Blue Seafood Guide Methodology

Version 1.1, March 2019

Developed for:

Sailors for the Sea Japan

Developed by:

Ocean Outcomes

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Introduction

The Blue Seafood Guide (BSG) methodology is a science-based tool used to evaluate the ecological sustainability of wild capture fisheries at a broad level. It is primarily based on the Rapid Assessment tool co-developed by Ocean Outcomes (O2), World Wildlife Fund for Nature US (WWF), and the Sustainable Fisheries Partnership (SFP). The tool uses Marine Stewardship Council (MSC) performance indicators, with incorporation of some concepts from the Monterey Bay Aquarium Seafood Watch (SFW) Fisheries Standard. The BSG methodology aims to be consistent with international guidelines on environmental sustainability, including the Global Seafood Rating Alliance (GSRA) core elements and the Global Sustainable Seafood Initiative (GSSI) Essential Components for Fisheries Certification Standards, which is essentially based on UN-FAO Guidelines.

In addition, the methodology has been adapted to account for general characteristics of the existing Japanese fisheries management system. Specifically, deficiencies in information (e.g. monitoring of other species caught in a fishery) and management components (e.g. harvest control rules) that are systemic will be mentioned in the assessment, but not necessarily considered in the BSG species selection process.

Objective

This methodology was designed to be a credible, science-based evaluation tool for determining which Japanese wild-capture fisheries are to be included in the BSG. The methodology considers fishery performance in relation to international best practices for environmental sustainability.

Scope

We have designed this methodology to be applicable for wild capture fisheries being operated out of Japan. Assessors are expected to have education or training in fisheries science. Experience in evaluating fisheries against sustainability standards, particularly the MSC standard, is also helpful. The focus of this methodology is on ecological and environmental sustainability, rather than socio-economic sustainability or traceability. We expect that this methodology will be applied primarily using desktop research, which might result in limitations. For instance, there may be limited information about other species caught in a fishery if there is no bycatch monitoring, or if such information is collected but not made public.

Overview of the methodology

General framework

As with an MSC pre-assessment, assessors evaluate indicators under the three main principles: (1) Status of Target Stock(s), (2) Ecosystem Impacts, and (3) Management. Following some initial pilot tests, we found that Japanese domestic fisheries almost always lack certain information and components of fisheries management (see table below describing systemic deficiencies). In some specific fisheries, there may be additional information, for instance about other species caught, or management measures voluntarily implemented by the fishermen. However, fishery-specific information is generally difficult to obtain, although it will certainly be

used where possible. Rather than exclude fisheries that score red (<60) for these indicators due to deficiencies and lack of information endemic to the existing management system, we are choosing to not evaluate them at this time, or have made some scoring adjustments so that the deficiencies do not automatically result in a red score.

Nevertheless, we want to be clear that these deficiencies exist and therefore describe them below (Table 1). If the Japanese fisheries management system makes changes such that the indicators may score better than red, some of the currently excluded indicators can be incorporated into the BSG selection process in the future.

Table 1. Systemic information and management deficiencies in Japan's fisheries.

Description	Relevant indicator(s)	Adjustment made
Japanese stock assessments do not use MSY-based reference points, even for data-rich fisheries. Stock status reference points are based on historical catch data.	1.1.1	Scoring of 1.1.1 will consider assessment results based on existing reference points.
Stock rebuilding plans are rare and implemented on a voluntary basis, and are not automatically developed in response to changes in stock status. When rebuilding actions are described, they often focus on enhancement, i.e. production and release of hatchery-produced juveniles, for species where such production is possible.	1.1.2	This indicator does not have to be scored.
In Japan, fishery stocks are not managed to achieve target reference points (TRPs). There is a stated objective to maintain stocks above a limit reference point (LRP), but if the stock falls below the LRP, recovery actions are not automatically triggered.	1.2.1	To achieve a yellow score or better, the harvest strategy needs to theoretically be capable of achieving management to a TRP. Some kind of output control, such as a harvest limit or minimum size limit, is required.
Harvest control rules are not developed or used in fisheries management.	1.2.1, 1.2.2	Lack of HCRs does not automatically result in a red score for 1.2.1 and 1.2.2 does not have to be scored.
Fishermen are not required to keep records on bycatch or catches of non-target species, so there are usually limited data to determine the other species	2.2.1, 2.2.2, 2.2.3	These indicators do not have to be scored.

caught within specific fisheries. Other species caught are sometimes broadly known for certain gear types.		
Fishermen are not required to keep records on encounters or accidental catches of non-fish and ETP species, so there are usually no monitoring data to determine impacts on ETP species. In terms of management, Japan has relevant domestic laws and complies with some international treaties, but fishery-specific measures regarding ETP species are generally not documented. Alternative measures are not considered or reviewed.	2.3.1, 2.3.2, 2.3.3	These indicators do not have to be scored.
Development and publication of fishery or stock-specific management plans is limited. Prefectural governments and fishery coops may publish regulations and resource management guidelines (e.g. 漁業調整規則 and 資源管理指針). These are usually specific to prefectures and/or gear types, not necessarily to species.	3.2.1	Publicly available information will be used to score this indicator.

In accordance with the adjustments described in Table 1, the following 17 indicators must be evaluated to determine which species are included in the BSG.

1.1.1 Stock status outcome
- 1.2.1 Harvest strategy (scored so that the lack of HCRs doesn't result in automatic red)
- 1.2.3 Information and monitoring
- 1.2.4 Assessment of stock status
- 2.4.1, 2.4.2, 2.4.3 Habitats information, outcome, and management
- 2.5.1, 2.5.2, 2.5.3 Ecosystem information, outcome, and management
- 3.1.1 Legal and customary framework
- 3.1.2 Consultation, roles and responsibilities
- 3.1.3 Long term objectives
- 3.2.1 Fishery-specific objectives

3.2.2 Decision-making processes
- 3.2.3 Compliance and enforcement
- 3.2.4 Management performance evaluation

It should be noted that a fishery that qualifies for inclusion in the BSG cannot automatically be considered as achieving a conditional or unconditional pass against the MSC standard, or a ‘yellow’ or ‘green’ rating under the SFW standard.

Scoring and rating fisheries

This methodology uses the following categories for scoring each indicator, consistent with those used in MSC pre-assessments and on the Fishery Progress website (www.fisheryprogress.org).

<60	High risk	Red
60-79	Medium risk	Yellow
80+	Low risk	Green

Within the scoring categories for each indicator, there may be multiple bullet points or 'guideposts.' By default, these bullet points are to be treated as 'AND' clauses, where all bullets within a category must be met to achieve that score. Otherwise the lower scoring (higher risk) category should be applied. When bullets are to be treated as 'OR' clauses, the OR will be explicitly mentioned in the scoring category text.

For all indicators, a written rationale for the score must be provided. Figures and tables can also be provided to support scores.

Determination of species to be included in the BSG

As a preliminary threshold, only fisheries that score yellow or green for all indicators can be included in the consumer-facing BSG. A red score is a disqualification.

Information gathering

Information will mostly be gathered through desktop research and, time permitting, interviews with fishers and other relevant fishery stakeholders. However, it is up to the assessor to determine the approach used for data collection. To allow for external verification of the information used, information should be publicly available, e.g. posted online or made available upon request. Information should be clearly attributable to the provider and the assessor.

Special cases

Assessors can use the following questions to determine if special considerations need to be applied for the fishery:

- Is the target species a low trophic level (LTL) species? (See Lower Level Trophic Species List in the appendix for a list of LTL families.) If YES, follow scoring category guidance for LTL species when scoring 'stock status outcome.'
- Is harvest augmented by artificial production (enhancement)? If YES, the impacts on wild stocks will need to be considered when scoring 'stock status outcome' (1.1.1) and 'ecosystem outcome' (2.5.1) indicators.

Note this methodology has not been developed to fully accommodate evaluation of fisheries with significant levels of enhancement.

Definitions of terms

This methodology includes a glossary with definitions of the terms used (see appendix). The definitions were largely drawn from the MSC and SFW standards for wild capture fisheries, and the Food and Agriculture Organization of the United Nations (UN-FAO). Below are some the more important terms used in scoring.

Likelihood:

Likelihood can be based on quantitative assessment, plausible argument or expert judgment. The MSC standard provides quantitative definitions of likelihood that vary by PI (Table SA 9 on p. 129, MSC FCR v2.0), and we used the most frequently occurring definitions.

- Highly unlikely - less than 30% chance
- Unlikely - less than 40% chance
- Likely - 70% chance or greater
- Highly likely - 80% chance or greater

Definition of the fishery being assessed

The following pieces of information are used to describe and define the fishery under assessment. The fishery is defined by the target stock combined with the main fishing method/gear(s) used to harvest that stock.

- Target species scientific name and common name
- The stock or location, if known
- Gear or vessel type(s)

Additional helpful information:

- Catch quantity (weight)
- Number of registered vessels
- Management authority (the regulatory authority with fishing management responsibilities; there may be multiple authorities where joint jurisdictional responsibilities occur)

Status of target stock(s) - Principle 1

Stock status outcome (1.1.1)

This indicator evaluates stock abundance following one of two pathways: non data-limited and data-limited. The non data-limited pathway is more applicable for fisheries where stock reference points exist, and stock abundance data have been collected over time (e.g. at least for 5 years). The data-limited pathway is more applicable for fisheries that lack reference points.

Non data-limited pathway

Under this pathway, stock abundance is evaluated relative to reference points, specifically a TRP and LRP. An abundance indicator is considered ‘at’ the reference point when it fluctuates around the reference point with no declining trend. Fishery management bodies use a variety of abundance indicators and reference points, so their appropriateness should be considered on a case by case basis. Commonly used indicators include biomass (B), spawning stock biomass (SSB), catch per unit effort (CPUE), and fishing mortality (F).

