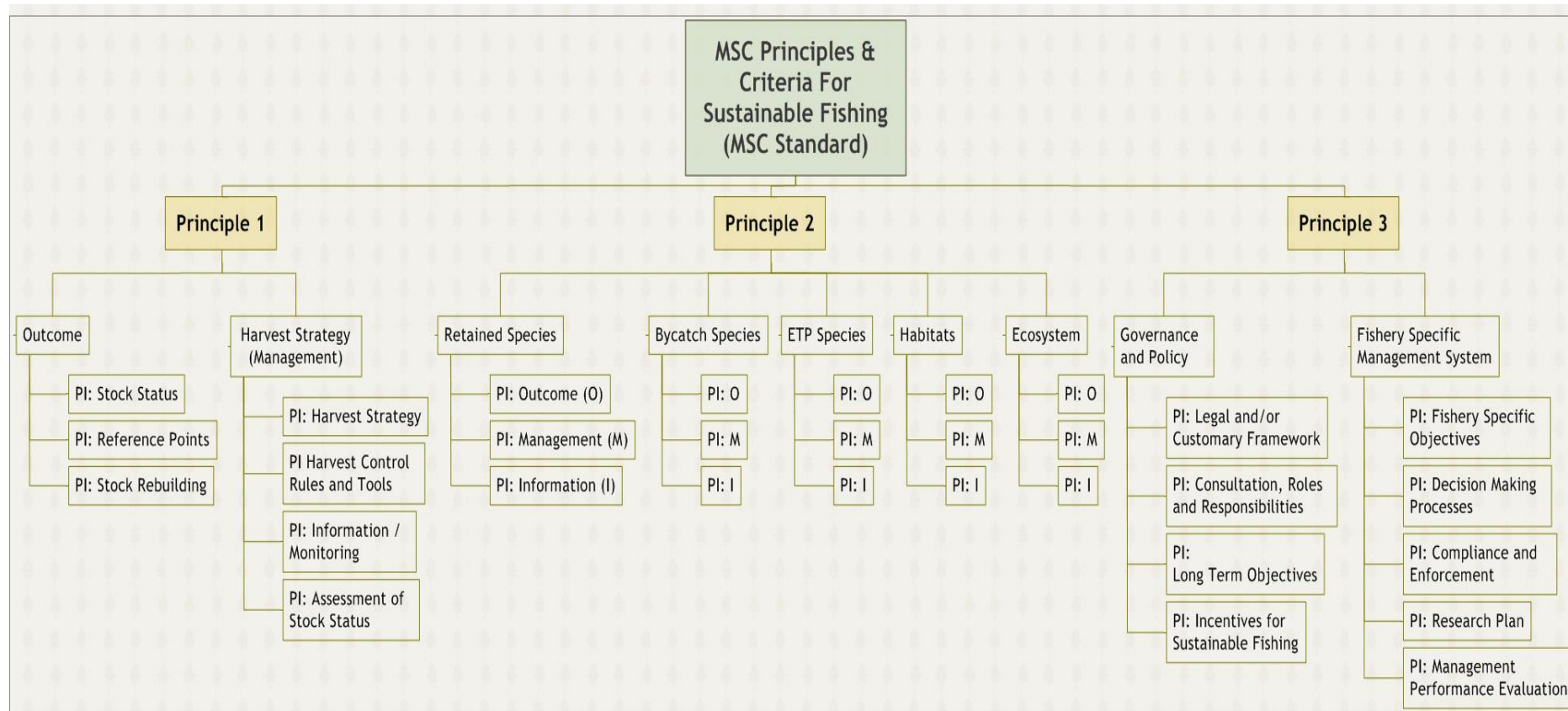


Figure 3. Full Assessment Tree structure in the FAM, showing the 31 Performance Indicators, grouped by Principle and component.