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Global Standard for Responsible Supply of Marine Ingredients

Fishery Assessment Methodology and Template Report V2.0

Fishery Under Assessment	**Japanese Sardine (*Sardinops sagax* – synonym *Sardinops melanostictus)***
Date	**September 2019**
Assessor	**Jim Daly**

Application details and summary of the assessment outcome				
Name: Mitsui Corporation				
Address: Plants at Ikeshita Sangyo Co. Ltd; Kushiro High-Meal Ltd (Hokkaido Island)				
Country: Japan		**Zip:**		
Tel. No.:		**Fax. No.:**		
Email address:		**Applicant Code**		
Key Contact: Mr Kohta Suzuki		**Title:** Director, Oils & Fats, Staple Food Project Division		
Certification Body Details				
Name of Certification Body:		SAI Global Ltd		
Assessor Name	**Peer Reviewer**	**Assessment Days**	**Initial/Surveillance/Re-approval**	**Whole fish/ By-product**
Jim Daly	Conor Donnelly	3	Re-approval	Whole fish
Assessment Period	2018			

Scope Details	
Management Authority (Country/State)	Ministry of Agriculture, Forestry and Fisheries (MAFF) Japan
Main Species	Japanese Sardine (*Sardinops sagax – synonym Sardinops melanostictus)*
Fishery Location	Northwest Pacific FAO 61
Gear Type(s)	Square fishing net attached to a pole, purse seines
Outcome of Assessment	
Overall Outcome	PASS
Clauses Failed	NONE
Peer Review Evaluation	PASS
Recommendation	APPROVE

Assessment Determination

The Ministry of Agriculture, Forestry and Fisheries (MAFF) is responsible for managing Japan's fisheries. A Basic Plan for Fisheries was established in March 2007 by renewal of the first Basic Plan (2002) and is based on Japan's Fisheries Law. Long-term objectives for fisheries management and conservation are set out in the Ministry's Fisheries Act No. 267 1949. This law covers all Japanese fisheries.

One of the main objectives of the 2007 Plan is to enhance stock status and promote international resource management. Japan's Fisheries Research and Education Agency (FRA) was established on April 1, 2016 through a merger of the Fisheries Research Agency and the National Fisheries University.

Japan is a member of and contributes data to several Regional Fisheries Management Organisations (RFMO's) in the assessment area. These include the Asia-Pacific Fishery Commission (APFIC) and the newly created (2015) North Pacific Fisheries Commission (NPFC).

Scientists have identified two stocks of Japanese sardine (Common names: South American Pilchard; Japanese sardine, *maiwashi* (*Sardinops sagax* - synonym *Sardinops melanostictus*)) in the waters around Japan, a Pacific Ocean stock and a Tsushima Warm Current stock. Although assessed separately, the stocks are essentially managed together with a single TAC set. Harvest volumes, body length, weight and age are sampled by FRA scientists. Egg, larval, acoustic and pelagic trawl surveys are carried out to enable robust stock assessments to be undertaken.

To determine the stock status of Japanese sardine, FRA scientists use cohort (VPA) analysis to estimate biomass at age and evaluate spawning stock biomass (SSB) against a biomass limit reference point (Blim). The chosen Blim was the estimated SSB in 1996, a level below which recruitment is thought to be poor. Model results are used to generate Allowable Biological Catch (ABC) for the stock, which in turn is used to set the total allowable catch (TAC). The assessment provides an indication of the volume of fishery removals appropriate for the current stock status.

A limit reference point (B_{lim}) for Spawning Stock Biomass (SSB) of Japanese Sardine is set at 221,000t. In 2015 the SSB was estimated to be 606,000t, well above Blim; the most recent (2016) estimate of SSB was 891,000t. Because recruitment for sardine varies greatly from year to year, stock assessment scientists consider high uncertainty when selecting a scenario. Managers then set the TAC, which is to be set no higher than the ABC recommended by stock assessment scientists. There is also a Bban of 22,000 tons, a reference point below which the fishery is closed. Assessments provide estimates of the status of the stock relative to a reference point or proxy.

Resource and fisheries management in Japan consists of:

- Input control, where fishing pressure is controlled at the outset.

- Technical control, which exhibits special management effects such as juvenile fish protection.
- Output control, where fishing pressure is controlled at the end through setting of the TAC (Total Allowable Catch).

Total fishery removals of this species do not regularly exceed the level indicated or stated in the stock assessment, suggesting that the TAC may not always effectively limit harvests. The purse seine fishery is essentially multispecies, some of the other target species, such as Japanese anchovy are at low abundance levels.

Evidence has been if removals of Japanese anchovy *Engraulis japonicus* by the fishery in the assessment area are considered by scientific authorities to be negligible. For anchovy the comparative lack of scientific information on the status of the population in the assessment area means that a risk-assessment style approach must be taken. The species was assessed using the risk-based Productivity, Susceptibility Analysis (PSA) as per IFFO-RS v 2.0 procedures for Category D species and passed this risk-based assessment (Table D1). Japanese anchovy is currently listed (IUCN website, accessed 25.09.19) as a species of least concern.

Data on by-catch in the sardine fishery, both large whale and small cetacean, comes from reporting by individual fishermen or fishery cooperative unions which are then reported by prefecture governments to the FRA. The Fisheries Agency (FAJ, Department within MAFF) maintains a Red List of ETP species for marine organisms but has not yet prescribed mortality limits. Potential habitat interactions are considered in the management decision-making process.

Purse seine fisheries operate in areas specified by their permits. The gear is operated within upper layers of the water column and generally does not contact bottom habitat. Habitat impacts are therefore minimal. If the fishery is known to interact with physical habitats, there are measures in place to minimise and mitigate negative impacts.

FRA scientists identify sardine and anchovy as major prey species for three species of whales. A decadal regime shift in the North-West Pacific results in regular large fluctuations in biomass of all pelagic species at different times. To reduce the effect of this regime shift on the ecosystem, fisheries are managed through the Regime Concept. This has the goal of providing, *inter alia*, management rules on target species switching and consideration of mismatches between life spans of fishing fleets and ecosystem regimes.

Information on sardine distribution contributes to the FRA's ecosystem approach to fisheries management (EAFM) as harvest control rules are adapted to changes in sardine distribution and productivity to reduce the negative effects of removals from the fishery on the ecosystem. The Hokkaido National Fisheries Research Institute (HNF) perform several research tasks in the waters

around Hokkaido (assessment area) including studies on relationships between fisheries (including pelagic fisheries) and marine ecosystems.

Research into feeding ecology and ecosystem studies is being undertaken in Japan but this seems to be focussed on the impact of cetacean predation on commercial fish stocks rather than on the impact of commercial fisheries on the ecosystem. Management of juvenile sardine (*Shirasu*) fishery is somewhat distinct from management of the fisheries targeting older fish; open and closed fishing periods may be set for *Shirasu* specifically. If one or more of the species identified during species categorisation plays a key role in the marine ecosystem, additional precaution is included in recommendations relating to total permissible fishery removals.

Japanese sardine has not yet been assessed for the IUCN Red List and is not on the current list of CITES endangered species (websites accessed 25.09.19)

Japanese sardine is approved by the assessment team for the production of fishmeal and fish oil under the IFFO-RS v 2.0 whole fish standard.

Peer Review Comments

Notes for On-site Auditor

Note: This table should be completed for whole fish assessments only.

General Results

General Clause	Outcome (Pass/Fail)
M1 - Management Framework	PASS
M2 - Surveillance, Control and Enforcement	PASS
F1 - Impacts on ETP Species	PASS
F2 - Impacts on Habitats	PASS
F3 - Ecosystem Impacts	PASS

Species-Specific Results

Category	Species	% landings	Outcome (Pass/Fail)	
Category A	Sardine (*Sardinops sagax* - synonym *Sardinops melanostictus*	95	A1	PASS
			A2	PASS
			A3	PASS
			A4	PASS
Category B				
Category C				
Category D	Anchovy *Engraulis japonicus*	5	PASS	

[List all Category A and B species. List approximate total %age of landings which are Category C and D species; these do not need to be individually named here]

HOW TO COMPLETE THIS ASSESSMENT REPORT

This assessment template uses a modular approach to assessing fisheries against the IFFO RS standard.