According to international standards, an appropriate TRP is a stock level at which high production is maintained (MSC FCR v2.0 p. 185), e.g. maximum sustainable yield (MSY). Examples of appropriate TRPs include $B_{MSY;}$ and $B_{40\%}$ (SFW FS v3.2, p. 39). An appropriate

LRP is a level at which a stock has a high probability of persistence in the presence of directed fishing (MSC FCR v2.0 p. 185), which is generally considered equivalent to PRI, or the point below which recruitment may be impaired. Examples of appropriate LRPs include ½ B_{MSY} and ½ $B_{40\%}$ (SFW FS v3.2, p. 39).

Where information is not available on the stock status relative to biomass reference points, assessors may use proxy indicators and reference points such as fishing mortality or CPUE, but they will need to show how the proxies are consistent with MSY or PRI. Examples of proxies include the point of recruitment overfishing for an LRP and F_{MSY} for a TRP. For additional guidance on proxy indicators, please see GSA 2.2.3.1 in the MSC FCR v2.0 (pp. 376-378).

In Japan, assessments of larger commercial stocks are generally conducted by regional branches of the Japan Fisheries Research and Education Agency (FRA; 水産研究・教育機構). In these assessments B_{limit} may be estimated and considered a PRI (point below which recruitment is impaired), since B_{limit} is defined as biomass level below which recruitment is thought to be poor based on historical data. However, B_{limit} is commonly used as a de facto TRP in Japanese fisheries management, while a de facto LRP is not set or used. The stock assessments rate the status of the stock as high (高位), medium (中位), or low (低位) based on reference points determined from historical catch data; catch-independent abundance indicators are not used. Assessments also determine whether stock abundance has shown an increasing, stable, or decreasing trend for the past five years.

The stock status reference points are usually not connected to MSY. They are also not used as triggers for management action; for example, when a stock is rated as low, catch reduction or rebuilding measures are not implemented as an automatic response. The FRA stock assessments therefore often lack some of the elements that are required for international credibility. To start addressing this deficiency, the Japanese government published preliminary MSY-based assessment results that compared SSB estimates to SSB_{MSY} for 32 stocks in March 2018.

For the stocks that underwent the preliminary MSY-based assessment, we recommend combining information from both the MSY-based and customary assessments to score this indicator, using the following general guidance.

- If SSB / $SSB_{MSY} \geq 1$, score green (MSY-based target is met)
- If SSB / $SSB_{MSY} \leq 0.75$[1], score red (ratio below 0.75 suggests overfishing)
- If SSB / $SSB_{MSY} \geq 0.75$ and < 1 AND
    - The FRA stock assessment suggests high status with stable or increasing abundance trend, score green
    - The FRA stock assessment suggests high status with decreasing abundance trend, score yellow
    - The FRA stock assessment suggests medium status with increasing abundance trend, score green
    - The FRA stock assessment suggests medium status with stable or decreasing abundance trend, score yellow

[1] 0.75 SSB_{MSY} was proposed as minimum stock size threshold in Goodyear 1999 for most long lived species, based on Atlantic blue marlin as a test case.

- The FRA stock assessment suggests low status, score red

Determining status of stocks that did not undergo an MSY-based assessment is more challenging because FRA assessments usually do not show whether the stock is fluctuating around MSY. In cases where it has been estimated, B_{limit} may be considered approximately equivalent to PRI or an LRP proxy.

It is worth noting that enhancement, or production and release of artificially produced juveniles, is considered a part of the harvest strategy for some Japanese wild capture fisheries. However, global sustainability standards consider the multi-faceted, sometimes negative impacts of enhancement on the wild populations and have specialized criteria for evaluating enhanced fisheries (e.g. salmon and bivalve fisheries). For stock status specifically, the presence of substantial levels of enhancement may 'obscure' estimation of indicators for the wild population itself. In extreme cases, harvest of wild individuals for use as broodstock may directly threaten viability of the wild population if not managed appropriately. These possibilities should be considered for enhanced fisheries.

Although we have provided some guidance, the assessor should use all available information along with his or her best judgment to score this indicator.

Data-limited pathway

Under this pathway, a combination of species vulnerability and available information on stock health and/or abundance trends is used to score the indicator, an efficient approach that is used by SFW for data-limited fisheries (MBA SFW FS v3.2, pp. 7-9). A PSA score will be estimated and used to determine vulnerability as follows:

- PSA score < 2.64 = low vulnerability
- PSA score ≥ 2.64 and ≤ 3.18 = medium vulnerability
- PSA score < 3.18 = high vulnerability

Examples of evidence suggesting good stock health include: age structure has been stable over time, average body length has been stable over time, or fish abundance/sizes do not differ between fishing areas and well-managed no-take zones. The Fair Trade USA Capture Fisheries Standard v1.0 includes examples of data-limited stock health indicators that can be considered (Appendix B, Table 1, p. 16).

Examples of evidence suggesting poor stock health include: age structure has shifted to younger ages, landings or CPUE have declined, geographic distribution has become more constrained for species that are not highly migratory, or fish abundance/sizes are significantly smaller in fishing areas than in well-managed no-take zones.

Note, although a PSA can provide an indication of likely stock status, it is not a substitute for a stock assessment. A responsible fisheries management strategy should include a robust stock assessment.

Special cases

When scoring an LTL species, please follow the specified guidance within scoring categories. Reference points for LTL species should be 'buffered' to consider the ecological role of the species and its importance as prey to higher trophic level species. Conceptually, the target reference point should be set at a level consistent with ecosystem needs (e.g. above 75% of virgin biomass, or 0.75 B_0 for a fishery with a moderate level of abundance information), while PRI should be considered the point below which serious ecosystem impacts could occur (e.g. 0.4 B_0 for a fishery with a moderate level of abundance information). Additional information on appropriate reference points for LTL species can be found in the SFW FS v3.2 (p.40) and MSC FCR v2.0 (SA 2.2.13, pp. 112-113).

Question: Is there information about stock status relative to (biomass or fishing mortality) reference points?

If YES
Score this indicator using the non data-limited scoring categories for stock status outcome.

If NO
Use the Productivity Susceptibility Analysis (PSA; see appendix for details) to derive a PSA score for the stock. Use a combination of the PSA score and supporting information to score this indicator, using the data-limited scoring categories for stock status outcome.

Non data-limited scoring categories for stock status outcome

Red	• The target stock is likely at or below an LRP or proxy. OR • For LTL species: the stock is at or below a buffered LRP or proxy.
Yellow	• Stock is below the TRP or TRP proxy but likely above the LRP or LRP proxy. OR • For LTL species: the stock is likely above a buffered LRP or proxy.
Green	• The stock is at or above an appropriate TRP or TRP proxy. OR • For LTL species: the stock is highly likely to be above a buffered LRP or proxy. • The LTL stock is at or above a buffered TRP.

Data-limited scoring categories for stock status outcome

Red	• High vulnerability. • No clear evidence suggesting the stock is healthy. OR • Medium or low vulnerability. • Some evidence suggesting the stock is not healthy.
Yellow	• High vulnerability. • Some evidence suggesting that the stock is healthy with no conflicting information. OR • Low or medium vulnerability. • No clear evidence suggesting the stock is either healthy or not healthy.
Green	• Low or medium vulnerability. • Some quantitative evidence the stock is healthy with no conflicting information.

Stock rebuilding outcome (1.1.2)

This indicator may not be included in the BSG selection process because within the Japanese management system, stock rebuilding plans are essentially implemented on a voluntary basis. As a result, documentation of rebuilding strategies is uncommon, and strategies are rarely developed for stocks that have not shown signs of severe depletion.

Where they do occur, stock rebuilding strategies often focus on enhancement, i.e. production and release of hatchery-produced juveniles, for species where such production is possible. Rebuilding plans that involve reduction of fishing pressure are rare, although there are occasionally voluntary efforts by fishermen to reduce fishing pressure on depleted stocks. Enhancement alone does not constitute an adequate rebuilding strategy by global standards.

The MSC defines a generation time as “the average age of a reproductive individual in an unexploited stock” (Box GSA4 in MSC FCR v2.0, p. 380). The glossary provides additional detail about calculating generation time.

If such age-related information is lacking, it may also be helpful to consider SFW’s definition of a reasonable timeframe for rebuilding: “dependent on the species’ biology and degree of depletion, but generally within 10 years, except in cases where the stock could not rebuild within 10 years even in the absence of fishing. In such cases, a reasonable timeframe is within the

number of years it would take the stock to rebuild without fishing, plus one generation" (MBA SFW FS v3.2, p. 47).

Question: Did the target species score green for stock status outcome (1.1.1)?

If YES
Skip this indicator.

If NO
Score this indicator.

Red	• No or some stock rebuilding measures are in place, but with no intended timeframe or accountability to provide likelihood of outcome. • There is limited monitoring in the fishery that would have some limited use to evaluate stock rebuilding evaluation.
Yellow	• An effective rebuilding timeframe is being implemented for the stock that is the shorter of 20 years or 2 times its generation time. • There is monitoring to assess effectiveness of rebuilding strategies.
Green	• An effective rebuilding timeframe is being implemented for the stock that is the shorter of 20 years or 2 times its generation time. • There is evidence of the strategy's effectiveness for rebuilding, or it is likely effective based on simulation modelling, exploitation rates or previous performance.

Harvest strategy (1.2.1)

A harvest strategy aims to control fishing mortality to biologically sustainable levels through a combination of monitoring (particularly in relation to stock abundance and exploitation rates), stock assessment, harvest control rules (HCRs) and management actions required for maintaining fishery sustainability. This indicator is closely related with the following three indicators (harvest control rules 1.2.2, information and monitoring 1.2.3, stock assessment 1.2.4). This particular indicator evaluates the overall performance of the harvest strategy, whether it includes all necessary components and whether those components work together to maintain the stock at levels consistent with appropriate target reference points. The HCRs, information, and stock assessment indicators examine those individual components of the harvest strategy more closely.

