

# Blue Seafood Guide Assessment Report

*Pacific cod, Hokkaido stock*

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(Image from Wikipedia)

## Introduction to the BSG Assessment Methodology

The Blue Seafood Guide (BSG) methodology is primarily based on the [Rapid Assessment tool](#) co-developed by Ocean Outcomes (O2), World Wildlife Fund US, and the Sustainable Fisheries Partnership. The tool uses Marine Stewardship Council (MSC) performance indicators, with incorporation of some concepts from the Monterey Bay Aquarium Seafood Watch (MBA SFW) Fisheries Standard. The methodology has also 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.

To be included in the BSG, the stock/species must not receive a red score for any of the indicators that are considered.



## Summary of results

In Japan, Pacific cod are managed as three stocks: Hokkaido, North Pacific, and Japan Sea. As of 2016, all three stocks appear to be at high abundance levels based on FRA stock assessments. However, harvest management of Pacific cod appears has deficiencies; a particular concern is the lack of clear measures that could be used to limit harvest if abundance appears low.

## BSG qualification outcome

Pacific cod does not qualify for inclusion in the BSG due to red score for the harvest strategy indicator.

## Scoring summary

Principle	Component	PI #	Performance Indicator	Scoring category
1	Outcome	1.1.1	Stock status outcome	
		1.1.2	Stock rebuilding outcome	Not considered
	Management	1.2.1	Harvest Strategy	
		1.2.2	Harvest control rules	Not considered
		1.2.3	Information and monitoring	
		1.2.4	Assessment of stock status	
2	Other species	2.2.3	Other species information	Not considered
		2.2.1	Other species outcome	Not considered
		2.2.2	Other species management	Not considered
	ETP species	2.3.3	ETP species information	Not considered
		2.3.1	ETP species outcome	Not considered
		2.3.2	ETP species management	Not considered
	Habitats	2.4.3	Habitats information	
		2.4.1	Habitats outcome	
		2.4.2	Habitats management	



	Ecosystem	2.5.3	Ecosystem information	
		2.5.1	Ecosystem outcome	
		2.5.2	Ecosystem management	
3	Governance & policy	3.1.1	Legal and customary framework	
		3.1.2	Consultation, roles and responsibilities	
		3.1.3	Long term objectives	
	Fishery specific management system	3.2.1	Fishery-specific objectives	
		3.2.2	Decision-making processes	
		3.2.3	Compliance and enforcement	
		3.2.4	Management performance evaluation	

## Basic fishery information

Target species scientific name and common name	Pacific cod ( <i>Gadus macrocephalus</i> ), <i>madara</i> (マダラ)
Fishery location and season	Pacific cod are caught all around Hokkaido, Japan.  Fisheries operate year-round, with the highest catches occurring from winter to spring.
Gear type(s)	The main gears are single vessel bottom trawl (沖合底びき網, 1 そうびき), gillnet (刺網) and longline (はえ縄).
Catch quantity (weight)	Landings from Japanese fisheries averaged 25,642 t from 2012 to 2016, with a 2016 estimate of 24,321 t.
Management authority	Fisheries Agency of Japan

## Description of the fishery



In Japan Pacific cod are managed as three stocks: Hokkaido, North Pacific, and Japan Sea. Stock structure has not been determined empirically, but migration is thought to be somewhat limited (Hattori 1994), and three management units have been also been defined within the Hokkaido stock. These are the Okhotsk Sea, Hokkaido-Pacific Ocean, and Hokkaido-Japan Sea units. For offshore bottom fisheries, most of the catch and fishing effort is from trawl (かけまわし) vessels greater than 100 tons. Offshore bottom trawl is the predominant fishing method in the Okhotsk Sea unit. In the Hokkaido-Pacific Ocean and Hokkaido-Japan Sea units, more than half the catch is from coastal fisheries (Chimura et al. 2017).