Whole Fish

The process for completing the template for a **whole fish** assessment is as follows:

1. ALL ASSESSMENTS: Complete the Species Characterisation table, to determine which categories of species are present in the fishery.
2. ALL ASSESSMENTS: Complete clauses M1, M2, M3: Management.
3. IF THERE ARE CATEGORY A SPECIES IN THE FISHERY: Complete clauses A1, A2, A3, A4 for **each** Category A species.
4. IF THERE ARE CATEGORY B SPECIES IN THE FISHERY: Complete the Section B risk assessment for **each** Category B species.
5. IF THERE ARE CATEGORY C SPECIES IN THE FISHERY: Complete clause C1 for **each** Category C species.
6. IF THERE ARE CATEGORY D SPECIES IN THE FISHERY: Complete Section D.
7. ALL ASSESSMENTS: Complete clauses F1, F2, F3: Further Impacts.

A fishery must score a pass in **all applicable clauses** before approval may be recommended. To achieve a pass in a clause, the fishery/species must meet **all** the minimum requirements.

By-products

The process for completing the template for **by-product raw material** is as follows:

1. ALL ASSESSMENTS: Complete the Species Characterisation table with the names of the by-product species and stocks under assessment. The '% landings' column can be left empty; all by-products are considered as Category C and D.
2. IF THERE ARE CATEGORY C BYPRODUCTS UNDER ASSESSMENT: Complete clause C1 for **each** Category C by-product.
3. IF THERE ARE CATEGORY D BYPRODUCTS UNDER ASSESSMENT: Complete Section D.
4. ALL OTHER SECTIONS CAN BE DELETED. Clauses M1 - M3, F1 - F3, and Sections A and B do not need to be completed for a by-product assessment.

By-product approval is awarded on a species-by-species basis. Each by-product species scoring a pass under the appropriate section may be approved against the IFFO RS Standard.

SPECIES CATEGORISATION

The following table should be completed as fully as the available information permits. Any species representing more than 0.1% of the annual catch should be listed, along with an estimate of the proportion of the catch each species represents. The species should then be divided into Type 1 and Type 2 as follows:

- **Type 1 Species** can be considered the 'target' or 'main' species in the fishery. They make up the bulk of annual landings and are subjected to a detailed assessment.

- **Type 2 Species** can be considered the 'bycatch' or 'minor' species in the fishery. They make up a small proportion of the annual landings and are subjected to relatively high-level assessment.

Type 1 Species must represent 95% of the total annual catch. Type 2 Species may represent a maximum of 5% of the annual catch (see Appendix B).

Species which make up less than 0.1% of landings do not need to be listed (NOTE: ETP species are considered separately). The table should be extended if more space is needed. Discarded species should be included when known.

The 'stock' column should be used to differentiate when there are multiple biological or management stocks of one species captured by the fishery. The 'management' column should be used to indicate whether there is an adequate management regime specifically aimed at the individual species/stock. In some cases, it will be immediately clear whether there is a species-specific management regime in place (for example, if there is an annual TAC). In less clear circumstances, the rule of thumb should be that if the species meets the minimum requirements of clauses A1-A4, an adequate species-specific management regime is in place.

NOTE: If any species is categorised as Endangered or Critically Endangered on the IUCN Red List, or if it appears in the CITES appendices, it **cannot** be approved for use as an IFFO RS raw material. This applied to whole fish as well as by-products.

TYPE 1 SPECIES (Representing 95% of the catch or more)
Category A: Species-specific management regime in place.
Category B: No species-specific management regime in place.

TYPE 2 SPECIES (Representing 5% OF THE CATCH OR LESS)
Category C: Species-specific management regime in place.
Category D: No species-specific management regime in place.

Common name	Latin name	Stock	% of landings	Management	Category
Sardine	*Sardinops sagax*	FAO 61	95	Japan	A
Anchovy	*Engraulis japonicus*	FAO 61	5	Japan	D

MANAGEMENT

The two clauses in this section relate to the general management regime applied to the fishery under assessment. A fishery must meet all the minimum requirements in every clause before it can be recommended for approval.

M1	Management Framework – Minimum Requirements		
	M1.1	There is an organisation responsible for managing the fishery	PASS
	M1.2	There is an organisation responsible for collecting data and assessing the fishery	PASS
	M1.3	Fishery management organisations are publically committed to sustainability	PASS
	M1.4	Fishery management organisations are legally empowered to take management actions	PASS
	M1.5	There is a consultation process through which fishery stakeholders are engaged in decision-making	PASS
	M1.6	The decision-making process is transparent, with processes and results publically available	PASS
		Clause outcome:	**PASS**

Evidence:

M1.1

The Ministry of Agriculture, Forestry and Fisheries (MAFF) is responsible for managing Japan's Fisheries. The Japanese fisheries management system is based primarily on the powers contained in the Fisheries Law (1949, as revised in 1962) of Japan. MAFF administer the law and are responsible for preserving and managing marine biological resources and fisheries production activities.

A Basic Plan for Fisheries was established in March 2007 by renewal of the first Basic Plan (2002) based on the Fisheries Law. One of the main objectives of 2007 Plan was to enhance stock status and promote international resource management. It also sought to strengthen fisheries business management and vitalize fishery industries to secure sustainable and internationally competitive fisheries as well as stable supply of fish and fishery products for the nation. In response to new Medium- to Long-term Objectives announced by MAFF (FY2016-FY2020) the FRA has formulated and published the Fourth Medium- to Long-Term Plan.

The FRA, through MAFF, will seek to contribute to the revival of Japan as a nation of fisheries by maximizing R&D outcomes through prioritizing research topics and by refining education content.

There is an organisation responsible for managing the fishery

M1.2:

Japan's Fisheries Research and Education Agency (FRA) was established on April 1, 2016 through a merger of the Fisheries Research Agency and the National Fisheries University. The Fisheries Agency (FAJ) is the Department within MAFF responsible for preserving and managing marine biological resources and fishery production activities. The FAJ maintains several research institutes, such as the National Research Institute of Far Seas fisheries (NRIFSF).

The Fisheries Research Agency (FRA), an incorporated administrative agency, conducts a wide range of research and development activities on fisheries, from basic research and application to practical use. The FRA conduct annual stock assessments. The FRA aims to maximize research and development (R&D) outcomes as the only comprehensive fisheries R&D organization in Japan. The Hokkaido National Fisheries Research Institute performs research and development on fisheries activities in the area around Hokkaido (assessment area) and nearby subarctic regions.

The FRA has independent legal status from the Fisheries Agency, the primary managing body. Both FRA and FAJ are governmental agencies, so scientific advice provided by the FRA should not be considered completely independent.

Among various kinds of research activities conducted by these institutes, the following areas of technology are particularly highlighted:

- Energy saving
- Satellite vessel monitoring
- Enhancement of efficiency and profitability of fisheries
- Improvement of fishing grounds and nursery areas of aquatic living resources
- Promotion of stock enhancement and aquaculture including those of bluefin tunas
- Development and promotion of bioenergy.

There is an organisation responsible for collecting data and assessing the fishery

M1.3:
Stock enhancement and protection/restoration of the aquatic environment are promoted, mainly by the Japan Sea-Farming Association (JASFA) and prefectural sea-farming centres, by releasing billions of seedlings and the preservation of nursery areas such as sea grass or seaweed beds. In 2003 FRA expanded also to take over duties of JASFA and the Japan Marine Resource Research Centre (JAMARC) for further enhanced and comprehensive research and stock enhancement activities.

Japan's Minister recently announced (2019 Our Oceans Conference Commitments) its commitment to strengthen the capacity of maritime law enforcement through cooperation with UNODC (United Nations Office on Drugs and Crime). Japan also announced its commitment to implement capacity building measures in the domain of a free, open, and sustainable ocean within all Forum Islands Countries (FICs, 16 Member States of the Pacific Island Forum, includes Australia and New Zealand). The purpose of this support is to assist FICs to ensure free and open maritime order based on the rule of law, and sustainability of ocean resources in the region.

