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Blue Seafood Guide Assessment Report

Willowy flounder, North Pacific stock

Dr. Jocelyn Drugan
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(Image from http://fishillust.com)

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.

Executive summary

In Japan, willowy flounder are managed as a single North Pacific stock. As of 2018, FRA stock assessments determined that the North Pacific stock was at a high level. In addition, an MSY-based stock assessment suggested that the stock was slightly below MSY in 2015. Enhancement activities take place where halibut seedlings are artificially produced and then released into the wild.

Because the gear type contacts the sea bottom, habitat impacts are likely to be moderate, although fishing is thought to take place over soft and sandy bottoms that are relatively resilient. Trophic relationships involving willowy flounder are broadly understood, but ecosystem impacts of flounder fisheries do not appear to have been studied in detail. Fishing levels do not appear to be high enough to disrupt key ecosystem elements. Ecological impacts from enhancement are not explicitly monitored, and more information on artificial production practices would be useful to obtain.

Individual prefectures that fish this stock, such as Ibaraki Prefecture, have some management objectives and/or measures in place for the fishery. For example, gear specifications (e.g. minimum mesh size) and fishery closed seasons and areas are used to maintain productivity and manage fishing effort. Fishing effort on this stock was strongly affected by the 2011 Tohoku earthquake, as fishing activity declined drastically following the earthquake and has since been gradually reinstated on an experimental basis.

BSG qualification outcome

Willowy flounder (North Pacific stock) qualifies for inclusion in the BSG.

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	Willowy flounder (*Tanakius kitaharai*), *yanagimushigarei* (ヤナギムシガレイ)

Fishery location and season	This stock is caught off the northeast coast of Honshu, Japan, from Aomori to Ibaraki prefectures (Fig. 1). Fisheries operate year-round.
Gear type(s)	The main gear is bottom trawl, offshore and small type (沖合底びき網, 小型底びき網). Bottom gillnets (刺網) are also used to harvest willowy flounder, but catches are comparatively small.
Catch quantity (weight)	According to aquaculture annual production statistics, catches for five prefectures (Aomori, Iwate, Miyagi, Fukushima, and Ibaraki) averaged 131 t from 2012 to 2016, with a preliminary catch estimate of 239 t in 2016.
Management authorities	Fishery cooperative associations, prefectural governments (Aomori, Iwate, Miyagi, Fukushima, and Ibaraki), Tohoku National Fisheries Research Institute, Fisheries Agency of Japan

Figure 1. Distribution of the North Pacific stock of willowy flounder, shown in pink. Image from http://abchan.fra.go.jp/digests2017/html/2017_66.html

Description of the fishery

In Japan, the North Pacific Ocean stock of willowy flounder is the only stock identified and assessed. The North Pacific stock is fished by five prefectures: Aomori, Iwate, Miyagi, Fukushima, and Ibaraki. Fishing effort on this stock was strongly affected by the 2011 Tohoku earthquake, as fishing activity declined drastically following the earthquake and has since been gradually reinstated on an experimental basis.

Although fishing is technically allowed year round, some regions may set specific fishery openings and closures, e.g. by gear type. Starting in the latter half of the 1990s, a minimum size limit was implemented (30 cm total length, or 35 cm total length in one specific area). Fish under the size limit had to be released (Kurita et al. 2017).

Catches of the North Pacific stock across the five prefectures appear to be split fairly evenly amongst major gear types (trawl, gillnet, and set net; see Table 1). Seedlings are artificially produced using wild, native adults and released to enhance natural recruitment to the fishery. Seedling production reportedly does not involve substantial augmentation of food supply, application of medicinal chemicals, or habitat modification. These enhancement activities are currently conducted on a smaller scale than they were prior to the 2011 earthquake. An average of 4.6 million seedlings were released each year from 2006 to 2010, whereas an average of 1.2 million were released each year from 2011 to 2015. Impacts of enhancement activity on sustainability of the wild stock should be considered.

Willowy flounder is an economically valuable species that is especially prized for its roe, which is used to make a dried product called komochi yanagi (子持ちヤナギ). Catches show significant, long-term fluctuations (Narimatsu et al. 2017). A resource recovery plan was implemented in the North Pacific area for this species starting in 2001, and some protected areas were implemented in 2003. Recovery efforts have continued under resource management plans.

Table 1. Japanese fisheries landings (in t) of the North Pacific stock of willowy flounder, separated by gear type. 2016 data are preliminary. Data available at http://abchan.fra.go.jp/digests2017/index.html

Year	Offshore trawl (沖底)	Small trawl (小底)	Gillnet (刺網)	Other (その他)	Total
2007	81.1	49.3	18.6	0.3	149
2008	108.3	53.9	4.1	0.4	167
2009	144.2	56.7	18.3	0.1	219
2010	152	51.7	19	0	223
2011	58.4	36.5	13.5	0	108

2012	52.9	11.8	4.2	0	69
2013	60.1	12.4	4.8	0	77
2014	73.3	30.2	1.9	2.5	107
2015	98.4	56.3	3.9	3.4	162
2016	129	103.6	3.2	2.8	239

Unit of Assessment(s)

The Unit of Assessment is willowy flounder from the North Pacific stock caught by bottom trawl and bottom gillnet.