Table 1. Japanese fisheries landings of the Hokkaido stock of Pacific cod. Data available at <http://abchan.fra.go.jp/digests2017/index.html>

Year	Okhotsk Sea オホーツク海	Hokkaido-Pacific Ocean 北海道太平洋	Hokkaido-Japan Sea 北海道日本海	Offshore bottom fisheries total 沖底	Coastal fisheries total 沿岸漁業	Total
2007	2,081	14,556	3,557	7,341	12,853	20,194
2008	1,174	16,721	4,248	7,151	14,992	22,143
2009	1,967	17,103	3,485	6,815	15,740	22,556
2010	3,018	16,713	3,504	8,519	14,716	23,236
2011	4,147	19,578	4,534	12,569	15,690	28,259
2012	2,348	21,789	4,416	10,918	17,636	28,554
2013	1,653	21,499	6,307	12,262	17,197	29,460
2014	1,521	19,234	3,962	9,073	15,643	24,716
2015	1,672	17,056	2,432	9,243	11,917	21,160
2016	3,483	17,505	3,334	11,808	12,513	24,321

## Unit of Assessment(s)

*Define the Unit of Assessment(s) here. General information about the fishery may also be described.*

## Status of target stock(s) - Principle 1

The Fisheries Research and Education Agency of Japan (FRA) evaluates stock status (low, medium, or high) relative to reference points that are determined by historical data and are not



directly linked to maximum sustainable yield (MSY). For Pacific cod, an index of catch per unit effort (CPUE) is used as the stock status indicator. The total range of past CPUE indices is divided into three parts, and the part that the most recent abundance estimate falls into determines the status. For some species and stocks a type of limit reference point ( $B_{\text{limit}}$ ) may be estimated, but it appears that no  $B_{\text{limit}}$  has been set for the Hokkaido Pacific cod stock. There is no target reference point.

Fishing effort in Japan is largely regulated through input controls (Makino 2011). For Pacific cod, effort is managed by regulating the number of vessels that can fish. Output controls appear to be lacking.

The Mutsu Bay spawning population (part of the Hokkaido-Pacific Ocean sub-stock) had a recovery plan in place from 2007 to 2011 (Chimura et al. 2017). Under the management plan implemented since 2012, the number of bottom set net (底建網) fishery operations has decreased, and there has been ongoing release of juveniles produced from (wild?) broodstock.

### Stock status outcome (1.1.1)

Scoring category	Yellow
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#### Rationale:

CPUE is used as the stock status indicator and is based on kg caught per month per net by trawling vessels > 100 tons, in the offshore Hokkaido-Pacific Ocean central area around the Kuril Islands (中海区千島における北海道根拠の沖底). A CPUE index is calculated by setting the average CPUE in the past 32 years (1985 to 2016) at a value of 50. Trawl fishing effort, defined as thousands of nets, has also been monitored, but fishing effort in coastal fisheries has not.

The reference points for determination of stock status are as follows. A CPUE index of 65 is the threshold between high and medium status, while 35 is the threshold between medium and low status. The estimated 2016 CPUE index was 113, resulting in a determination of high status, and the index showed an increasing trend from 2012 to 2016 (Chimura et al. 2017; Fig. 1). In terms of individual management units, the Okhotsk Sea resource was rated as high status (increasing trend), the Hokkaido-Pacific Ocean was rated as high status (stable trend), and the Hokkaido-Japan Sea was rated as medium status (stable trend).

According to a preliminary, MSY-based assessment conducted in March 2018 for the Council for Promotion of Regulatory Policy Reform, the Sea of Japan Pacific cod stock was at a near sustainable abundance level in 2015, with an  $SSB_{2015} / SSB_{\text{MSY}}$  ratio of 0.91.

Based on the overall CPUE index and the increasing trend, stock status is likely above a limit reference point, but there is no information to determine whether stock abundance is fluctuating around MSY.



Figure 1. Estimated Hokkaido Pacific cod resource level (blue circles, CPUE index) over time. The dashed lines separate the thresholds between high (高位), medium (中位), and low status (低位) level. Figure from [http://abchan.fra.go.jp/digests2017/html/2017\\_30.html](http://abchan.fra.go.jp/digests2017/html/2017_30.html)

## Stock rebuilding outcome (1.1.2)

Scoring category	Not considered
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### Rationale:

This indicator was not considered because in Japan, stock rebuilding plans are rare and generally implemented only on a voluntary basis. They are not automatically developed in response to changes in stock status. No rebuilding plan or measures have been developed for the Hokkaido Pacific cod stock, likely because a need has not been identified by the Japanese management system.