Long-term objectives for fisheries management and conservation are set out in the Fisheries Act No. 267 1949. This law covers all Japanese fisheries. Its purpose is to ensure long-term utilization and sustainability of fisheries and to provide means and organisations to ensure objectives are met. There

are also conservation and sustainable use policies that incorporate the precautionary and ecosystem approaches into fisheries management decisions.

Article 58 of the Fisheries Act outlines the conditions under which permits are issued which includes a reference to the biological status of stocks which are taken into consideration:

'In the case where the Agriculture, Forestry and Fisheries Minister permissions a specified fishery or approves business commencement of the designated fishery, he/she shall decide and publicly notify, for said designated fishery in advance, the numbers of boats to be permissioned or to be approved on business commencement by gross tonnage or the numbers of boats by gross tonnage and by fishing area or by fishing period (the numbers of mother ships by gross tonnage or the numbers of mother ships by gross tonnage and by fishing area or by fishing period, and the numbers of boats by type of the self-navigating boats belonging to the same fleet as each mother ship and by gross tonnage, in the case of the mother ship type fishery) and the periods during which the application for a permission or an approval of business commencement should be filed, considering the number of the persons who operate said specified fishery, managements and other circumstances, to such an extent that the protection of reproduction of aquatic animals and plants, fisheries adjustment and other public interest will not be impaired'..

Fishery management organisations are publicly committed to sustainability

M1.4:
The Fisheries Resources Conservation Law (1951) provides the basic framework for conservation of fisheries resources in the coastal waters of Japan. In 2001, Japan established the Basic Law on Fisheries by renewal of the Promotion Law for Coastal Fisheries (1963). The new law seeks to secure sustainable utilization of fishery resources, stable supply of fish and fishery products for the nation and sound development of Japanese fishing industries, including not only the fishing sector, but also processing and distribution sectors. MAFF administer the law.

Japan is Party to the 1982 United Nations Convention on the Law of the Sea (UNCLOS) and the 1995 United Nations Fish Stocks Agreement (UNFSA) since June 1996 and August 2006 respectively. Since June 2000, Japan is Party to the 1993 FAO Compliance Agreement.

Fishery management organisations are legally empowered to take management actions

M1.5:
The Fisheries Agency (FAJ) regularly undertakes both formal and informal consultation with fishing industry stakeholders and other groups. The Fisheries Policy Council, made up of various stakeholders, meets regularly to discuss fisheries matters; meeting minutes are widely available. Assessments are subject to external peer review. Allowable Biological Catch (ABC) options are reviewed with the assistance of a group of external experts including University researchers.

FRA has entered into a formal collaboration with Global Fishing Watch, and the Australian National Centre for Ocean Resources and Security (ANCORS) to investigate illegal, unreported and unregulated (IUU) fishing and to strengthen transparency and governance of fisheries within the region. Partners in the collaboration intend to share relevant open public data and analytical methodologies, including vessel movement data, catch data and satellite imagery; collaborate on relevant research activities, and publish research outcomes to advance international understanding on IUU fishing and its impacts.

There is a consultation process through which fishery stakeholders are engaged in decision-making

M1.6

Japan is a member of and contributes data to several Regional Fisheries Management Organisations (RFMO's) in the assessment area, including the Asia-Pacific Fishery Commission (APFIC) and the North Pacific Fisheries Commission (NPFC). The NPFC was founded (2015) following the signing of the Convention on the Conservation and Management of High Seas Fisheries Resources in the North Pacific Ocean. The NPFC recognises Japanese sardine Sardinops *sagax/melanostictus* as one of eight 'priority species. The sardine fishery in international waters of the Central Pacific, Japan Sea and Southern areas of the Okhotsk Sea and Bering Sea fall under the remit of this RFMO. The Commission is supported by a Scientific Committee (SC) which includes Small Scientific Committees on two target species in the High Seas Fisheries: Pacific saury and Chub Mackerel.

A list of Conservation and Management Measures (CMM); updated in November 2018, is published on NPFC's website and includes obligations for vessel transhipments and rules for the protection of Vulnerable Marine Ecosystems (VME's).

Within Japan's EEZ the Fisheries Agency (FAJ) provides information to stakeholders on conservation and management measures for all target species, through MAFF's website. Currently FAJ's website contains information for the consumer on the presence of radioactive materials in fishery products. The FAJ website, through MAFF's website, provides links to Conservation and Management Measures (CMM) as laid down in the Fisheries Act.

The decision-making process is transparent, with processes and results publicly available

R1-R11; R29-R30

References p31

Standard clauses 1.3.1.1, 1.3.1.2

M2	Surveillance, Control and Enforcement - Minimum Requirements		
	M2.1	There is an organisation responsible for monitoring compliance with fishery laws and regulations	PASS
	M2.2	There is a framework of sanctions which are applied when laws and regulations are discovered to have been broken	PASS
	M2.3	There is no substantial evidence of widespread non-compliance in the fishery, and no substantial evidence of IUU fishing	PASS
	M2.4	Compliance with laws and regulations is actively monitored, through a regime which may include at-sea and portside inspections, observer programmes, and VMS.	PASS
		Clause outcome:	**PASS**

Evidence

M2.1:

The Fisheries Agency (FAJ) conduct on-board inspections of foreign fishing boats operating in Japan's EEZ based on bilateral agreements; making sure they comply with license terms. In addition, boundary waters are patrolled for illegal fishing.

A recent statement by Minister Akamatsu on direction of future fishery management confirmed that Japan will continue to play its leading role at ICCAT and other RFMOs in preventing over-fishing by adopting effective conservation and management measures, based on scientific stock assessments, and by establishing reliable monitoring systems to ensure compliance by RFMO member countries with adopted measures. Japan will also continue efforts to strengthen collaboration and cooperation with developing countries toward this end. Japan is in a position not to import any fishery products from fish not caught in compliance with RFMO rules.

For domestic fishers Japan's Ministry is considering the introduction of an income assurance system for those actively participating in proper fishery management.

There is an organisation responsible for monitoring compliance with fishery laws and regulations

M2.2:

There are severe penalties for anyone not complying or to be found in violation of the Fisheries Act and permit conditions. Penalties include imprisonment, fines, permit removals or suspensions and confiscation of the catch, fishing boat or gear used. The corresponding market value of the illegal catch and/or gear used may be collected.

M2.3:

The number of arrests for violation of fisheries laws and regulations stood at 1,856 in 2015 (1,703 in coastal waters and 153 in inland waters) (Source MAFF, 2017). In 2016, the Fisheries Agency captured 6 foreign fishing boats and conducted 86 on-board inspections; the number of confiscations of illegal fishing gear (gill nets, crab traps, etc.) totalled 14. In 2017, the Fisheries Agency conducted 24 on-board inspections and captured 5 foreign fishing vessels; and the number of confiscations of illegal fishing gear totalled 24.

The government stepped up regulations and increased fines on foreign fishing boats in the light of the problem of Chinese coral fishing boats illegally operating inside Japan's EEZ. As a result, illegal coral fishing has been on a sharp decline since the end of 2014. In the East China Sea advanced purse seine fishing is practiced more widely in addition to conventional trawl fishing. In waters surrounding Yamato Ridge of the Sea of Japan, illegal operations conducted by fishing vessels belonging to North Korea, etc. have been on the increase. In response, vessels for fishery inspection are deployed on a priority basis to remove illegal vessels by taking rigorous actions such as the use of water cannon. As a result, in 2017, the number of cases in which an expulsion warning, etc. was issued to foreign fishing vessels stood at 5,191.

The Fisheries Agency "Fisheries Enforcement Headquarters" was established in January 2018 with the Director-General of the Fisheries Agency as the Direct General of the Fisheries Enforcement Headquarters. Illegal operations will be strictly dealt with, for example, by conducting intensive surveillance in sea areas in which, and at times during which, illegal operations occur frequently.

There is no substantial evidence of widespread non-compliance in the fishery, and no substantial evidence of IUU fishing.