There are essentially no large, commercially-important Japanese wild-capture fisheries, including tuna fisheries, with a harvest strategy that would be considered adequate by MSC and other global standards. In Japan, the main means of managing harvest is through input controls such as licensing and seasonal or areal fishing closures. HCRs are non-existent, and thus we have removed references to HCRs within the scoring guidance, to avoid an automatic red score for all Japanese fisheries. Output controls are largely limited to species that are managed by total allowable catch (TAC). Even in those cases, TAC management is not very effective at

adjusting harvest levels in response to stock abundance information, except to sometimes increase allowable catch.

Question: Is there a harvest strategy?

If YES
Score this indicator.

If NO
Score is red. Highlight the lack of a harvest strategy.

Red	• A harvest strategy exists, but at least one necessary component (monitoring, assessment, or management actions) is missing or is weak/ineffective. OR • A harvest strategy with all necessary components exists, but based on the design and/or how the components interact, the strategy is not likely to be effective at achieving sustainability objectives, such as maintenance of stock biomass around or above a target reference point (e.g. B_{MSY} or other proxy).
Yellow	• The harvest strategy includes all necessary components. • The harvest strategy is expected to achieve sustainability objectives, such as maintenance of stock biomass around or above a level consistent with a target reference point. • The strategy is likely to work based on prior experience or plausible argument.
Green	• As with the yellow scoring category, there is a complete harvest strategy with clear sustainability objectives. • There is evidence that elements of the harvest strategy work together to meet management objectives. • The harvest strategy is responsive to the state of stock.

Harvest control rules (1.2.2)

This indicator is not included in the BSG selection process because currently no Japanese fisheries have harvest control rules (HCRs) in place.

HCRs are a set of defined, pre-agreed rules and management actions that will be taken in response to changes in indicators of stock status with respect to reference points. HCRs are regarded as ‘well-defined’ when they exist in some written form that has been agreed by the management agency, ideally with stakeholders, and clearly state what actions will be taken at what specific trigger reference point levels. They should be regarded as only ‘generally

understood' in cases where they can be shown to have been applied in some way in the past, but have not been explicitly defined or agreed (MSC FCR v2.0, p.396).

Under the red and yellow scoring categories, assessors may accept 'available' HCRs (versus HCRs that are 'in place') in cases where:

1. Stock biomass has not previously been reduced below the MSY level or has been maintained at that level for a recent period of time that is at least longer than 2 generation times of the species, and is not predicted to be reduced below B_{MSY} within the next 5 years; or
2. In fisheries where B_{MSY} estimates are not available, the stock has been maintained to date by the measures in use at levels that have not declined significantly over time, nor shown any evidence of recruitment impairment (MSC FCR v2.0, p.120).

There are essentially no Japanese wild-capture fisheries, including tuna fisheries, with HCRs that would be considered adequate by MSC and other global standards. However, any cases where fishing effort is actively managed should be recognized, e.g. via TAC, IQ, or other means (e.g. voluntary efforts by fisheries cooperatives). To be considered somewhat effective, fishing effort needs to be reduced if indicators suggest that stock status is low, and/or fishing effort is too high.

Question: Are there harvest control rules (HCRs) for this fishery?

If YES
Score this indicator.

If NO
Score is red. Highlight the lack of HCRs.

Red	• HCRs may exist but are unlikely to result in sustainable fishing practices, where exploitation is reduced in response to evidence of stock depletion.
Yellow	• Generally understood HCRs are in place or available, and are expected to reduce the exploitation rate as the point of recruitment impairment (e.g. limit reference point) is approached. • There is some evidence that the tools used (or available) to implement HCRs are appropriate and effective in controlling exploitation.
Green	• There are well-defined HCRs that ensure reduction of exploitation rates as stock size approaches PRI. • Evidence clearly shows that management actions/tools in use are effective in achieving the exploitation levels required under the HCRs. • HCRs are likely to be robust to major uncertainties such as ecological uncertainties.

Information and monitoring (1.2.3)

Question: Is any information on stock abundance and productivity, fishery removals, and fleet composition collected to support the harvest strategy?

If YES
Score this indicator.

If NO
Score is red. Highlight the lack of information monitoring.

Red	• Information related to stock structure, stock productivity, fishery removals, and fleet composition is insufficient for supporting the harvest strategy.
Yellow	• Some relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy. • Information on fishery removals is collected, but there may not be reasonably accurate estimates of all sources of fishery removals (e.g. lack of quantitative estimates of IUU catches).
Green	• Sufficient relevant information related to stock structure, stock productivity, fleet composition and other data are available to support the harvest strategy. • There is good information on all sources of fishery removals.

Assessment of stock status (1.2.4)

As pertaining to the yellow and green scoring categories, we follow SFW guidance for considering a stock assessment recent (SFW FS v3.2, p. 47) with an addendum for short-lived species. Generally, or for species whose generation time is unknown, stock assessments conducted within the last five years are considered recent. For short-lived species with a generation time of less than five years, a stock assessment conducted within the generation time is considered recent.

If YES
Score this indicator.

If NO
Score is red. Highlight the lack of a stock assessment.

Red	• Very limited information is available by which to assess stock status; it has not been collected reliably or consistently to serve as a basis for establishing abundance. OR • General abundance indicators are tracked in the fishery, but no reference points or proxies have been established by which to guide harvest management.
Yellow	• There is a recent assessment that estimates stock status relative to reference points that are at least somewhat appropriate to the species, and identifies major sources of uncertainty.
Green	• An assessment has been recently conducted that is appropriate to the stock and HCRs. • The assessment estimates stock status relative to appropriate, species- or stock-specific reference points, takes uncertainty into account, and is peer reviewed.

Ecosystem impacts - Principle 2

Background information for Principle 2

Under the MSC standard, other species impacted by the fishery are categorized as primary, secondary, or ETP (endangered, threatened, or protected). Primary species have management objectives (e.g. reference points) and stock status monitoring in place, whereas secondary species do not. However, this terminology is specific to MSC, and the terms may be misinterpreted outside of the MSC context. Hence this methodology classifies all non-ETP, Principle 2 species as 'other' species instead. If MSC PI numbers are used, scores will be entered under the secondary species PIs (2.2.1, 2.2.2, 2.2.3).

The order of indicators here is slightly different than that used in the MSC standard. Principle 2 includes multiple components (e.g. other species and habitat impacts), each of which has three indicators: outcome, management, and information. In this methodology, we score the information indicator first for each component, because the level of information affects ability to score outcome and also relates to management. For example, if there is no qualitative or quantitative information collected on habitat impacts from the fishery, then we know that habitat impacts outcome cannot be scored, and habitat impacts management will not receive a green score. This allows the assessment to be conducted more efficiently.

Important definitions used in Principle 2

Management measures and strategies, as defined by MSC:

- **Measures** - Actions or tools in place within the management system that either explicitly manage impacts on the component or indirectly contribute to management of the component under assessment having been designed to manage impacts elsewhere.
- **Partial strategy** - 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. It may not have been designed to manage the impact on that component specifically.
- **Strategy or full strategy** - A cohesive and strategic arrangement which may comprise one or more measures, an understanding of how it/they work to achieve an outcome and which should be designed to manage impact on that component specifically. A strategy needs to be appropriate to the scale, intensity, and cultural context of the fishery and should contain mechanisms for the modification of fishing practices in light of identification of unacceptable impacts.

Principle 2 scoring guidance

Scoring for non-target species is more complex when a fishery catches multiple species. We have laid out several steps (see below) to help guide the assessor and make scoring more efficient, by quickly identifying indicators that should score red, or that should not be scored due to lack of information.

Information on all of the species caught in the fishery and their catch quantities is necessary for scoring many of the indicators under this principle. However, most Japanese fisheries outside of tuna fisheries are not required to monitor catches of 'other' species, including bycatch and non-target species. Thus unless such information is available, indicators 2.2.1, 2.2.2, 2.2.3, 2.3.1, 2.3.2, and 2.3.3 may not be evaluated in the BSG selection process. However, if there is any evidence that the fishery is catching significant quantities of species with relatively poor stock status, and hence may hinder their recovery, those impacts should be flagged, and the fishery should not be included in the BSG.

List of other species

Identify all other species that are known to be caught, regardless of whether they are retained or discarded, and fill in the first two columns of the following table. Species used for bait should also be listed. Classifications will be determined in the next step.

Other species classification table

Species common and scientific names	**Approximate proportion of catch**	**Classification**
Example: Pacific herring (*Clupea pallasii*)	0.25	Main

Classification decision tree

Non-ETP Principle 2 species are classified as either ‘main’ or ‘minor’ depending on their proportion in the total catch by weight. For the purposes of the rapid assessment, only main species have to be assessed/scored. We have provided some guidance from MSC for designating main species below; more detailed guidance can be found in GSA3.4.2 (MSC FCR v3.2, pp. 412-414).

Question: is the catch composition (all species caught by the fishery and their relative catch quantities) known?

If YES
Proceed with remaining questions in the classification decision tree.

If NO
Other species information scores red. Do not score other species outcome.

Question: Is the species at least 5% of the total catch by volume? Where data exist, the 5% should be an average taken across recent years and/or seasons to account for fluctuations in catch composition.

If YES
The species is classified as main and will be scored.

If NO
Question: Is the species considered less resilient, known to be depleted (poor stock status), and/or are catches sufficiently large to be a significant risk to the population?

A species is considered less resilient if a productivity analysis (e.g. the productivity portion of the PSA) indicates it has low or medium productivity. Alternatively, a species may be considered less resilient, even if its intrinsic resilience is high, if existing knowledge suggests that its resilience has been lowered due to anthropogenic or natural changes to its life-history.

If YES
The species will be classified as ‘main’ if the species is at least 2% of the total catch by volume. Where data exist, the 2% should be an average taken across recent years and/or seasons to account for fluctuations in catch composition.

If NO
The species is not classified as ‘main.’

After all other species have been classified, go through the other species decision tree.

Other species decision tree

Question: Are there any main other species?

If NO
Skip the other species information, outcome, and management indicators. However, we recommend providing comments about any other species including those categorized as minor, especially if those species are known to be or are potentially depleted.

If YES
Are stock status reference points available for main other species?

If YES
Proceed to the non data-limited decision tree for other species.

If NO
Proceed to the data-limited decision tree for other species.