## Harvest strategy (1.2.1)

Scoring category	Red
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### Rationale:

As is typical with Japanese fisheries, harvest control rules (HCRs) are lacking. Information collected to support the harvest strategy includes trawl CPUE, landings at major ports, and research conducted by the Japan Fisheries Agency and national research institutes (Chimura et



al. 2017). FRA scientists assess the stock every year and estimate an acceptable biological catch (ABC) for each of the management units in this stock. Thus all harvest strategy components required by the MSC standard, excluding HCRs, are present.

However, there are no output controls in place for this fishery. Although ABCs are estimated, they are not used to set any sort of catch limit or total allowable catch (TAC). Harvest management as currently implemented would not be expected to maintain stock biomass around a target reference point (TRP).

### Harvest control rules (1.2.2)

Scoring category	Not considered
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#### Rationale:

Since harvest control rules are not currently used in Japanese fisheries management, this indicator is not considered. There are no official harvest control rules (HCRs) for Pacific cod stocks, and there is no evidence that exploitation is significantly reduced in response to stock depletion.

### Information and monitoring (1.2.3)

Scoring category	Yellow
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#### Rationale:

Information from the trawl fishery has been collected since at least 1985, but effort in coastal fisheries has not been regularly monitored (Chimura et al. 2017). Information on landings and fleet composition is collected, and is likely sufficient to support a harvest strategy.

### Assessment of stock status (1.2.4)

Scoring category	Yellow
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#### Rationale:

Scientists at the Japan Fisheries Research and Education Agency (FRA) assess Pacific cod stocks annually. These assessments determine stock status relative to reference points based on historical CPUE estimates from the offshore trawl fishery; no fishery-independent data are used (Chimura et al. 2017). The assessments are reviewed internally and also externally by experts and officials (JFA and FRA 2015). CPUE data from coastal fisheries is not collected, and while assessment scientists mention this deficiency, the data gap does not seem to be accounted for in the assessment. The stock assessment determines an  $ABC_{target}$  that is set at 80% of the  $ABC_{limit}$  to account for uncertainty in estimation of ABC, but ABC is a recommendation rather than a binding catch limit. The assessment appears appropriate to the



species and could be used to develop an HCR, but as mentioned, there are limitations to the data used.

## Ecosystem impacts - Principle 2

Pacific cod is primarily caught by single vessel bottom trawl (沖合底びき網, 1 そうびき), gillnet (刺網) and longline (はえ縄). In terms of Japan's total harvest, bottom trawls catch about 46% of the harvest, gillnets about 23%, and longlines about 14%

([http://www.maff.go.jp/j/tokei/kouhyou/kaimen\\_gyosei/index.html](http://www.maff.go.jp/j/tokei/kouhyou/kaimen_gyosei/index.html)). Single vessel bottom trawl vessels often catch walleye pollock (*Gadus chalcogrammus*), flounders (e.g. *Paralichthys olivaceus*), Okhotsk atka mackerel (*Pleurogrammus azonus*) and squids (e.g. *Todarodes pacificus*) in addition to Pacific cod. Gillnet vessels also catch walleye pollock, flounders, and Okhotsk atka mackerel. Longlines that target Pacific cod rather than tuna may catch walleye pollock, amberjack species (e.g. *Seriola quinqueradiata*), and octopuses.

Despite the availability of information on overall catches by fishing gear, there is no catch composition data for fishing vessels that are specifically targeting Pacific cod. Japanese fishers are not required to keep records on discards or bycatch, though they sometimes record catches of commercially important species. Species information regarding bait, which is typically used with longlines but not bottom trawls or gillnets, is also not available.

### Other species information (2.2.3)

Scoring category	Not considered
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Rationale:

Due to the lack of bycatch monitoring, including fishery-specific data on other species caught and retained, insufficient information is collected to inform bycatch management and determine the fishery's risk to these other species.