M2.4:

Management controls are implemented using Conservation and Management Measures (CMM) and Resolutions. Most information on compliance comes from port monitoring, observer programs and vessel monitoring systems. In Japan, authorized fisheries supervisors are engaged in regulatory activities in cooperation with the coast guard and police officers while fishers belonging to fisheries cooperatives patrol fishing grounds and report illegal fishing.

As a countermeasure against the poaching of a marine resource in Mutsu Bay (Aomori Prefecture) a mechanism was developed to automatically trigger alarms for relevant fisheries cooperatives, etc. when artificial intelligence identified poaching vessels by referring to images sent from 15 surveillance cameras. This enabled real time surveillance 24 hours a day and 365 days a year and is expected to lead to the recovery of the marine resource.

Compliance with laws and regulations is actively monitored, through a regime which may include at-sea and portside inspections, observer programmes, and VMS.

R3-R5; R11-R16

References p32
Standard clause 1.3.1.3

CATEGORY A SPECIES

The four clauses in this section apply to Category A species. Clauses A1 - A4 should be completed for **each** Category A species. If there are no Category A species in the fishery under assessment, this section can be deleted. A Category A species must meet the minimum requirements of all four clauses before it can be recommended for approval. If the species fails any of these clauses it should be re-assessed as a Category B species.

Species Name		**Japanese Sardine (South American Pilchard) *Sardinops sagax***	
A1	**Data Collection - Minimum Requirements**		
	A1.1	Landings data are collected such that the fishery-wide removals of this species are known.	PASS
	A1.2	Sufficient additional information is collected to enable an indication of stock status to be estimated.	PASS
		Clause outcome:	**PASS**

Evidence

A1.1:

Stock designations are based on spawning times and areas, as observed from research surveys conducted around Japan. The Pacific stock spawns November to June from Shikoku to the Kanto region, while the Tsushima stock spawns January to June from around Nagasaki to Toyama prefecture. Although assessed separately, the stocks are essentially managed together.

Age specific catch data are collected by the FRA. Harvest volumes from major ports are recorded and body length, weight and age are sampled. Egg and larval surveys are carried out; acoustic and trawl surveys are also carried out.

Catch data are provided (annually, one year in arrears) by FRA Scientists. The client has provided an extract of a report (Japanese) from FRA Administrative Agency 20190227 Scientists. Landings of sardine and anchovy (sample period unknown) were provided:

Table 1: East Hokkaido Island landings (2017) **R16**

Port	Sardine (tons)	Anchovy (tons)
Hiroo	28,266t	0
Kushiro City	71,163t	0

Sardine landed into both ports from the assessment area are used to manufacture fishmeal by the client.

Landings data are collected such that the fishery-wide removals of this species are known.

A1.2:

To determine stock status, assessment scientists use cohort analysis to estimate biomass at age and evaluate spawning stock biomass (SSB) against a biomass limit reference point (B_{lim}). The chosen B_{lim} was the estimated SSB in 1996, a level below which recruitment is thought to be poor.

The cohort (VPA) analysis is adjusted using both fishery independent and dependent information. Key sources of input data include total landings, numbers of fish caught by age and year (based on body length composition in survey catches and market landings), egg production (based on research

surveys), a recruitment index (based on surveys of juveniles), and fish distributions (based on pelagic fish surveys).

Purse seine vessel CPUE is used as an abundance indicator. Pelagic fish surveys appear to be fishery-independent and may include adults, but survey data are also used to determine fish distributions.

The stock assessment model is run with varying catch scenarios and accounts for uncertainty in recruitment through resampling, where each catch scenario is run 1,000 times. Resampling results are compared to results from the model that does not consider uncertainty, to confirm that outputs are similar. Model parameters are adjusted as new information is obtained, for example from more recent research surveys. The model does not consider climatic covariates. Model results are used to generate Allowable Biological Catch (ABC) for the stock, which in turn is used to set the total allowable catch.

To estimate the ABC, FRA Scientists model three scenarios (Tables 2,3):

- Maintaining harvest at the current rate (catch rate = **Fcurrent**),
- Maintaining current SSB (catch rate = **Fmed**)
- Increasing SSB to SSB30%SPR (catch rate = **F30%SPR**).

Four parameters: Fishing mortality rate, Exploitation rate (catch divided by stock size), SSB and ABC are estimated for each scenario. Within each scenario, a limit and precautionary target (0.8 of limit) is provided for fishing mortality and exploitation rates. The target value is intended to account for uncertainty in stock projections.

Based on management objectives for that year, ABC_{lim} and ABC_{target} are selected from one of the scenarios. Because recruitment for sardine varies greatly from year to year, stock assessment scientists consider high uncertainty when selecting a scenario. Managers then set the TAC, which is to be set no higher than the ABC recommended by stock assessment scientists.

The FRA has independent legal status from the Fisheries Agency, the primary managing body. Both FRA and FAJ are governmental agencies, so scientific advice provided by the FRA should not be considered completely independent. Scientists at academic institutions may provide feedback on stock assessments, but in general, independent scientific input into the management process appears limited.

Sufficient additional information is collected to enable an indication of stock status to be estimated.

R4-R5; R14-R17

References p32

Standard clause 1.3.2.1.1

A2	Stock Assessment - Minimum Requirements		
	A2.1	A stock assessment is conducted at least once every 3 years (or every 5 years if there is substantial supporting information that this is sufficient for the long-term sustainable management of the stock) and considers all fishery removals and the biological characteristics of the species.	PASS
	A2.2	The assessment provides an estimate of the status of the biological stock relative to a reference point or proxy.	PASS
	A2.3	The assessment provides an indication of the volume of fishery removals which is appropriate for the current stock status.	PASS
	A2.4	The assessment is subject to internal or external peer review.	PASS
	A2.5	The assessment is made publically available.	PASS
		Clause outcome:	**PASS**

Evidence

A2.1:

FRA conduct annual stock assessments. Compared to some other Japanese stock assessments, sardine assessments are relatively detailed and documented. The stock assessment model is run with varying catch scenarios and accounts for uncertainty in recruitment through resampling, where each catch scenario is run 1,000 times. Resampling results are compared to results from the model that does not consider uncertainty, to confirm that outputs are similar. Model parameters are adjusted as new information is obtained, for example from more recent research surveys. The model does not consider climatic covariates. Model results are used to generate the allowable biological catch (ABC) for the stock, which in turn is used to set the total allowable catch (TAC)

A stock assessment is conducted at least once every 3 years.

A2.2-A2.3:

A limit reference point (B_{lim}) for Spawning Stock Biomass (SSB) is set at 221,000t. In 2015 the SSB was estimated to be 606,000t, well above B_{lim}; the most recent (2016) estimate of SSB was 891,000 t. Tables 2, 3 show calculated ABC's for all three catch scenarios (2017 and 2018 fishery, Yukami et al 2017; Furuichi et al 2018). A quota of 800,000t was awarded in 2018 (R18).

The stock is currently above PRI (Biomass level at Potential for Impairment of future Recruitment) and is potentially recovering. The FRA stock assessment does not include official target reference points but mentions a management goal of maintaining current SSB. There is currently no stated objective to rebuild the stock to an official target reference point (such as B_{high},).

Modelled age composition data indicate that recruitment has been strong in recent years, estimated proportions of age 2 and 3 fish have increased since 2011. Although SSB is not very high compared to historical abundances, recruitment appears to be improving.

It is also worth noting that environmental regimes and fishers' behaviour have historically affected stock abundance. There are no regulations explicitly banning discards, but discards are generally

minimal in Japanese purse seine fisheries as most species have some value (e.g. for fishmeal) and discarding slows down fishing operations on the vessel. There is no evidence that discarding issues affect the stock.
The assessment provides an estimate of the status of the biological stock relative to a reference point or proxy.
The assessment provides an indication of the volume of fishery removals which is appropriate for the current stock status.

A2.4:
The Fisheries Agency regularly undertakes both formal and informal consultation with fishing industry stakeholders and other groups. The Fisheries Policy Council, made up of various stakeholders, meets regularly to discuss fisheries matters; minutes are widely available.

Allowable Biological Catch (ABC) options are reviewed with the assistance of a group of external experts including University researchers.