Non data-limited decision tree for other species indicators

Question: Is qualitative or quantitative information regarding fishery impacts on main other species being collected?

Examples of impacts information include stock assessments and species-specific estimates of catch and/or discard quantities.

If NO
Score other species information as red. Don't score other species outcome and mark that indicator as data deficient, highlighting the lack of information about other species. Score other species management, which will receive either a red or yellow score.

If YES
Score the other species information, outcome, and management indicators.

Data-limited decision tree for other species indicators

The vulnerability of main other species to fishing will be evaluated using PSAs where possible.

Question: Is there sufficient qualitative information to conduct a PSA on the main other species?

If NO
Score 'other species information' as red. Do not score 'other species outcome' and mark that performance indicator as data deficient, highlighting the lack of information about other species. Score 'other species management,' which will receive either a red or yellow score.

If YES
Score the 'other species information', 'outcome,' and 'management' performance indicators.

Scoring multiple species within a Principle 2 indicator

Multiple species may be evaluated within each other species and ETP species indicator. When this occurs, each species is considered a 'scoring element.' The assessor will assign a score to each scoring element using the MSC RBF Worksheets tool, then combine scoring for all scoring elements using the following table.

Combining scores for scoring elements

Score	Combination of individual scoring elements
Red	At least one element scores red.
Yellow	All elements score at least a yellow, no element scores red.
Green	All elements score green.

Other species information (score applied to PI 2.2.3)

As mentioned previously, Japanese fishers are generally not required to record data on bycatch, so information may be limited. Efforts to collect such information should be recognized.

Red	• Information is inadequate to estimate the impact of the UoA on main other species with respect to status. OR • If PSA is used to evaluate the vulnerability of other species to fishing: Qualitative information is inadequate to estimate productivity and susceptibility attributes for main other species.
Yellow	• Qualitative information is adequate to estimate the impact of the UoA on the main other species with respect to status. OR • If PSA is used to evaluate the vulnerability of other species to fishing: Qualitative information is adequate to estimate productivity and susceptibility attributes for main other species. AND • Information is adequate to support measures to manage main other species.

Green	• Some quantitative information is available and is adequate to assess the impact of the UoA on the main other species with respect to status. OR • If PSA is used to evaluate the vulnerability of other species to fishing: Some quantitative information is adequate to assess productivity and susceptibility attributes for main other species. AND • Information is adequate to support a partial strategy or full strategy to manage main other species.

Other species outcome (score applied to PI 2.2.1)

A biologically based limit is defined as the abundance indicator level below which a stock or population is considered to experience serious or irreversible harm. Acceptable examples include the PRI for a single species, a minimum viable population size (number of individuals required to have a specified probability of persistence over a given time period), and potential biological removal (maximum number of animals that may be removed from a stock while allowing for optimum sustainable population to be maintained; often used for cetaceans and seabirds; see Table SA8 in MSC FCR v2.0, p. 126).

If PSAs are used to evaluate the vulnerability of other species to fishery impacts, the score for this performance indicator will be based on PSA scores for all main other species combined. The assessor will assign a score to each scoring element (main other species) using the 'PI 2.2.1 PSA' sheet in the MSC RBF worksheets tool, and then combine scoring for all scoring elements following the guidance in the table 'Combining scores for scoring elements.'

Red	• Main other species are unlikely to be above biologically based limits. • Management measures are not in place to ensure that the UoA doesn't hinder recovery, or there is significant uncertainty that the measures will be effective.
Yellow	• Main other species are likely to be above biologically based limits. OR • If main other species are below biologically based limits, management measures are in place within the UoA that are expected to ensure the UoA doesn't hinder recovery.
Green	• Main other species are highly likely to be above biologically based limits.

Other species management (score applied to PI 2.2.2)

MSC defines 'alternative measures' as alternative fishing gear and practices that have been shown (experimentally or otherwise) to minimize the rate of incidental mortality of the species to the lowest achievable levels (SA 3.5.3.1, MSC FCR v2.0, p. 132). For this performance indicator, scoring for alternative measures should only be considered when unwanted catch occurs (catch that the fisher did not intend to catch but could not avoid, and did not want or chose not to use).

Red	• No management measures for main other species are available for the UoA. OR • Some management measures for main other species may be available for the UoA, but they are not established with an explicit intent to maintain or not hinder recovery of the species. • The efficacy of measures or the likelihood of them being implemented is uncertain, or the measures are known to be ineffective for species recovery. OR • Shark finning is taking place.
Yellow	• There are measures in place for the UoA, if necessary, that are expected to maintain or to not hinder rebuilding of main other species at/to levels which are likely to be above biologically based limits. • The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar UoAs/species). • It is likely that shark finning is not taking place. • If there is unwanted catch: there is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main other species.
Green	• There is a partial strategy in place for the UoA, if necessary, that is expected to maintain or to not hinder rebuilding of the main other species at/to levels which are highly likely to be above biologically based limits. • There is some objective basis for confidence that the measure/partial strategy will work, based on some information directly about the UoA and/or species involved. • There is some evidence that the measures/partial strategy is being implemented successfully. • It is highly likely that shark finning is not taking place.

	• If there is unwanted catch: there is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main other species, and they are implemented as appropriate.

ETP species information (2.3.3)

ETP species refers to endangered, threatened or protected species, which under this methodology includes the following:

- Species of concern recognised by national legislation and/or binding international agreements to which the jurisdictions controlling the fishery under assessment are party, such as Appendix I of CITES and binding agreements concluded under the Convention on Migratory Species.
- Species listed as “vulnerable,” “endangered” or “critically endangered” by the International Union for the Conservation of Nature (IUCN).

This definition differs slightly from that used by MSC, which classifies IUCN-listed species as ETP only when they are ‘out of scope’ (amphibians, reptiles, birds, and mammals). More recent or more regional data can override these determinations, for example when it can be shown that the particular stock impacted by the fishery under assessment is not endangered.

Qualitative and quantitative information about fishery impacts on ETP species may include the following:

- Local knowledge from fishers, government agencies, research scientists, or environmental NGOs
- Plausible arguments based on knowledge or studies of the fishing gear
- Maps of ETP species distributions and fished areas
- Fisher or observer logbooks with records of ETP species encounters
- Direct monitoring or video surveillance
- Empirical modelling or scientifically robust studies

In situations where information about ETP species impacts is lacking, it may be possible to use a PSA to evaluate vulnerability of an ETP species to fishing. However, some experts have noted that while PSAs are appropriate for finfish and invertebrates, they are not calibrated for use with other taxa such as seabirds and sea turtles. For example assessors may score highly vulnerable turtle species as moderately vulnerable because the PSA fecundity scale is not calibrated appropriately for turtles. Thus we suggest not applying PSAs to non-finfish, non-invertebrate ETP species. If information about fishery impacts on such species is lacking, the assessor should assume high vulnerability.

Question: Is qualitative or quantitative information about ETP species mortality resulting from the assessed fishery available?

If YES

ETP species outcome (2.3.1) will be evaluated without using PSA. Score this performance indicator accordingly.

If NO
ETP species outcome (2.3.1) will be evaluated using PSA. Score this performance indicator accordingly.

Red	• Qualitative or quantitative information is inadequate to estimate the impact of the UoA on ETP species. OR • If PSA is used to evaluate ETP species outcome: Qualitative information is inadequate to estimate productivity and susceptibility attributes for ETP species.
Yellow	• Qualitative or quantitative information is adequate to estimate the impact of the UoA on ETP species. OR • If PSA is used to evaluate ETP species outcome: Qualitative information is adequate to estimate productivity and susceptibility attributes for ETP species. AND • Information is adequate to support measures to manage impacts on ETP species.
Green	• Some quantitative information is adequate to assess the impact of the UoA on ETP species and to determine whether the UoA may be a threat to protection and recovery of the ETP species. OR • If PSA is used to evaluate ETP species outcome: Some quantitative information is adequate to assess productivity and susceptibility attributes for ETP species. AND • Information is adequate to measure trends and support a strategy to manage impacts on ETP species.

Question: Does ETP species information (2.3.3) have a red score?

If YES
Do not score 'ETP species outcome' (2.3.1) and mark that performance indicator as data deficient, highlighting the lack of information about ETP species. Score 'ETP species management,' which will receive either a red or yellow score.

If NO
Score the 'ETP species outcome' and 'management' performance indicators (2.3.1, 2.3.2).

ETP species outcome (2.3.1)

Direct effects on ETP species include capture, entanglement and fishery mortality, whereas indirect effects include competition for resources, pollution, and habitat loss. The first bullet within each scoring category applies only when specific limits have been set by national legislation or international agreements to minimize fishery impacts on ETP species (e.g. no more than 30 individuals of the species can be caught per year).

For Japanese fisheries, information on encounters with or accidental captures of ETP species is almost never collected, with the potential exception of tuna fisheries that are subject to some observer requirements established by regional fisheries management organizations (RFMOs). We considered using data-limited methods such as productivity susceptibility analysis (PSA) and the Unknown Bycatch Matrices developed by SFW to score this indicator, but these methods are designed to be conservative to offset the lack of information, and will generally result in a red score for entire categories of gear types, such as bottom trawl and longline. Since many Japanese fisheries use these gears but may not actually have significant impacts on ETP species, we thought it would be overly conservative to rely on the data-limited methods. However, if there is any evidence that ETP species impacts are significant, those impacts should be flagged, and the fishery should not be included in the BSG.

Red	• Where fishery impact limits on ETP species have been set: the effects of the UoA on the population/stock are likely not within these limits. • Direct effects of the UoA are likely to hinder recovery of ETP species. OR • If Unknown Bycatch Matrices are used, turtles, seabirds, and/or sharks scores high concern.
Yellow	• Where fishery impact limits on ETP species have been set: the effects of the UoA on the population/stock are known and likely to be within these limits. • Known direct effects of the UoA are likely to not hinder recovery of ETP species. OR

	• If Unknown Bycatch Matrices are used, turtles, seabirds, and sharks all score low or moderate concern.
Green	• Where fishery impact limits on ETP species have been set: the combined effects of UoAs on the population/stock are known and highly likely to be within these limits. • Direct effects of the UoA are highly likely to not hinder recovery of ETP species. • Indirect effects have been considered for the UoA and are thought to be highly likely to not create unacceptable impacts.