### Other species outcome (2.2.1)

Scoring category	Not considered
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This indicator is not considered due to lack of information.

### Other species management (2.2.2)

Scoring category	Not considered
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This indicator is not considered due to lack of information.





### ETP species information (2.3.3)

Scoring category	Not considered
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#### Rationale:

This indicator is not considered due to lack of information. There is no standardized monitoring of bycatch species in Japanese fisheries (Fukutake et al. 2014), and fishers do not usually record data on encounters with ETP species. Qualitative information about ETP species mortality resulting from the assessed fishery is not available.

### ETP species outcome (2.3.1)

Scoring category	Not considered
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#### Rationale:

This indicator is not considered due to lack of information. However, we used the SFW Unknown Bycatch Matrix information to preliminarily consider likely impacts on turtles, seabirds, and sharks from bottom trawl, bottom gillnets, and bottom longlines in the North Pacific or Northwest Pacific Ocean. Level of concern regarding fishing mortality is marked by the following colors: high concern = red, medium concern = yellow, and low concern = green. Highest impacts receive a score of 1, and lowest impacts receive a score of 5. For benthic invertebrates, finfish, forage fish, and corals, impacts were not determined by region, and SFW did not assign concern categories.

Based on the information in the matrices, impacts on sea turtles are expected to be moderate to high concern for all three gear types, while impacts on marine mammals, seabirds, and sharks are expected to be high (Table 2). Thus the ETP species outcome indicator received a red score. However, if monitoring information or evidence can show that impacts on these potential ETP species are minimal, the score can be adjusted accordingly.

Table 2. Impacts of bottom trawls, bottom gillnets, and bottom longlines based on the Monterey Bay Aquarium SFW Unknown Bycatch Matrices.

Bycatch susceptibility category	Region	Bottom trawl	Bottom gillnet	Bottom longline
		Score	Score	Score
Sea turtle	North Pacific	3	2	2
Marine mammal	Northwest Pacific	1	1	1



Seabird	Northwest Pacific	2	1	1
Shark	Northwest Pacific	1	2	1
Benthic invertebrates	N/a	2	3	4.5
Finfish	N/a	2.5	2	2
Forage fish	N/a	2	2	5
Corals and other biogenic habitats	N/a	1	2	3

### ETP species management (2.3.2)

Scoring category	Not considered
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#### Rationale:

Since no information is available on the specific ETP species that may be affected, we could not score this indicator.

Japan has a Red Data Book identifying ETP species found within the country. In terms of national legislation, there is a Law for the Conservation of Endangered Species of Wild Fauna and Flora (Law No. 75) that aims to conserve endangered species and contribute to conservation of the natural environment (Ministry of the Environment 2016a). There is also a Wildlife Protection and Hunting Law (Law No. 32) that protects birds and mammals by establishing wildlife protection areas (Ministry of the Environment 2016b).

### Habitats information (2.4.3)

Scoring category	Yellow
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#### Rationale:

Pacific cod are often found at depths of 60 to 160 m over sand and gravel (Garrison and Miller 1982), and are fished on or close to the sea bottom. Bottom gillnets and longlines are therefore likely set over sandy substrates, while trawls are dragged close to or along such substrates. According to guidance in the SFW fisheries standard, bottom gillnets and longlines generally have low habitat impacts when used over resilient mud/sand habitat, while bottom trawls used over such habitats have moderate impacts. FAO gear descriptions note that bottom trawls usually interact with bottom sediments, potentially resulting in removal or damage of benthic organisms and objects (FAO 2001). The Japan Coast Guard hosts a map website (CeisNet: <http://www1.kaiho.mlit.go.jp/JODC/ceisnet/index.html>) that includes maps of benthic habitats



and sensitive areas such as coral reefs. Deepwater corals exist within some of the jurisdictions where fishing takes place (Matsumoto 2005).

In summary, the types and distribution of commonly encountered habitats and the nature of gear impacts upon those habitats is broadly understood. However, data are not adequate for verifying efficacy of habitat management measures and determining risks to habitat from this specific fishery.