Japan is a member of and contributes data to several Regional Fisheries Management Organisations (RFMO's) in the assessment area, including the Asia-Pacific Fishery Commission (APFIC) and the North Pacific Fisheries Commission (NPFC).

Assessments are subject to internal or external peer review.

A2.5:
The Fisheries Agency (FAJ) provides information to stakeholders on conservation and management measures for all target species, through MAFF's website.

Assessments are made publicly available.
R5, R9-R10; R14-R17

References p32

Standard clause 1.3.2.2, 1.3.2.1.2, 1.3.2.1.4

Table 2: Yukami et al (2017) Catch scenarios and ABC to maintain stock above B_{lim}.
Assessment results are available online in Japanese **R14**

Catch scenarios: 1. Maintain current fishing pressure (Fcurrent); 2. Increase SSB (F30%SPR); 3. Maintain SSB (Fmed)		**Fishing mortality F** (compared with current mortality, Fcurrent)	**Catch ratio** (%)	**2017 ABC Allowable Biological Catch** (ABC) ktons	**Blimit = 221kton** Projected broodstock after 5 years kton
漁獲シナリオ（管理基準）	Target/ Limit	F 値（Fcurrent との比較）	漁獲割合（%）	2017 年 ABC（千トン）	Blimit=221 千トン 親魚量 5 年後（千トン）
現状の漁獲圧の維持*（Fcurrent）	Target	0.26（0.80Fcurrent）	16	467	2,666
	Limit	0.32（1.00Fcurrent）	20	566	2,144
親魚量の増大*（F30%SPR）	Target	0.33（1.02Fcurrent）	20	577	2,094
	Limit	0.41（1.28Fcurrent）	24	694	1,588
親魚量の維持*（Fmed）	Target	0.35（1.10Fcurrent）	21	612	1,933
	Limit	0.44（1.37Fcurrent）	26	735	1,437

SPR Spawning Potential Ratio. The number of eggs that could be produced by an average fish recruiting to a fished stock divided by the number of eggs that could be produced by an average recruit in an unfished stock.

Table 3: Furuichi et al (2018) ABC in Ktons) Catch scenarios to maintain stock above Blim Assessment results are available online in Japanese. **R15**

漁獲シナリオ（管理基準）	Target/ Limit	2018 年 ABC（千トン）	漁獲割合（%）	F 値（現状の F 値からの増減%）	2023 年の親魚量（千トン）（80%区間）	確率評価（%）	
						2023 年に 2016 年親魚量を維持	2023 年に Blimit を維持
現状の漁獲圧の維持*（Fcurrent）	Target	400	16	0.21（－20%）	2,996（1,257～5,171）	97	100
	Limit	486	19	0.26（±0%）	2,370（986～4,119）	92	100
親魚量の増大*（F30%SPR）	Target	569	23	0.31（＋21%）	1,860（764～3,255）	85	100
	Limit	682	27	0.39（＋51%）	1,310（526～2,316）	66	100
親魚量の維持*（Fmed）	Target	588	24	0.32（＋26%）	1,756（717～3,077）	82	100
	Limit	704	28	0.41（＋57%）	1,220（487～2,160）	61	100

A3	Harvest Strategy - Minimum Requirements		
	A3.1	There is a mechanism in place by which total fishing mortality of this species is restricted.	PASS
	A3.2	Total fishery removals of this species do not regularly exceed the level indicated or stated in the stock assessment. Where a specific quantity of removals is recommended, the actual removals may exceed this by up to 10% ONLY if the stock status is above the limit reference point or proxy.	PASS
	A3.3	Commercial fishery removals are prohibited when the stock has been estimated to be below the limit reference point or proxy (small quotas for research or non-target catch of the species in other fisheries are permissible).	PASS
		Clause outcome:	**PASS**

Evidence:

A3.1:

Resource and fisheries management in Japan consists of (Figure 1):

- Input control, where fishing pressure is controlled at the outset.
- Technical control, which exhibits special management effects such as juvenile fish protection, and
- Output control, where fishing pressure is controlled at the end through setting of the TAC (Total Allowable Catch).

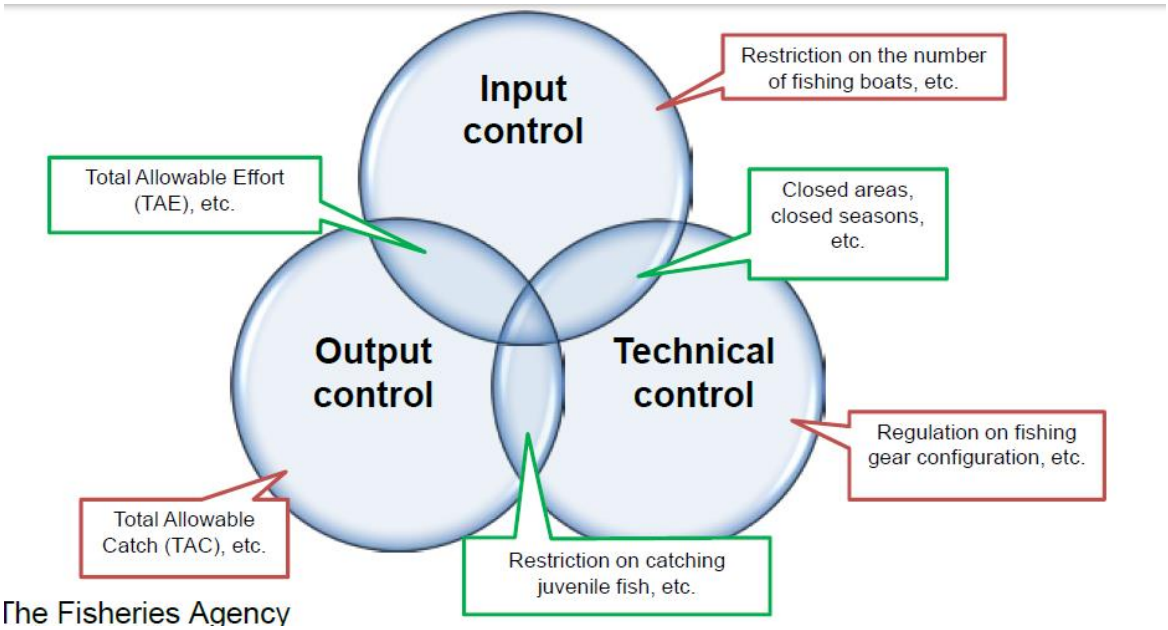

Figure 1 Resource Management MAFF (2017) **R5**

A variety of methods are combined in Japan to properly manage resources, considering the characteristics of fisheries, the number of fishers and status of targeted stocks. Fishing rights refer to rights for conducting specific types of fishing in permitted waters exclusively within specified periods. Rights are granted by prefectural governors, covering coastal set net fishing, aquaculture, shellfish

fishing, seaweed harvesting and other types of fishing of sessile aquatic animals. High seas and offshore fishing are subject to permits administered by MAFF or issued by Prefectural Governors.

The TAC system has been in place in Japan since 1996. Quotas allocated to each fishery are further divided by ocean area and period based on fishers' voluntary agreements, etc., to coordinate operations and maintain stable catches.

The IQ (Individual Quota) system allocates quotas to individual fishers or boats; considering its effects on each species along with challenges involved. IQ-based fishing trials on mackerel (Northern Pacific) involving some large-and medium-sized purse seine fishing boats started in October 2014 and expanded in October 2015 to include all boats, the results of which will be discussed and reviewed.

There is a mechanism in place by which total fishing mortality of this species is restricted.

A3.2:
Total fishery removals of this species do not regularly exceed the level indicated or stated in the stock assessment (Table 4);

Table 4. Sardine Fishery catch and quotas **R18**

	Actual catch	**Quota**
2018	No data	800,000tt
2017	Under calculation	856,000t
2016	381,490MT	804,000t
2015	309,478MT	435,000t
2014	186,238MT	429,000t

A 3.3:
When estimated SSB is below B_{lim} the stock status is rated low. The second stock status reference point (B_{high}) is 5,000,000 tons. Stock status is rated high if SSB is above B_{high}. If SSB is above B_{lim} and below B_{high}, stock status is rated as medium. There is also a B_{ban} of 22,000 tons, a reference point below which the fishery is closed. B_{ban} is the estimated lowest abundance during the low abundance period of the 1950s and 1960s. Interim measures are not explicitly required if SSB falls below Blim.