ETP species management (2.3.2)

ETP requirements refer to national and international requirements for the protection of ETP species that have been identified as vulnerable to the fishery under assessment. In general, fishery-specific measures for minimizing mortality of ETP species are not documented, although certain practices (e.g. releasing entangled seabirds or marine mammals) are common. Alternative measures for minimizing UoA related mortality of ETP species are usually not considered, certainly not in any systematic way, so the MSC requirement to review such measures at the SG 60-79 (yellow) level was not included in this methodology.

Red	• If ETP requirements are in place:
	  ○ There are no measures in place for minimising the UoA-related mortality of ETP species.
	OR
	  ○ There are some measures but they are not expected to be effective at achieving national and international requirements for the protection of ETP species.
	OR
	• If ETP requirements are not in place:
	  ○ There are no measures in place that are expected to ensure the UoA does not hinder the recovery of ETP species.
	OR
	  ○ There are some measures, but they are considered unlikely to work.

Yellow	• If ETP requirements are in place:
	  ○ There are measures in place that minimise the UoA-related mortality of ETP species.
	  ○ The measures are expected to be highly likely to achieve national and international requirements for the protection of ETP species.
	OR

	• If ETP requirements are not in place: ○ There are measures in place that are expected to ensure the UoA does not hinder the recovery of ETP species. AND • The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/species).

Green	• If ETP requirements are in place:
	  ○ There is a strategy in place for managing the UoA's impact on ETP species, including measures to minimise mortality, which are designed to be highly likely to achieve national and international requirements for the protection of ETP species.
	
	OR
	
	• If ETP requirements are not in place:
	  ○ There is a strategy in place that is expected to ensure the UoA does not hinder the recovery of ETP species.
	
	AND
	
	• There is an objective basis for confidence that the partial strategy/strategy will work, based on information directly about the UoA and/or the species involved.
	• There is some evidence that the measures/strategy is being implemented successfully.
	• There is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA related mortality of ETP species, and they are implemented as appropriate.

Habitats information (2.4.3)

Commonly encountered habitats are those that regularly come into contact with the gear used by the UoA, considering the geographic overlap of fishing effort with the habitat's range within the management area(s) covered by the UoA's relevant governance body(s).

Red	• The types and distribution of the commonly encountered habitats are not broadly understood. • Information is inadequate to broadly understand the nature of the main impacts of gear use on the commonly encountered habitats, including spatial overlap of habitat with fishing gear.

Yellow	• The types and distribution of the commonly encountered habitats are broadly understood. • Information is adequate to broadly understand the nature of the main impacts of gear use on the commonly encountered habitats, including spatial overlap of habitat with fishing gear.
Green	• The nature, distribution and vulnerability of the commonly encountered habitats in the UoA area are known at a level of detail relevant to the scale and intensity of the UoA. • Information is adequate to allow for identification of the main impacts of the UoA on the commonly encountered habitats, and there is reliable information on the spatial extent of interaction and on the timing and location of use of the fishing gear. • Adequate information continues to be collected to detect any increase in risk to the commonly encountered habitats.

Question: Does habitats information (2.4.3) have a red score?

If YES
Do not score the 'habitats outcome' and 'management' performance indicators (2.4.1, 2.4.2). Highlight the lack of information about habitat impacts.

If NO
Score the 'habitats outcome' and 'management' performance indicators (2.4.1, 2.4.2).

Habitats outcome (2.4.1)

Vulnerable marine ecosystems (VMEs) have features that are physically or functionally fragile, and the most vulnerable are both easily disturbed and are very slow to recover. VMEs include seamounts, hydrothermal vents, cold water corals and sponge fields; additional guidance for recognizing VMEs is provided in GSA3.13.3.2 (MSC FCR v2.0, pp. 435-436).

MSC defines 'serious or irreversible harm' as "...changes caused by the UoA that fundamentally alter the capacity of the habitat or ecosystem to maintain its structure and function.

For the habitat component, this is the reduction in habitat structure, biological diversity, abundance and function such that the habitat would be unable to recover to at least 80% of its unimpacted structure, biological diversity and function within 5-20 years, if fishing were to cease entirely" (Table SA8, MSC FCR v2.0, p. 127).

In terms of habitat-related resources, the Japan Coast Guard hosts a map website (CeisNet: http://www2.kaiho.mlit.go.jp/) that includes maps of benthic habitats and sensitive areas such as coral reefs.

Red	• The UoA is likely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm. • The UoA is likely to reduce structure and function of VME habitats to a point where there would be serious or irreversible harm. OR • Dynamite or poisons are used to harvest fish.
Yellow	• The UoA is unlikely to reduce structure and function of the commonly encountered and VME habitats to a point where there would be serious or irreversible harm. • The UoA is unlikely to reduce structure and function of VME habitats to a point where there would be serious or irreversible harm.
Green	• Based on some type of evidence, the UoA is highly unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm. • Based on some type of evidence, the UoA is highly unlikely to reduce structure and function of VME habitats to a point where there would be serious or irreversible harm.

Habitats management (2.4.2)

Red	• There are no or few habitat measures in place, if necessary, to ensure the UoA is highly unlikely to reduce structure and function of the commonly encountered and VME habitats to a point where there would be serious or irreversible harm. • Any existing measures have uncertain efficacy based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/ habitats). • If the fishery impacts a VME: there is no or limited evidence that the UoA complies with its management requirements to protect VMEs.
Yellow	• There are habitat measures in place, if necessary, that are expected to ensure the UoA is highly unlikely to reduce structure and function of the commonly encountered and VME habitats to a point where there would be serious or irreversible harm. • The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/ habitats). • If the fishery impacts a VME: there is qualitative evidence that the UoA complies with its management requirements to protect VMEs.

Green	● There is partial strategy in place, if necessary, that is expected to ensure the UoA is highly unlikely to reduce structure and function of the commonly encountered and VME habitats to a point where there would be serious or irreversible harm. ● There is some objective basis for confidence that the measures/ partial strategy will work, based on information directly about the UoA and/or habitats involved. ● There is some quantitative evidence that the measures/ partial strategy is being implemented successfully. ● If the fishery impacts a VME: there is some quantitative evidence that the UoA complies with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs or non-MSC fisheries, where relevant.

Ecosystem information (2.5.3)

The intent of this indicator is to consider whether there is adequate understanding of key ecosystem elements and the fishery's impact on the ecosystem. Key ecosystem elements are the features of an ecosystem considered crucial to giving the ecosystem its characteristic nature and dynamics. These may include trophic structure and function (in particular key prey, predators, and competitors), community composition, productivity pattern (e.g. upwelling or spring bloom, etc.), and characteristics of biodiversity. This and the other ecosystem indicators are not intended to repeat evaluation of fishery impacts on habitats and other species caught in the fishery, including ETP species.

Red	● Information is inadequate to identify the key ecosystem elements. ● Main impacts of the UoA on these key ecosystem elements cannot be inferred from existing information.
Yellow	● Information is adequate to identify the key ecosystem elements. ● Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, but have not been investigated in detail.
Green	● Information is adequate to broadly understand the key ecosystem elements. ● Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, and some have been investigated in detail. ● The main functions of the components (i.e., target species, other species, ETP species, and habitats) in the ecosystem are known. ● Adequate information is available on the impacts of the UoA on these components to allow some of the main consequences for the ecosystem to be inferred. ● Adequate data continue to be collected to detect any increase in risk level.

	• Adequate data continue to be collected to detect any increase in risk level.

Ecosystem outcome (2.5.1)

MSC defines 'serious or irreversible harm' as "...changes caused by the UoA that fundamentally alter the capacity of the habitat or ecosystem to maintain its structure and function… For the ecosystem component, this is the reduction of key features most crucial to maintaining the integrity of its structure and functions and ensuring that ecosystem resilience and productivity is not adversely impacted. This includes, but is not limited to, permanent changes in the biological diversity of the ecological community and the ecosystem's capacity to deliver ecosystem services" (Table SA8, MSC FCR v2.0, p. 127).

Question: Does the ecosystem information indicator (2.5.3) have a red score?

If YES
Do not score this indicator.

If NO
Score this indicator.

Red	• The UoA is likely to disrupt the key ecosystem elements and function to a point where there would be a serious or irreversible harm. OR • Dynamite or poisons are used to harvest fish.
Yellow	• The UoA is unlikely to disrupt the key ecosystem elements to a point where there would be a serious or irreversible harm.
Green	• The UoA is highly unlikely to disrupt the key ecosystem elements to a point where there would be a serious or irreversible harm.

Ecosystem management (2.5.2)

This performance indicator should always be scored. Good practice requires management explicitly consider fishery impacts on functionality of the ecosystem, and has a strategy to address those impacts. Full ecosystem based approaches with ecosystem models, while of value, are not required.

Red	• There are no measures in place, if necessary, which take into account the potential impacts of the UoA on key ecosystem elements. • If measures are in place, their efficacy is uncertain, or they are considered likely to be ineffective.

Yellow	• There are measures in place, if necessary, which take into account the potential impacts of the UoA on key ecosystem elements. • If measures are in place, they are considered likely to work based on plausible argument (e.g., general experience, theory or comparison with similar UoAs/ ecosystems).
Green	• There is a partial or full strategy in place, if necessary, which takes into account available information and is expected to restrain fishing impacts such that the UoA is highly unlikely to disrupt the key ecosystem elements to a point where there would be a serious or irreversible harm. • If measures or a strategy are in place, there is some objective basis for confidence they will work, based on some information directly about the UoA and/or the ecosystem involved. • There is evidence that the measures/strategy is being implemented successfully.

Management - Principle 3

Under this principle it is important to look for evidence of a precautionary approach in management. The precautionary approach involves the application of prudent foresight, taking into account the uncertainties in fisheries systems and considering the need to take action with incomplete knowledge.