### Habitats outcome (2.4.1)

Scoring category	Yellow
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Rationale:

Based on information in the SFW Fisheries Standard, impacts on mud/sand habitat are likely to be low from bottom gillnets and longlines, and moderate from bottom trawls. Muddy and sandy habitats are somewhat resilient, so Pacific cod fisheries seem highly unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm. VME habitats such as deepwater corals occur in some areas off the west coast of Hokkaido (Matsumoto 2005), but it is unclear whether fisheries interact with them.

### Habitats management (2.4.2)

Scoring category	Yellow
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Rationale:

Bottom trawls cannot be operated within coastal areas according to the Basic Fishery Law (Article 52, Paragraph 1)<sup>1</sup>. There are fewer explicit restrictions on operations of bottom gillnets and longlines, though their habitat impacts are expected to be relatively low. However, the effectiveness of habitat measures has not been tested, and there is no quantitative evidence that they are being implemented successfully.

### Ecosystem information (2.5.3)

Scoring category	Yellow
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Rationale:

Trophic relationships involving Pacific cod are broadly understood, but ecosystem impacts of Pacific cod fisheries do not appear to have been studied in detail. There does not appear to be sufficient monitoring in place to detect increases in ecosystem risk level. As juveniles Pacific cod prey on copepods, then transition to consuming fishes, benthic crustaceans, cephalopods and

<sup>1</sup> <http://jamarc.fra.affrc.go.jp/enganbiz/bizbox/sokobiki/ami/okisokotoha/okisoko.htm>



shellfish as adults (Mishima 1989). In the Sea of Okhotsk, cod also prey on snow crab (Yanagimoto 2003). Cod are a prey item for marine mammals (Goto and Shimazaki 1998).

### Ecosystem outcome (2.5.1)

Scoring category	Yellow
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Rationale:

Fisheries harvest large quantities of Pacific cod, but CPUE has been high in recent years, suggesting that stock is not currently in a depleted state. Fisheries appear unlikely to disrupt key ecosystem elements to a point where there would be serious or irreversible harm.

### Ecosystem management (2.5.2)

Scoring category	Yellow
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Rationale:

The Japanese fisheries management system focuses primarily on target species and currently lacks an ecosystem-based approach, although some policy documents, such as the Fisheries Policy of 2001, state that ecosystems should be conserved (Makino 2011). Pacific cod harvests are not managed to minimize negative ecosystem impacts, but stock assessments do include estimates of ABC that could potentially be used to manage impacts.

The 2011 Japan Ministry of the Environment document titled 'Marine life diversity conservation strategy' (海洋生物多様性保全戦略) suggests a general movement toward policies that protect marine diversity and promote the sustainable use of marine resources (Fukutake et al. 2014). Relevant management measures include implementation of Marine Protected Areas (see Makino 2013). Conservation policy strategies are established by the Marine Diversity Conservation Specialist Investigative Commission (海洋生物多様性保全戦略専門家検討会), which holds meetings and receives public comments.

## Management - Principle 3

Japan's fisheries are managed on multiple levels. The national management body is the Fisheries Agency of Japan (JFA) within the Ministry of Agriculture, Forestry, and Fisheries (MAFF). Prefectural governments administer fishing rights and licenses within their jurisdictions (Makino 2011). At a smaller scale, fisheries are managed by fishery cooperative associations, whose membership consists of fishermen and small fishing companies. These cooperatives tend to be defined by region, target species, and/or gear type. Management is coordinated among all these levels, generally with the JFA and prefectural governments issuing regulations and the fishery cooperatives implementing those regulations (McIlwain 2013). In Japan there is an emphasis on resource users actively contributing to management of their own fisheries, and



fishery cooperatives have considerable influence in determining operational rules (e.g. gear restrictions) and setting fishery openings and closures (Uchida and Watanabe 2008, Makino 2011).