Commercial fishery removals are prohibited when the stock has been estimated to be below limit reference point or proxy, in this case B_{ban}.

R2; R5, R14

References p 32

Standard clause 1.3.2.1.3

A4	Stock Status - Minimum Requirements		
	A4.1	The stock is at or above the target reference point, OR IF NOT: The stock is above the limit reference point or proxy and there is evidence that a fall below the limit reference point would result in fishery closure OR IF NOT: The stock is estimated to be below the limit reference point or proxy, but fishery removals are prohibited.	PASS
		Clause outcome:	**PASS**

Evidence

A 4.1:

A limit reference point (Blim) for Spawning Stock Biomass (SSB) is set at 221,000t. In 2015 the SSB was estimated to be 606,000t, well above Blim; the most recent (2016) estimate of SSB was 891,000 t.

The sardine stock is currently estimated to be above B_{lim}; there is also evidence that a fall below Blim would result in fishery closure.

References p31

Standard clause 1.3.2.1.4

CATEGORY D SPECIES

In a whole fish assessment, Category D species are those which make up less than 5% of landings and are not subject to a species-specific management regime. In the case of mixed trawl fisheries, Category D species may make up most landings. In a by-product assessment, Category D species are those which are not subject to a species-specific management regime. In both cases, the comparative lack of scientific information on the status of the population of the species means that a risk-assessment style approach must be taken.

The process for assessing Category D species involves the use of a Productivity-Susceptibility Analysis (PSA) to further subdivide the species into 'Critical Risk', 'Major Risk' and 'Minor Risk' groups. If there are no Category D species in the fishery under assessment, this section can be deleted.

Productivity and susceptibility ratings are calculated using a process derived from the APFIC document "Regional Guidelines for the Management of Tropical Trawl Fisheries, which in turn was derived from papers by Patrick *et al* (2009) and Hobday *et al* (2007). Table D1 should be completed for each Category D species as follows:

- Firstly, the best available information should be used to fill in values for each productivity and susceptibility attribute.
- Table D2 should be used to convert each attribute value into a score between 1 and 3.
- The average score for productivity attributes and the average for susceptibility attributes should be calculated.
- Table D3 should be used to determine whether the species is required to meet the requirements of Table D4. A species which does not need to meet the requirements of D4 is automatically awarded a pass.

- Table D4 should be used to assess those species indicated by Table D3 to determine a pass/fail rating.
- Any Category D species which has been categorised by the IUCN Red List as Endangered or Critically Endangered, or which appears in the CITES appendices, automatically results in a fail.

D1	**Species Name:**	**Anchovy *Engraulis japonicus***	
	Productivity Attribute	**Value**	**Score**
	Average age at maturity (years)	1.5	1
	Average maximum age (years)	4	1
	Fecundity (eggs/spawning)	160,000	1
	Average maximum size (cm)	12.4	1
	Average size at maturity (cm)	10.5	1
	Reproductive strategy	Broadcast spawner	1
	Mean trophic level	3.1	2
	Average Productivity Score		**1.14**
	Susceptibility Attribute	**Value**	**Score**
	Overlap of adult species range with fishery	??	2?
	Distribution	Throughout region	1
	Habitat	Pelagic	1
	Depth range	0-400m	3
	Selectivity	??	3?
	Post-capture mortality	Most dead or retained	3
	Average Susceptibility Score		**2.75 (worst case)**
	PSA Risk Rating (From Table D3)		**Pass**

References:

D1 Productivity attributes (except fecundity)

http://www.fishbase.org/summary/Engraulis-japonicus.html

D2 Fecundity attribute

Jung, Hwang & Kim (2008). Fecundity and growth-dependent mortality of Pacific anchovy (Engraulis japonicas) in Korean coastal waters

https://www.sciencedirect.com/science/article/pii/S0165783608000593?via%3Dihub

D3 Distribution, other attributes Fishbase Japanese Anchovy

https://www.fishbase.se/Summary/SpeciesSummary.php?ID=1663&AT=japanese+anchovy

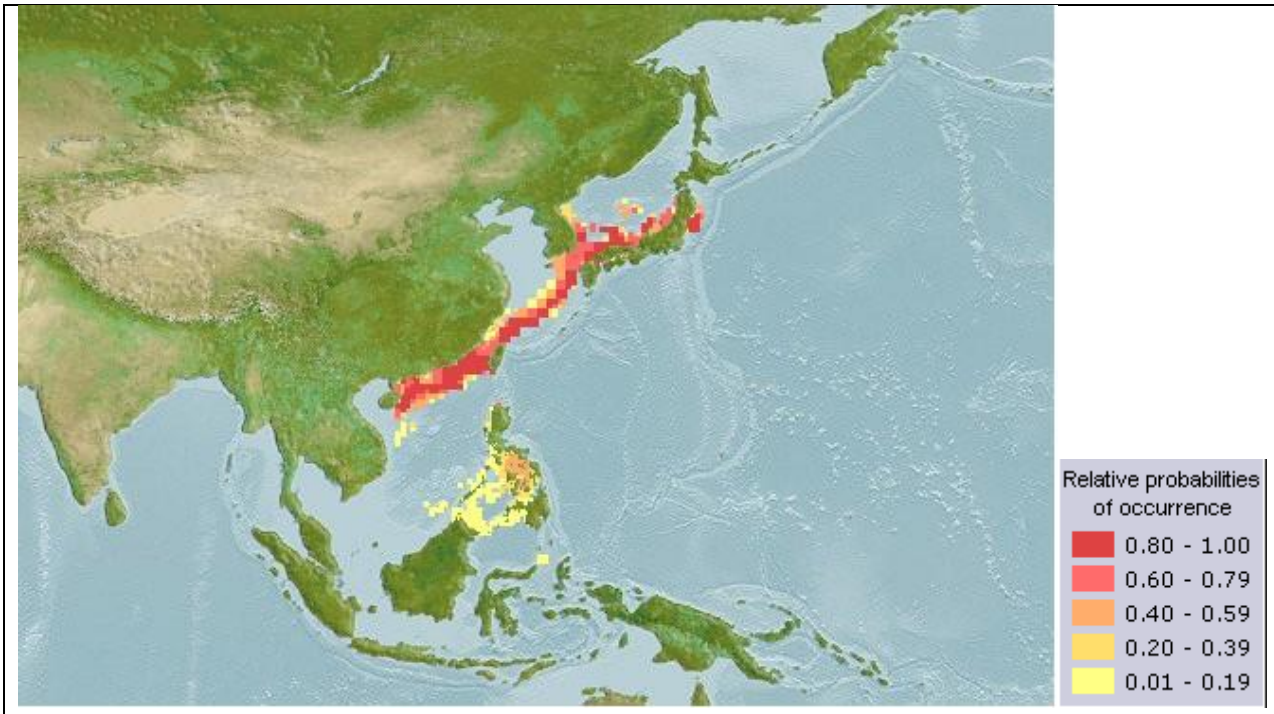

Figure 2 Distribution map for *Engraulis japonicus* (Japanese anchovy) www.aquamaps.org **D1**

Standard clauses 1.3.2.2

Table D2 - Productivity / Susceptibility attributes and scores.