Legal and/or customary framework (3.1.1)

A legal framework is defined as a broad system of rules that governs and regulates decision making, agreements, laws, etc. At a minimum, a legal framework for fisheries should define who can fish, where, when, for what species and under what conditions. The framework should also define management responsibilities. The applicable framework is generally assumed to be at the national level, although there may be some exceptions.

Japan has a well developed legal framework for fisheries management and should usually score green for this indicator.

Red	• There is some form of national legal system that could also potentially provide a framework for cooperation with other parties, where necessary, but its effectiveness to deliver management outcomes consistent with the following is unlikely: 1) management of the stock to MSY and 2) minimising impacts on other species, habitats, and wider ecosystem components. • The management system may have channels for resolving legal disputes arising within the system, but they are not directly incorporated into the management system nor are they legally binding. • The management system may have potential mechanisms, though not-well defined, to generally respect the legal or customary rights of

	people dependent on fishing for food or livelihood in a manner consistent with the two management outcomes described above, but they may not be well defined, and/or effectiveness is unlikely.
Yellow	• There is an effective national legal system and a framework for cooperation with other parties, where necessary, to deliver the management outcomes consistent with the following: 1) management of the stock to MSY and 2) minimising impacts on other species, habitats, and wider ecosystem components. • The management system incorporates or is subject by law to a mechanism for the resolution of legal disputes arising within the system. • The management system has a mechanism to respect the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the two management outcomes described above.
Green	• There is an effective national legal system and organised and effective cooperation with other parties, where necessary, to deliver the management outcomes consistent with the following: 1) management of the stock to MSY and 2) minimising impacts on other species, habitats, and wider ecosystem components. • The management system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes which is considered to be effective in dealing with most issues and that is appropriate to the context of the UoA. • The management system has a mechanism to observe the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the two management outcomes described above.

Consultation, roles, and responsibilities (3.1.2)

Roles and responsibilities in fisheries management are well defined in Japan, so this indicator should usually score yellow or green.

Red	• Organisations and individuals involved in the management process have not been clearly identified. Functions, roles and responsibilities may be defined but are not generally understood. • The management system periodically, but inconsistently, uses consultation processes to obtain relevant information from the main affected parties, including local knowledge, to inform the management system.

Yellow	• Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are generally understood. • The management system includes consultation processes that obtain relevant information from the main affected parties, including local knowledge, to inform the management system.
Green	• 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. • The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information obtained. • The consultation process provides opportunity for all interested and affected parties to give input regarding decisions.

Long term objectives (3.1.3)

This indicator focuses on long term management objectives contained at a high or broad level in government policy, beyond the specific fishery being assessed. Examples of such objectives include ‘avoidance of overfishing’ or ‘sustainable use of resources.’ To score better than red, the objectives need to be consistent with ‘appropriate’ management, where ‘appropriate’ means consistent with sustainable outcomes expressed under Principles 1 and 2.

In Japan, these types of objectives are described in laws such as the Fisheries Basic Act (2001) and the The Law of Conservation and Management of Marine Living Resources.

Red	• There are some implicit, long term objectives within management policy, which have the potential to partially guide decision making, but they are not adequate to be consistent with the precautionary approach and appropriate management of target stocks and ecosystem impacts.
Yellow	• Long term objectives to guide decision making, consistent with the precautionary approach and appropriate management of target stocks and ecosystem impacts, are implicit within management policy.
Green	• Clear long term objectives that guide decision-making, consistent with the precautionary approach and appropriate management of target stocks and ecosystem impacts, are explicit within management policy.

Fishery-specific objectives (3.2.1)

This indicator focuses on fishery-specific management objectives, which provide direction for management measures or regulations that directly apply to the assessed fishery. Such objectives can often be found in a management plan for the fishery.

In Japan, official management plans are generally not required for fisheries. Under the Fisheries Cooperative Association Law (1948 with consecutive amendments), fisheries cooperative associations (FCAs) hold the responsibility to execute resource management at an operational level. FCAs may develop management documents describing regulations such as fishery closures and gear specifications, particularly for regional fisheries, but these are often not posted publicly. These documents also may not describe short or long-term goals for the fishery.

Red	• Some objectives are implicit within the fishery specific management system but are likely inadequate to be broadly consistent with the precautionary approach and appropriate management of target stocks and ecosystem impacts.
Yellow	• Objectives, which are broadly consistent with the precautionary approach and appropriate management of target stocks and ecosystem impacts, are implicit within the fishery specific management system.
Green	• Short and long term objectives, which are consistent with the precautionary approach and appropriate management of target stocks and ecosystem impacts, are explicit within the fishery specific management system.

Decision-making processes (3.2.2)

Decision-making processes include rules for voting on decisions and public comment periods.

Red	• There are some decision-making processes in place, but they are unlikely to result in measures and strategies to achieve the fishery-specific sustainability objectives. • Decision-making processes do not respond to serious issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner, nor do they take some account of the wider implications of decisions. • Information on the fishery's performance and management action is generally not available on request to stakeholders. • The management authority or fishery may repeatedly violate the same law or regulation necessary for the sustainability of the fishery.

Yellow	• There are some decision-making processes in place that result in measures and strategies to achieve the fishery-specific sustainability objectives. • Decision-making processes respond to serious issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take some account of the wider implications of decisions. • Some information on the fishery's performance and management action is generally available on request to stakeholders. • Although the management authority or fishery may be subject to continuing court challenges, it is not indicating a disrespect or defiance of the law by repeatedly violating the same law or regulation necessary for the sustainability for the fishery.
Green	• There are established decision-making processes that result in measures and strategies to achieve the fishery-specific sustainability objectives. • Decision-making processes respond to serious and other important issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions. • Decision-making processes use the precautionary approach and are based on best available information. • Information on the fishery's performance and management action is available on request, and explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring evaluation and review activity. • The management system or fishery is attempting to comply in a timely fashion with judicial decisions arising from any legal challenges.

Compliance and enforcement (3.2.3)

Monitoring, control, and surveillance (MCS) mechanisms relate to enforcement used to support fisheries management, in addition to data collection and legislation. These mechanisms are aimed at reducing non-compliance with regulations and may involve tools such licensing, vessel registration, logbooks, port and dockside monitoring, vessel monitoring systems (VMS), fisheries observer programs, at sea monitoring, boarding and inspection, and IUU vessel listing. For small-scale fisheries with limited financial capacity for implementing MCS, community-based mechanisms (e.g. fisher patrols, clear enforcement protocols and codes for behavior) or cost-effective technologies (e.g. vessel registration, smartphone applications for tracking vessels and their catches) can be useful.

When evaluating sanctions, it is important to consider whether they are actually applied and significant enough to deter non-compliance. In Japan, community-based management systems generally have high rates of compliance. Risk of non-compliance is likely higher for species that are rare and/or especially valuable economically.

Red	• Some MCS mechanisms exist, and are implemented in the fishery, but there is not a reasonable expectation that they are effective. • Some sanctions to deal with noncompliance may exist, but there is no clear evidence that they are applied. • Fishers do not consistently comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery.
Yellow	• MCS mechanisms exist and are implemented in the fishery, and there is a reasonable expectation that they are effective. • Sanctions to deal with noncompliance exist and there is some evidence that they are applied. • Fishers are generally thought to comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery.
Green	• An MCS system has been implemented in the fishery and has demonstrated an ability to enforce relevant management measures, strategies and/or rules. • Sanctions to deal with noncompliance exist, are consistently applied, and are thought to provide effective deterrence. • Evidence exists to demonstrate that fishers comply, including, when required, providing information important to the effective management of the fishery. • There is no evidence of systematic noncompliance.

Monitoring and management performance evaluation (3.2.4)

This performance indicator focuses on evaluation and review of the overall management system as well as its components or parts. MSC has not explicitly defined what 'key' parts are, but from our perspective they include monitoring and evaluation of stock status, management of ecosystem impacts (e.g. catches of other species and habitat issues), and performance of the compliance and enforcement system. Additional parts of the management system may include incorporation of scientific feedback/information and effectiveness of consultation and decision-making processes.

Red	• There may be mechanisms in place to evaluate some parts of the fishery-specific management system, but they are not used. • The fishery-specific management system is not subject to internal or external review.
Yellow	• There are mechanisms in place to evaluate some parts of the fishery-specific management system. • The fishery-specific management system is subject to occasional internal review.

Green	• There are mechanisms in place to evaluate all parts, or at least key parts, of the fishery-specific management system. • The fishery- specific management system is subject to regular internal and occasional external review.

Appendices

Much of the material in the appendices below, including the definitions, were taken from other sources. Superscripts in appendix text denote source material as follows.

F - FAO Glossary and Term Portal
M - MSC Fisheries Certification Requirements (v 2.0)
S - Monterey Bay Aquarium Seafood Watch Fisheries Standard (v 3.2)

Lower trophic level species

For certain taxa that have an exceptionally important role in the ecosystem, reference points should be based on ecosystem considerations (i.e. maintaining enough biomass to allow the species to fulfill its ecological role), rather than MSY or single-species considerations.[S] Forage species, which often belong to lower trophic levels, are generally considered to be exceptionally important within ecosystems. MSC has identified families of lower trophic level (LTL) fish species, described in Box SA1 in the MSC Fisheries Certification Requirements (FCR) v 2.0.

Species types that are defined by default as “key LTL stocks” for the purposes of an MSC assessment.

Family *Ammodytidae* (sandeels, sandlances)
Family *Clupeidae* (herrings, menhaden, pilchards, sardines, sardinellas, sprats)
Family *Engraulidae* (anchovies)
Family *Euphausiidae* (krill)
Family *Myctophidae* (lanternfish)
Family *Osmeridae* (smelts, capelin)
Genus *Scomber* (mackerels)
Order *Atheriniformes* (silversides, sand smelts)
Species *Trisopterus esmarkii* (Norway pout)

A potentially useful resource is the ASFIS List of Species, which provides information on species included in different families and orders.