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 willowy flounder, estimated biomass and offshore trawl CPUE have been used as stock status indicators. The total range of past estimates is divided into three parts, and the part that the most recent estimate falls into determines the status. There do not appear to be explicit limit or target reference points.

Fishing effort in Japan is largely regulated through input controls (Makino 2011). For willowy flounder, effort is managed by regulating the number of vessels that can fish, and some prefectures or fishery cooperatives implement fishery openings and closures. There do not appear to be output controls in the form of catch limits.

Stock status outcome (1.1.1)

Scoring category	Green

Rationale:
Biomass was used as the stock status indicator in the 2018 assessment, based on preliminarily published results. The threshold between low and medium status is 600 t, while the threshold between medium and high status is 1,200 t. The estimated biomass in 2017 was around 1,800 t, which indicated high status, and biomass showed an increasing trend during the five most recent years (Fig. 2). Fishing mortality is also estimated in the stock assessments, and appears to vary around a 10 to 20 year cycle. Fishing mortality was relatively low in 2017 (Fig. 3).

CPUE (catch per unit effort), defined as kg of flounder caught per offshore bottom trawl net, was used as the stock status indicator in 2017. In 2017, the stock status level was determined to be

high (Fig. 4). According to a preliminary, MSY-based assessment conducted in March 2018 for the Council for Promotion of Regulatory Policy Reform, the North Pacific stock of willowy flounder was slightly below a sustainable abundance level in 2015, with an SSB_{2015} / SSB_{MSY} ratio of 0.85 (unpublished data). Based on all of the information above, stock status is likely above a limit reference point and fluctuating around MSY.

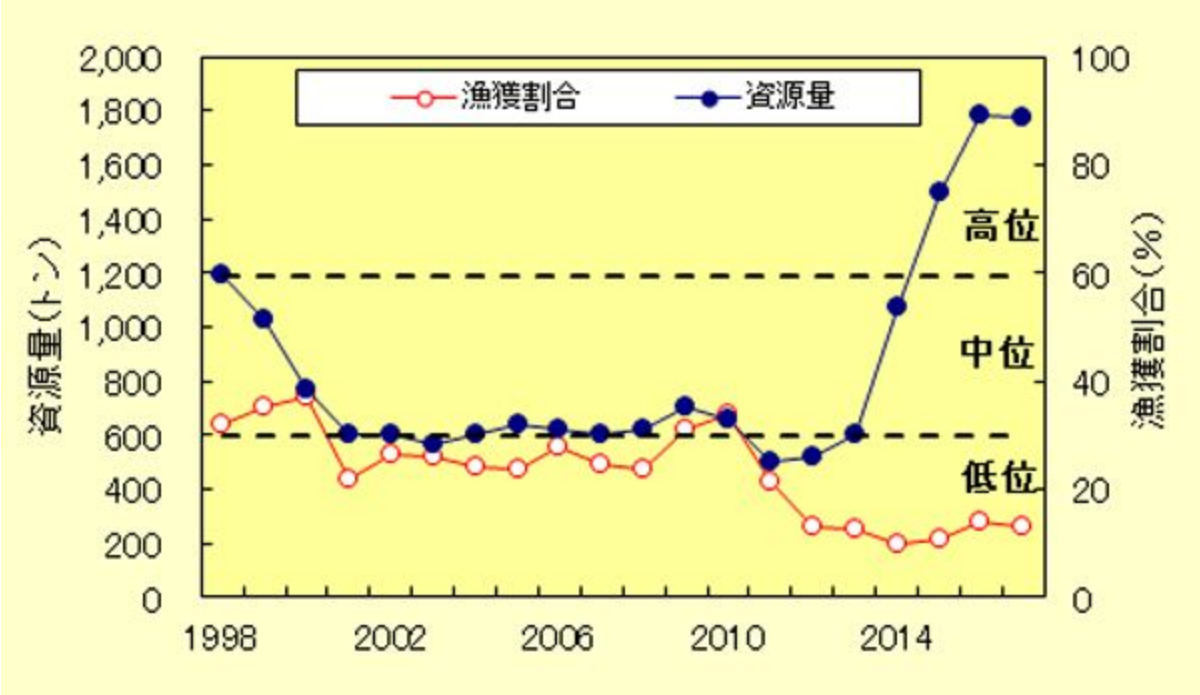

Figure 2. Estimated willowy flounder biomass level (blue circles, in t) and exploitation rate (white circles, catch divided by estimated biomass) over time. The dashed lines are the thresholds between high (高位), medium (中位), and low status (低位) levels. Figure from http://abchan.fra.go.jp/digests2018/html/2018_66.html

Figure 3. Estimated fishing mortality rate F over time. Figure from http://abchan.fra.go.jp/digests2018/html/2018_66.html