### Legal and/or customary framework (3.1.1)

Scoring category	Green
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#### Rationale:

Fisheries governance in Japan is supported by an effective national legal system with binding procedures governing cooperation with other parties, and the system is capable of delivering management outcomes consistent with 1) management of the stock to a sustainable level and 2) minimising impacts on other species, habitats, and wider ecosystem components. The legal system aims to guarantee justice and transparency in administrative management, and there is a clear decision-making process for determining fishery measures and dealing with disputes as they arise (Fukutake et al. 2014). The system has a mechanism to observe the legal rights of people dependent on fishing for food or livelihood.

The Fisheries Law of 1949 outlines a framework for managing fisheries via fishery rights and licenses that are controlled by the government (Makino 2011).

### Consultation, roles, and responsibilities (3.1.2)

Scoring category	Green
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#### Rationale:

Functions, roles, and responsibilities are clearly defined and understood in the national management framework. The Japanese Fisheries Policy Council has a key role in seeking and accepting relevant information from stakeholders, which may then be incorporated into management measures. The JFA regularly offers opportunities for stakeholders, including fishing industry members, to participate in public consultation processes (Fukutake et al. 2014).

Additionally, the JFA supports economic incentives for sustainable fishing by providing some degree of compensation for income loss resulting from management measures (Makino 2011).

### Long term objectives (3.1.3)

Scoring category	Green
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#### Rationale:

The Fisheries Basic Act (2001) describes the overarching framework for fisheries management in Japan. Chapter 1, Article 2 states a requirement to manage fisheries resources to ensure



their sustainable use as a component of marine ecosystems, following the recommendations of UN Convention on the Law of the Sea (UNCLOS). The Law of Conservation and Management of Marine Living Resources states the need to protect surrounding ecosystems and habitats. Thus long term objectives 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)

Scoring category	Yellow
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#### Rationale:

There is no official management plan specific to Pacific cod fisheries that describes short or long-term objectives for the fisheries. However, the JFA posted a document describing the general concepts around Pacific cod management ([http://www.jfa.maff.go.jp/j/suisin/s\\_kouiki/taiheiyo/attach/pdf/index-19.pdf](http://www.jfa.maff.go.jp/j/suisin/s_kouiki/taiheiyo/attach/pdf/index-19.pdf)). The document states that the JFA supports efforts to improve accuracy of the stock assessment and encourage understanding of stakeholders. It also notes that the agency may consider measures to maintain spawning stock biomass, such as management via TAC. Thus implicit objectives that are consistent with appropriate management of target stocks and ecosystem impacts appear to exist. In addition, the 2018 Hokkaido Prefecture Resource Management Guidelines (<http://www.pref.hokkaido.lg.jp/sr/ggk/sigen/300905do-shishin.pdf>) state a management objective of maintaining Pacific cod stocks at stable levels.

However, objectives consistent with the precautionary approach are not apparent.

### Decision-making processes (3.2.2)

Scoring category	Yellow
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#### Rationale:

Status of the fishery and fish stocks are reviewed at least once per year. These reflect the existence of decision-making processes that result in measures for achieving fishery-specific objectives, and suggest that the processes respond to monitoring and evaluation results. Some information on the fishery's performance is available in materials posted on the FRA and MAFF websites. There is no indication that management authorities or fishers repeatedly violate regulations necessary for sustainability of the fishery. However, it is not apparent that decision-making processes employ a precautionary approach.

### Compliance and enforcement (3.2.3)

Scoring category	Yellow
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**Rationale:**

Fishing effort appears to be primarily regulated through permits and limited entry to the fishery. The JFA and Japan Coast Guard engage in some enforcement activities such as checking fishing logbooks and permits, and clear provisions exist for penalizing individuals or parties who violate fishery regulations (Clarke 2007). Thus MCS mechanisms exist and are implemented. These mechanisms are expected to be reasonably effective, and there are no reports of systematic non-compliance. More information on application of sanctions and evidence of compliance would be needed to score this indicator green.

**Monitoring and management performance evaluation (3.2.4)**

Scoring category	Yellow
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**Rationale:**

Key components of the fishery-specific management system 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. Stock assessments are regularly evaluated and subject to internal review, but it is not clear whether the other components are regularly evaluated and adapted.



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