It is also possible to identify LTL species on the basis of biological and ecological criteria. For example, MSC suggests that assessors treat species as LTL if the species feeds predominantly on plankton, has a trophic level 2-4, is characterized by small body size/early maturity/high fecundity/short lifespan, and meets at least two of the following criteria (see SA2.2.9 in the MSC FCR v2.0):

1. A large proportion of the trophic connections in the ecosystem involve this stock, leading to significant predator dependency

2. A large volume of energy passing between lower and higher trophic levels passes through the stock
3. There are few other species at this trophic level through which energy can be transmitted from lower to higher trophic levels, such that a high proportion of the total energy passing between lower and higher trophic levels passes through this stock

Productivity Susceptibility Analysis (PSA)

Instructions for conducting a PSA

These instructions are adapted from the MSC and SFW standards.

1. To conduct a PSA, the assessor needs to use the MSC Risk Based Framework (RBF) Worksheet, which can be downloaded at: https://www.msc.org/documents/scheme-documents/forms-and-templates/rbf-worksheets/view

2. For each data-deficient stock combination (gear type, location, body of water) that is assessed using PSA, a separate PSA score will be calculated. Both productivity and susceptibility will be scored on a three-level risk scale: low, medium and high. Where there is limited or conflicting information for a productivity or susceptibility attribute, use the more precautionary (higher value) score.

3. For Productivity: See the Productivity Table below for guidance. Note that lower productivity corresponds to higher risk (and vice versa). Additional information below for certain attributes:

- Score the average maximum size and average size at maturity for fish species only.
- Score density dependence for invertebrate species only.

Attribute information for fish species can generally be found at Fishbase.org

Productivity Table[M]

Productivity attribute	High productivity (Low risk, score=2)	Medium productivity (Medium risk, score=2)	Low productivity (High risk, score=3)
Average age at maturity	< 5 years	5-15 years	> 15 years
Average maximum age	< 10 years	10-25 years	> 25 years
Fecundity	> 20,000 eggs per year	100-200,000 eggs per year	< 100 eggs per year

Average maximum size (not to be used when scoring invertebrate species)	< 40 cm	40-200 cm	> 200 cm
Reproductive strategy	Broadcast spawner	Demersal egg layer	Live bearer
Trophic level	< 2.75	2.75 - 3.25	> 3.25
Density dependence (to be used only when scoring invertebrate species)	Compensatory dynamics at low population sizes demonstrated or likely	No depensatory or compensatory dynamics demonstrated or likely	Depensatory dynamics at low population sizes (Allee effects) demonstrated or likely

4. For Susceptibility: See the Susceptibility Table below for guidance. The Susceptibility Table was originally developed by MSC, and then SFW made edits to the table for their own standard because mathematically, the original scoring was such that a low score in any one of the susceptibility attributes would almost always lead to a low or medium vulnerability rating, even in cases where other susceptibility attributes were medium to high risk, and even if the species productivity was very low. As an example, a fishery targeting mature individuals or spawning aggregations would score a “low risk” of susceptibility. In practice, however, there are some very ecologically unsustainable fisheries that target mature fish, such as the fisheries for bluefin tuna. We have used the SFW Susceptibility Table because it is important to score conservatively, especially for a rapid assessment.

Note that lower susceptibility corresponds to lower risk (and vice versa). Additional information for certain attributes is described below:

- “Areal overlap” and “vertical overlap” should be scored with consideration of all
- fisheries impacting the species.
- “Selectivity” and “post-capture mortality” should be scored with reference to the fishery
- under assessment only.
- Default values are provided in the table. Default values should be used unless there is
- evidence to the contrary.

Susceptibility will generally be high for target species because fishing gear and effort will be aimed at maximizing catches.

Susceptibility Table[S]

Susceptibility attribute	Low susceptibility (Low risk, score=1)	Medium susceptibility (Medium risk, score=2)	High susceptibility (High risk, score=3)

Areal overlap (availability) Overlap of the fishing effort with a species concentration of the stock	Vast majority (>90%) of species concentration (main geographic range) is unfished. (Must have evidence.)	Most (70%-90%) of species concentration is unfished by any fishery. (Must have evidence.)	>30% of the species concentration is fished, considering all fisheries. **Default score if unknown.**
Vertical overlap (encounterability) The position of the stock/species within the water column relative to the fishing gear	Low overlap between fishing depths and depth range of species, i.e. most of the species depth range (>=66%) is unfished. (Must have evidence; unlikely for any "main species.")	Medium overlap between fishing depths of depth range of species, i.e. species has considerable portion (>=33%) of depth range that is unfished. (Must have evidence.)	High degree of overlap between fishing depths and depth range of species. **Default score for target species, as well as any air-breathing animal, or when unknown.**
Selectivity of gear type Potential of the gear to retain species	Species is not targeted AND is not likely to be captured by gear (e.g., average body size at maturity is smaller than mesh size (net fisheries), or species is not attracted to the bait used (line fisheries), or is too large to enter trap (pot/trap fisheries), etc. (if known, <33% of individuals of this species encountering gear are captured). Must have evidence.	Species is targeted, or is incidentally encountered AND is not likely to escape the gear, BUT conditions under 'high risk' do not apply. **Default score when conditions under 'high risk' do not apply.**	Species is targeted or is incidentally encountered AND Attributes of the fishery, in combination with the species' biology or behavior, e.g. migratory bottlenecks, spawning aggregation, site fidelity, unusual attraction to gear, sequential hermaphrodite, semelparity, segregation by sex, etc. increase its susceptibility to the gear: e.g. net mesh size allows retention of individuals below size at maturation, or fishery targets spawning aggregations or large fecund females.

			If effective management measures are in place to mitigate the effect of the behavior or requirement, the behavior and/or requirement need not be considered.
Post-capture mortality (PCM) The chance that, if captured, a species would be released and that it would be in a condition permitting subsequent survival	Evidence of majority of captured individuals (>66%) released and survive post-capture.	Evidence of some released postcapture and survival.	Retained species or majority dead when released. **Default score for retained species.**

5. Enter scores into appropriate sheet within the MSC RBF Worksheet, using one row for each species. Check the 'Automated scores' tab for indicator-level (PI) scores.

Glossary

Alternative measures - Fishing gear and practices that have been shown (experimentally or otherwise) to minimize the rate of incidental mortality of the species to the lowest achievable levels.[M]

Biologically based limit - The abundance indicator level below which a stock or population is considered to experience serious or irreversible harm.[M]

B_{MSY} - Biomass necessary to produce maximum sustainable yield

$B_{40\%}$ - 40% of estimated unfished biomass

Commonly encountered habitats - Habitats that regularly come into contact with a gear used by the UoA, considering the geographic overlap of fishing effort with the habitat's range within the management area(s) covered by the governance body(s) relevant to the UoA.[M]

Data-limited or data-poor - Refers to fisheries for which there are no estimates of MSY, stock size, or certain life history traits. There may be minimal or no stock assessment data, and uncertainty measurements may be qualitative only.[S]

Depleted - In reference to stocks, at a very low level of abundance compared to historical levels, with dramatically reduced spawning biomass and reproductive capacity. Stocks should be classified as "depleted" if the stock is likely to be below an appropriate limit reference point.[S]

Ecological role - The trophic role of a stock within the ecosystem under assessment.[M]

Ecosystem elements - Elements may include trophic structure and function (in particular key prey, predators, and competitors), community composition, productivity pattern (e.g. upwelling or spring bloom, abyssal, etc.), and characteristics of biodiversity.[M]

Effective - Management or mitigation strategies are defined as "effective" if a) the management goal is sufficient to maintain the structure and function of affected ecosystems in the long-term, and b) there is scientific evidence that they are meeting these goals.[S]

Endangered, Threatened or Protected (ETP) Species - Species recognised as "threatened," "endangered" or "critically endangered" by national legislation and/or binding international agreements to which the jurisdictions controlling the fishery are party.

Relevant binding international agreements include:[M]

a. Appendix 1 of the Convention on International Trade in Endangered Species (CITES), unless it can be shown that the particular stock of the CITES listed species impacted by the UoA under assessment is not endangered.

b. Binding agreements concluded under the Convention on Migratory Species (CMS), including:

§ Annex 1 of the Agreement on Conservation of Albatross and Petrels (ACAP);

§ Table 1 Column A of the African-Eurasian Migratory Waterbird Agreement (AEWA);

§ Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS);

§ Annex 1, Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS);

§ Wadden Sea Seals Agreement;

§ Any other binding agreements that list relevant ETP species concluded under this Convention.

ETP species also include those classified as 'out-of scope' (amphibians, reptiles, birds and mammals) that are listed in the IUCN (International Union for the Conservation of Nature) Redlist as vulnerable (VU), endangered (EN) or critically endangered (CE).[M] To be precautionary, the ETP classification should also include non 'out-of scope' taxa (i.e. fish and shellfish) listed as EN or CE.[S]

Fishery - FAO defines a fishery as a unit determined by an authority or other entity that is engaged in raising and/or harvesting fish. Typically, the unit is defined in terms of some or all of the following: people involved, species or type of fish, area of water or seabed, method of fishing, class of boats and purpose of the activities.[M]

Fishing mortality (*F*) - The rate at which animals are removed from the stock by fishing.[F]

Generation time (*G*) - The average age of a reproductive individual in an unexploited stock, consistent with the definition of Goodyear:[2]

where *a* is age, *A* is the oldest age in an unfished state, E_a is the maturity at age *a*, and N_a is the number per recruit alive at age *a* in the absence of fishing.

Habitat - The chemical and bio-physical environment, including biogenic structures, where fishing takes place.[M]

Harvest control rules (HCRs) - A set of well-defined pre-agreed rules or actions used for determining a management action in response to changes in indicators of stock status with respect to reference points.[M]

Harvest strategy - The combination of monitoring, stock assessment, harvest control rules and management actions.[M]

Likelihood - The definitions below can be based on quantitative assessment, plausible argument or expert judgment. (See Table SA9 on p. 128 of MSC Fisheries Certification Requirements v2.0.)