Productivity attributes	Low productivity/ High risk	Medium productivity/ Medium risk	High productivity/ Low risk
	Score 3	Score 2	Score 1
Average age at maturity (years)	>4	2 to 4	<2
Average maximum age (years)	>30	10 to 30	<10
Fecundity (eggs/spawning)	<1 000	1 000 to 10 000	>10 000
Average maximum size (cm)	>150	60 to 150	<60
Average size at maturity (cm)	>150	30 to 150	<30
Reproductive strategy	Live bearer, mouth brooder or significant parental investment	Demersal spawner "berried"	Broadcast spawner
Mean trophic level	>3.25	2.5–3.25	<2.5

Susceptibility attributes		High susceptibility/ High risk	Medium susceptibility/ Medium risk	Low susceptibility/ Low risk
		Score 3	Score 2	Score 1
Availability	1) Overlap of adult species range with fishery	>50% of stock occurs in the area fished	Between 25% and 50% of the stock occurs in the area fished	<25% of stock occurs in the area fished
	2) Distribution	Only in the country/ fishery	Limited range in the region	Throughout region/ global distribution
Encounterability	1) Habitat	Habitat preference of species make it highly likely to encounter trawl gear (e.g. demersal, muddy/sandy bottom)	Habitat preference of species make it moderately likely to encounter trawl gear (e.g. rocky bottom/reefs)	Depth or distribution of species make it unlikely to encounter trawl gear (e.g. epi-pelagic or meso-pelagic)
	2) Depth range	High overlap with trawl fishing gear (20 to 60 m depth)	Medium overlap with trawl fishing gear (10 to 20 m depth)	Low overlap with trawl fishing gear (0 to 10 m, >70 m depth)
Selectivity		Species >2 times mesh size or up to 4 m length	Species 1 to 2 times mesh size or 4 to 5 m length	Species <mesh size or >5 m length
Post capture mortality		Most dead or retained Trawl tow >3 hours	Alive after net hauled Trawl tow 0.5 to 3 hours	Released alive Trawl tow <0.5 hours

Note: Availability 2 is only used when there is no information for Availability 1; the most conservative score between Encounterability 1 and 2 is used.

D3		Average Susceptibility Score		
		1.00 – 1.75	1.76 – 2.24	2.25 – 3.00
Average Productivity Score	1.00 – 1.75	PASS	PASS	PASS
	1.76 – 2.24	PASS	PASS	TABLE D4
	2.25 – 3.00	PASS	TABLE D4	TABLE D4

FURTHER IMPACTS

The three clauses in this section relate to impacts the fishery may have in other areas. A fishery must meet the minimum requirements of all three clauses before it can be recommended for approval.

F1	Impacts on ETP Species - Minimum Requirements		
	F1.1	Interactions with ETP species are recorded.	PASS
	F1.2	There is no substantial evidence that the fishery has a significant negative effect on ETP species.	PASS
	F1.3	If the fishery is known to interact with ETP species, measures are in place to minimise mortality.	PASS
Clause outcome:			**PASS**

Evidence

F1.1-F1.2:

By-catch of ETP species does occur in purse seine fleets, although it appears more data is available in the assessment are on impact of other gear types, such as longlines and driftnets. Bycatch and incidental capture of ETP species have been studied in purse seine fisheries targeting tuna, information for purse seine vessels targeting other pelagic fish is less common. Tuna purse seine fisheries incidentally catch sea turtles, especially when fish aggregating devices (FADs) are used, but fisheries targeting sardine generally do not use FADs and may pose less risk to turtles (Debski, 2013).

Interactions of Japanese Fishers with cetaceans are recorded. Annual reporting occurs to the International Whaling Commission (IWC) in the following information categories:

- Sightings
- Vessel strikes of large whales
- Fishery bycatch of large whales
- Direct catches of small cetaceans
- Vessel strikes of small cetaceans
- Fishery bycatch of small cetaceans
- Strandings
- Systematic surveys
- Cetacean databases, datasets and archives

Japan typically provides information on sightings, direct catches of large whales and by-catch of large whales but not of small cetaceans, considered out of scope of the IWC. However, small cetacean by-catch does appear to be recorded and is reported elsewhere.

Data on by-catch, both large whale and small cetacean, comes from reporting by individual fishermen or fishery cooperative unions which are then reported by prefecture governments to FAJ (Yoshida, 2015; Miyashita, 2011).

By-catch mortality of whales is reported to be a significant issue in Japanese waters with rates similar to that caused by the scientific whaling programme in the North Pacific, JAPRN and JARPN II. Unregulated and under-reported catches of whales have been reported to be an issue in Japanese and Korean fisheries; it is considered official estimates are likely to underestimate the level of mortality.

In the last few years all the by-catch mortality of large whales reported by Japan to IWC is associated with trap nets. In the Yoshida report (2015) 10 of the 12 incidences of small cetacean by-catch were attributed to trap nets or set gillnets with the remainder attributed to 'miscellaneous' gears.

The Fisheries Agency maintains a Red List of ETP species for marine organisms but has not prescribed mortality limits.

Interactions with ETP species are recorded. There is no substantial evidence that the fishery has a significant negative effect on ETP species.

R2, R20-R22; R31-32

References p31

Standard clause 1.3.3.1

F2	**Impacts on Habitats - Minimum Requirements**		
	F2.1	Potential habitat interactions are considered in the management decision-making process.	PASS
	F2.2	There is no substantial evidence that the fishery has a significant negative impact on physical habitats.	PASS
	F2.3	If the fishery is known to interact with physical habitats, there are measures in place to minimise and mitigate negative impacts.	PASS
		Clause outcome:	**PASS**

Evidence

F2.1:

Fishers follow operational regulations stipulated by their license or permit, prefecture, and local Fishery Cooperative Associations (FCAs). These regulations define areas that can be fished, fishing seasons, and gears that can be used. Additionally, some areas are designated for specific uses such as stationary traps and aquaculture, and there are joint fisheries rights areas managed by FCAs. The

Japan Coast Guard maintains maps of designated areas, as well as maps of several coastal habitat types including seaweed beds, wetlands, tidal flats, and coral reefs. The number of arrests for violation of fisheries laws and regulations stood at 1,856 in 2015 (1,703 in coastal waters and 153 in inland waters) (Source MAFF, 2017). In 2016, the Fisheries Agency captured 6 foreign fishing boats and conducted 86 on-board inspections; the number of confiscations of illegal fishing gear (gill nets, crab traps, etc.) totalled 14.

Japan has a system of coastal and marine parks, which aim to protect scenery and natural environments, important ecological areas including spawning habitat, and cultivation areas for fishery organisms. Wildlife protection areas and protected living areas are established specifically to protect native and rare species.

Potential habitat interactions are considered in the management decision-making process.

F2.2-F2.3

Purse seine fisheries operate in areas specified by their permits. The gear is operated within upper layers of the water column and generally does not contact bottom habitat. Habitat impacts are therefore minimal. If the fishery is known to interact with physical habitats, there are measures in place to minimise and mitigate negative impacts (**F2.1**).

There is no substantial evidence that the fishery has a significant negative impact on physical habitats.

R2, R5, R23

References p31

Standard clause 1.3.3.2

F3	Ecosystem Impacts - Minimum Requirements		
	F3.1	The broader ecosystem within which the fishery occurs is considered during the management decision-making process.	PASS
	F3.2	There is no substantial evidence that the fishery has a significant negative impact on the marine ecosystem.	PASS
	F3.3	If one or more of the species identified during species categorisation plays a key role in the marine ecosystem, additional precaution is included in recommendations relating to the total permissible fishery removals.	PASS
		Clause outcome:	**PASS**

Evidence

F3.1-F3.2

The FRA identify sardine and anchovy as major prey species for three species of whales. A decadal regime shift in the North-West Pacific results in large fluctuations in biomass of all pelagic species at different times. To reduce the effect of this regime shift on the ecosystem fisheries are managed through the Regime Concept (Figure 3). This has the goal of providing the following deliverables:

- Regime-dependent fishing rates with time-lag after the year of regime shift.
- Target species switching.
- Conservation of age/size diversity.
- The precautionary approach.
- Consideration of mismatches between life spans of fishing fleets and ecosystem regimes.