- Highly unlikely - less than 30% chance.[M]
- Unlikely - less than 40% chance.[M]
- Likely - 70% chance or greater.[M,S]
- Highly likely - 80% chance or greater.[M]

Limit reference point (LRP) - The point beyond which the state of a fishery and/or a resource is not considered desirable and which management is aiming to avoid.[M] To be considered appropriate, biomass LRPs should generally be no less than half of B_{MSY}, or half of an appropriate target reference point such as $B_{40\%}$.

Management system - The framework of processes and procedures used to ensure that an organisation can fulfil all tasks required to achieve its objectives. In a fisheries context includes agencies involved in the management of the fishery, the legislative framework within which the

[2] Goodyear, C.P. 1995. Red snapper in U.S. waters of the Gulf of Mexico. NMFS/SEFSC. Cited by Thompson, G. G., Mace, P. M., Gabriel, W. L., Low, L. L., Maccall, A. D., Methot, R. D., ... Witzig, J. F. (1998). Technical Guidance On the Use of Precautionary Approaches to Implementing National Standard 1 of the Magnuson- Stevens Fishery Conservation and Management Act.

fishery is undertaken and the core management measures implemented.[M] An appropriate management system uses the best available science to implement policies that minimize the risk of overfishing or damaging the ecosystem, taking into account species vulnerability along with scientific and management uncertainty.[S]

Management strategies or measures:

- *Measures* - Actions or tools in place within the management system that either explicitly manage impacts on the component or indirectly contribute to management of the component under assessment having been designed to manage impacts elsewhere.[M]
- *Partial strategy* - 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. It may not have been designed to manage the impact on that component specifically.[M]
- *Strategy or full strategy* - A cohesive and strategic arrangement which may comprise one or more measures, an understanding of how it/they work to achieve an outcome and which should be designed to manage impact on that component specifically. A strategy needs to be appropriate to the scale, intensity, and cultural context of the fishery and should contain mechanisms for the modification of fishing practices in light of identification of unacceptable impacts.[M]

Maximum sustainable yield (MSY) - The highest theoretical equilibrium yield that can be continuously taken (on average) from a stock under existing (average) environmental conditions without affecting significantly the reproduction process.[M]

Overfishing - A generic term used to refer to a level of fishing effort or fishing mortality such that a reduction of effort would, in the medium term, lead to an increase in the total catch; or, a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield on a continuing basis.[F]

- *Biological overfishing*: Catching such a high proportion of one or all age classes in a fishery as to reduce yields and drive stock biomass and spawning potential below safe levels. In a surplus production model, biological overfishing occurs when fishing levels are higher than those required for extracting the Maximum Sustainable Yield (MSY) of a resource and recruitment starts to decrease.[F]
- *Recruitment overfishing*: The rate of fishing above which the recruitment to the exploitable stock becomes significantly reduced. This is characterized by a greatly reduced spawning stock, a decreasing proportion of older fish in the catch, and generally very low recruitment year after year. Recruitment may lead to stock collapse if prolonged and combined with poor environmental conditions.[F]
- *Growth overfishing*: Occurs when too many small fish are being harvested too early through excessive fishing effort and poor selectivity (e.g., excessively small mesh sizes), and the fish are not given enough time to grow to the size at which maximum yield-per-recruit would be obtained from the stock. Reduction of fishing mortality among juveniles, or their outright protection, would lead to an increase in yield from the fishery. Growth overfishing occurs when the fishing mortality rate is above Fmax (in a yield-per-recruit model). This means that individual fish are caught before they have a chance to reach their maximum growth potential. Growth overfishing, by itself, does not affect the ability of a fish population to replace itself.[F]

- *Economic overfishing*: Occurs when a fishery is generating no economic rent, primarily because an excessive level of fishing effort is applied in the fishery. This condition does not always imply biological overfishing.[F]

Precautionary approach - Approach involving the application of prudent foresight, taking into account the uncertainties in fisheries systems and considering the need to take action with incomplete knowledge. The precautionary approach requires, inter alia: (i) consideration of the needs of future generations and avoidance of changes that are not potentially reversible; (ii) prior identification of undesirable outcomes and measures to avoid or correct them promptly; (iii) initiation of any necessary corrective measures without delay and on a timescale appropriate for the species' biology; (iv) conservation of the productive capacity of the resource where the likely impact of resource use is uncertain; (v) maintenance of harvesting and processing capacities commensurate with estimated sustainable levels of the resource and containment of these capacities when resource productivity is highly uncertain; (vi) adherence to authorized management and periodic review practices for all fishing activities; (viii) establishment of legal and institutional frameworks for fishery management within which plans are implemented to address the above points for each fishery, and (ix) appropriate placement of the burden of proof by adhering to the requirements above.[S,F]

Principle - A fundamental element, in the MSC's case, used as the basis for defining a well-managed and sustainable fishery.[M]

Productivity-Susceptibility Analysis (PSA) - This semi-quantitative approach examines several attributes of each species that contribute to or reflect its productivity or susceptibility, in order to provide a relative measure of the risk to the scoring element from fishing activities.[M]

Qualitative data - Data describing the attributes or properties that an object possesses. The properties are categorized into classes that may be assigned numeric values. However, there is no significance to the data values themselves, they simply represent attributes of the object concerned.[M]

Quantitative data - Data expressing a certain quantity, amount or range. Usually, there are measurement units associated with the data, e.g. metres, in the case of the height of a person. It makes sense to set boundary limits to such data, and it is also meaningful to apply arithmetic operations to the data.[M]

Recent stock assessment - As a rule of thumb, stock assessments or updates conducted within the last five years are considered to be recent. If the stock assessment is very out of date – as a rule of thumb, >10 years old – the stock status should be considered unknown and rated accordingly.[S]

Recruitment impairment - Situation where fishing activity impacts the stock—either through reduced abundance, changes in size, sex or age distribution, or reduction of reproductive capacity at age—to a degree that will diminish the growth and/or reproduction of the population over the long-term (multiple generations); or, the stock is below an appropriate limit reference point.[S]

Reference points - Reference points used to define management action in response to stock biomass, stock status, or fishing mortality. Appropriate reference points are designed with the goal of maintaining stock biomass at or above the point where yield is maximized (target reference points; TRPs) and safely above the point where recruitment is impaired (limit reference points; LRPs). Fishing mortality reference points should be designed with the goal of

ensuring that catch does not exceed sustainable yield and has a very low likelihood of leading to depletion of the stock in the future.[S]

Reliable data or information - Data produced or verified by an independent third party. Reliable data may include government reports, peer-reviewed science, audit reports, etc. Data are not considered reliable if significant scientific controversy exists over the data, or if data are old or otherwise unlikely to represent current conditions.[S]

Retained species - Species that are retained by the fishery (usually because they are commercially valuable or because they are required to be retained by management rules).[M]

Shark finning - The practice of removing any of the fins of a shark (including the tail) while at sea and discarding the remainder of the shark at sea.[M]

Species of concern - Species about which management has some concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species as endangered.[S]

Stakeholder - Any person or group (including governmental and non-governmental institutions, traditional communities, universities, research institutions, development agencies and banks, donors, etc.) with an interest or claim (whether stated or implied) which has the potential of being impacted by or having an impact on a given project and its objectives. Stakeholder groups that have a direct or indirect "stake" can be at the household, community, local, regional, national, or international level.[M]

Standard - A document established by consensus and approved by a recognised body that provides for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context.[M]

Stock - The living resources in the community or population from which catches are taken in a fishery. Use of the term stock implies that the particular population is a biologically distinct unit, i.e. not strongly linked to other populations through interbreeding, immigration, or emigration.[M,S] Some species form a single stock (e.g. southern bluefin tuna) while others are composed of several stocks (e.g. albacore tuna in the Pacific Ocean comprises separate Northern and Southern stocks).[F]

Stock assessment - An integrated analysis of information to estimate the status and trends of a population against benchmarks such as reference points.[M]

Strategy - A cohesive and strategic arrangement which may comprise one or more measures, an understanding of how it/they work to achieve an outcome and which should be designed to manage impact on that component specifically. A strategy needs to be appropriate to the scale, intensity and cultural context of the fishery and should contain mechanisms for the modification fishing practices in the light of the identification of unacceptable impacts.[M]

Susceptibility - A stock's capacity to be impacted by the fishery under consideration, depending on factors such as the stock's likelihood to be captured by the fishing gear.[S]

Sustainable level (of fishing mortality) - A level of fishing mortality that will not reduce a stock below the point where recruitment is impaired, i.e., above F reference points, where defined. The F limit reference points should be around either FMSY or $F_{35\%}$ to $F_{40\%}$ for moderately productive stocks; low productivity stocks like rockfish and sharks require F in the range of F50–60% or lower. Higher F values require a strong scientific rationale. The F reference points are limit reference points, so buffers should be used to ensure that fishing mortality does not

exceed these levels. Where F is unknown but MSY is estimated, fishing mortality at least 25% below MSY is considered a sustainable level (for fisheries that are at or above BMSY).

Target reference point (TRP) - The point which corresponds to a state of a fishery and/or resource which is considered desirable and which management is trying to achieve.[M] To be considered appropriate, biomass TRPs should generally not be lower than B_{MSY} or $B_{35\%}$ to $B_{40\%}$.[S]

Tools - Mechanisms for implementing fishery management strategies. For example, total allowable catches, mesh regulations, closed areas, etc. could be used to implement harvest control rules.[M]

Uncertainty - Lack of perfect knowledge of many factors that affect stock assessments, estimation of biological reference points and management, and the consequence of this lack of perfect knowledge.[M]

Vulnerable marine ecosystem (VME) - VMEs have features that are physically or functionally fragile, and the most vulnerable are both easily disturbed and are very slow to recover. VMEs include seamounts, hydrothermal vents, cold water corals and sponge fields.[F] MSC also provides guidance on identifying VMEs in GSA3.13.3.2 (MSC FCR v2.0, pp. 435-436).