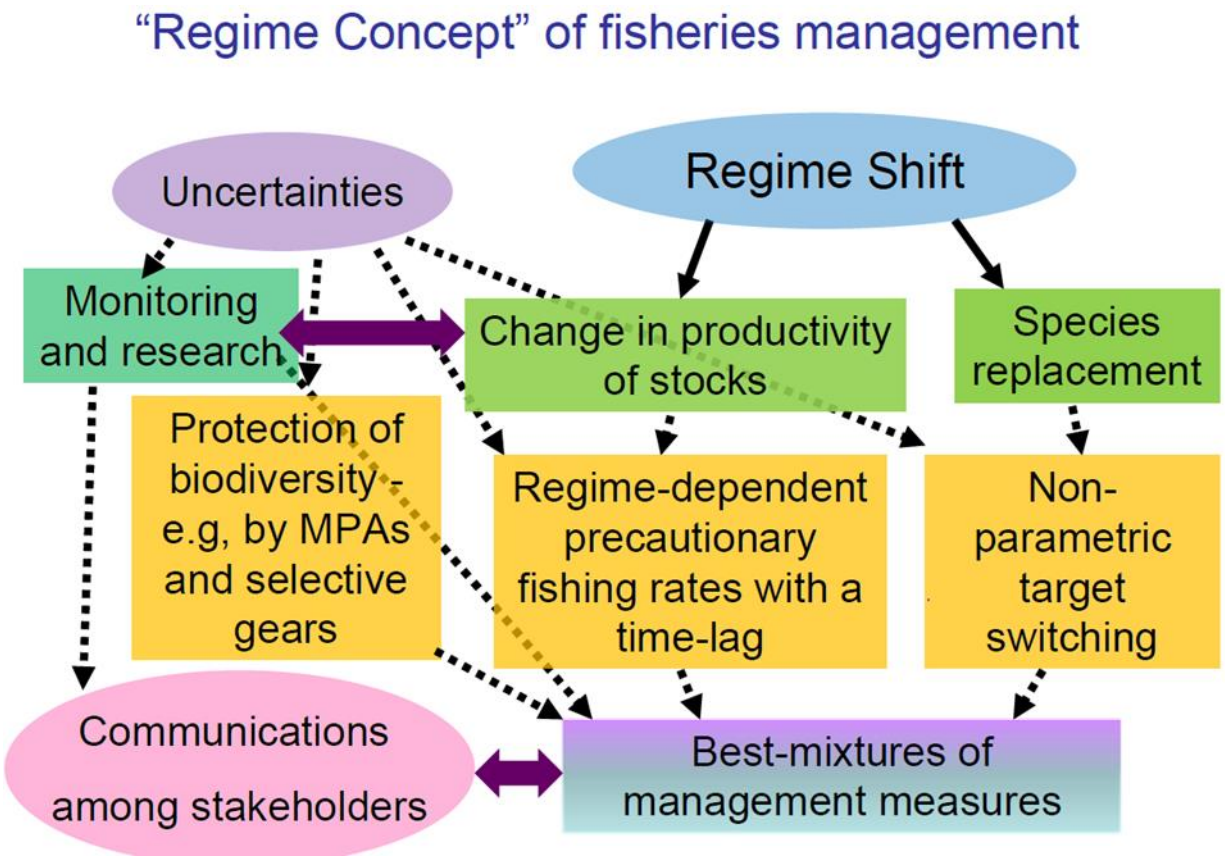

Figure 3: Regime Concept of Fisheries Management **R5**

Management in Japan recognise the importance of raising the level of productivity in the entire ecosystem through conservation of (inshore) seaweed beds, tidal flats and recovery of their functions. Conservation measures have been promoted by combining local governments' development of inshore areas with fishers' and residents' conservation efforts. Offshore ''Fishing Grounds Area Improvement Plans'' have been promoted with support based on the Ministry's ''Resource Management and Income Stability Measure''.

The Hokkaido National Fisheries Research Institute (HNF) performs several research tasks in the waters around Hokkaido (assessment area):

- Research on abundance fluctuations and subsequent management methods of major marine resources such as walleye pollock and common squid for their sustainable use.
- Studies on relationships between fisheries (including pelagic fisheries) and marine ecosystems.
- Assessment on productivity of coastal ecosystems affected by marine environment fluctuation and global climate change.

Findings from research are applied to each fishery to reduce impacts of fisheries on habitat ecosystems. Future assessments should examine research by HNF that has examined the importance of sardine as forage species for cetaceans, including whales.

The broader ecosystem within which the fishery occurs is considered during the management decision-making process.

The NPFC (of which Japan is a member) is developing an observer programme (North Pacific Ocean Fisheries Observer Program) for pelagic fisheries within their operational area. These programmes will include compilation of fishing effort, catch and length-frequency and other biological data. The NPFC note that members have relatively well-developed observer programmes for bottom fisheries as required by the Commission's Conservation and Management Measures (CMMs); currently not the case for pelagic fisheries. Future assessments should note Japan's contribution to this programme.

F3.3:
Information on fish distribution contributes to the FRA's ecosystem approach to fisheries management (EAFM) as harvest control rules are adapted to changes in sardine distribution and productivity in order to reduce the effects of removals from the fishery on the ecosystem.

Annual stock assessments are run with varying catch scenarios and account for uncertainty in recruitment through resampling, where each catch scenario is run 1,000 times. Resampling results are compared to results from the model that does not consider uncertainty, to confirm that outputs are similar. Model parameters are adjusted as new information is obtained, for example from more recent research surveys.

Model results are used to generate allowable biological catch (ABC) for each stock. Precautionary tools are used during each assessment to generate accurate data that support levels of removals from the fishery that will not affect stock status nor reduce the role each pelagic stock has within the ecosystem.

Japan's Resource Management Plan is used to regulate, for example, the capture of juveniles through rules on fishing areas and closed seasons. Statutory regulations are often accompanied by fishers'

voluntary resource management efforts; considering the characteristics of fisheries, the number of fishermen and the status of targeted stocks.

In his 2014 paper Matsuishi (Fisheries Management in Japan) presentation refers to ecosystem considerations which are considered along with other parameters (e.g. current stock status) when stock assessments are undertaken.

As an incentive to fishers Japan's "Resource Management and Income Stability Measure" is implemented for those who are systematically engaged in resource management.

Research into feeding ecology and ecosystem studies is being undertaken in Japan but this seems to be focussed on the impact of cetacean predation on commercial fish stocks rather than on the impact of commercial fisheries on the ecosystem**.** Management of juvenile sardine (*Shirasu*) fishery is somewhat distinct from management of the fisheries targeting older fish. For example, open and closed fishing periods may be set for *Shirasu* specifically.

Japan's Fisheries Research and Education Agency (FRA) includes in their mission statement:

- Research on abundance fluctuations and management methods of major marine resources such as walleye pollock for sustainable use.
- Studies on relationships between the fisheries and marine ecosystems.
- Assessment on productivity of coastal ecosystem affected by marine environment fluctuation and global climate change.

Future assessments should look at how FRA can apply the same ecosystem approach to research on sardine and other pelagic species targeted in the assessment area.

A discussion paper on the Ecosystem Approach to Fisheries Management (FRA 2007) looks at management tools that integrate physical, chemical and biological processes within the ecosystem. New modelling technologies provide powerful management tools that will allow FRA to integrate offshore fisheries into the broader context of coastal and large marine ecosystem management. Future assessments should examine how these tools will be used to provide management with additional advice on the level of removals from the sardine fishery that will not affect the key role of this species in the ecosystem.

If one or more of the species identified during species categorisation plays a key role in the marine ecosystem, additional precaution is included in recommendations relating to the total permissible fishery removals.

R5-R7; R26-R28

References

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R2 Fishsource Japanese Sardine: https://www.fishsource.org/stock_page/2317
R3 Japan Our Oceans Commitments to Ocean Sustainability (EN): https://ourocean2019.no/commitments/bali-2018/
R4 Fisheries Research Agency (FRA) http://www.fra.affrc.go.jp/english/eindex.html
R5 MAFF FY 2018 Trends in Fisheries FY2018 Fisheries Policy (EN)

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R8 Ministry of Agriculture, Forestry and Fisheries (EN) http://www.maff.go.jp/e/
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Standard clause 1.3.3.3

SOCIAL CRITERION

In addition to the scored criteria listed above, applicants must commit to ensuring that vessels operating in the fishery adhere to internationally recognised guidance on human rights. They must also commit to ensuring there is no use of enforced or unpaid labour in the fleet(s) operating upon the resource.

Comments on this proposition are welcomed along with any other feedback on the proposed approach.