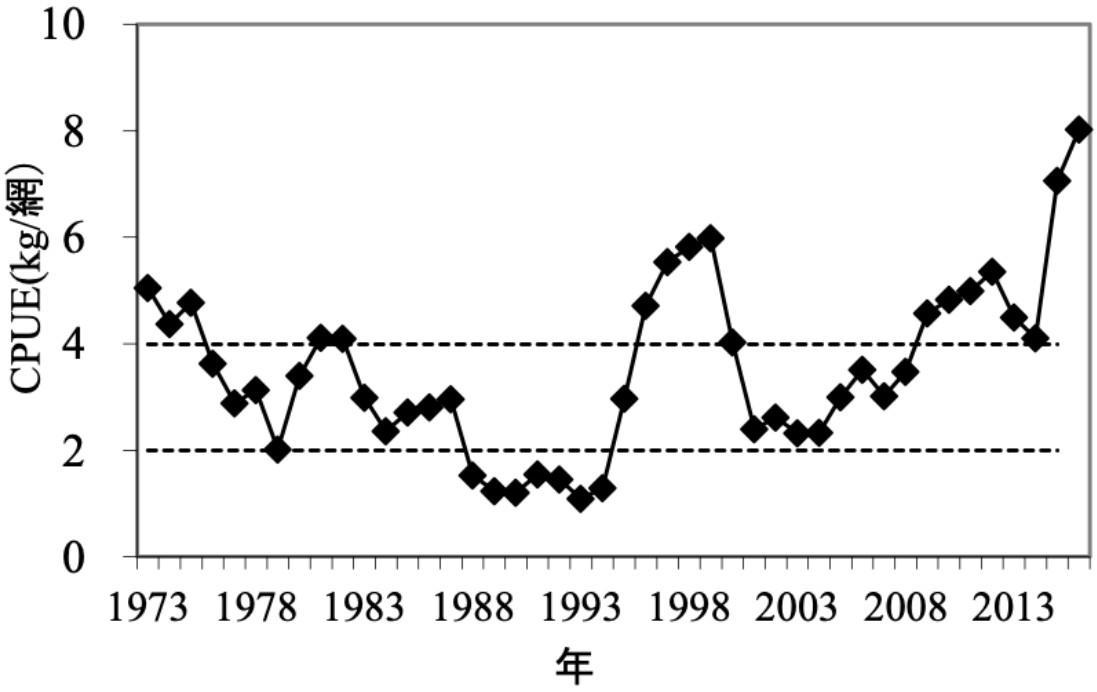

Figure 4. Willowy flounder CPUE (kg / net) over time for the entire offshore trawl fleet, from Kinkazan to the Boso area. The dashed lines are the thresholds between high (高位), medium (中位), and low status (低位) levels. Figure from Narimatsu et al. 2017.

Stock rebuilding outcome (1.1.2)

Scoring category	Not considered

Rationale:
This indicator does not need to be scored if stock status outcome has a green score.

Harvest strategy (1.2.1)

Scoring category	Yellow

Rationale:
Information collected to support the harvest strategy includes landings at major ports, size composition data, and research conducted by the Japan Fisheries Agency and national research institutes (Narimatsu et al. 2017). Willowy flounder harvests are managed by total allowable effort (TAE), at least in some areas and prefecture, as described in the North Pacific flatfish resource recovery plan that was implemented starting in 2003 (http://www.jfa.maff.go.jp/j/suisin/s_keikaku/pdf/taiheiyoukarei.pdf). Under the plan, MAFF set a total allowable effort (TAE) for offshore trawlers during a specific time and area (April 1 to June 30 in the area between the Miyagi/Fukushima border and the Chiba/Ibaraki border), as well as a TAE for small-type trawler vessels in Fukushima and Ibaraki prefectures. Effort is supposed to managed via non-fishing days, harvest limits, and/or gear restrictions. However, as is typical for Japanese fisheries, there are no harvest control rules (HCRs). All harvest strategy components required by the MSC standard, excluding HCRs, are present. Harvest management as currently implemented could theoretically be expected to maintain stock biomass around an MSY-based target reference point (TRP).

Harvest control rules (1.2.2)

Scoring category	Not considered

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 willowy flounder stocks. Under MSC guidance, ‘available’ HCRs may be accepted and evaluated in cases where the stock has been maintained at an MSY level and not shown any evidence of recruitment impairment (MSC FCR v2.0, p.120). However, willowy flounder was listed as a stock recovery species in 2001, suggesting that stock may have been at the point of recruitment

impairment in the past. In addition, it is uncertain whether exploitation will be reduced significantly in response to stock depletion.

Information and monitoring (1.2.3)

Scoring category	Yellow

Rationale:
Landings information has been collected since 1940, and body length information has been collected for subsamples halibut that has been landed at ports (Narimatsu et al. 2017). This information is likely sufficient to support a harvest strategy.

Assessment of stock status (1.2.4)

Scoring category	Green

Rationale:
Scientists at the Japan Fisheries Research and Education Agency (FRA) assess willowy flounder stocks annually. These assessments estimate biomass and determine stock status relative to reference points based on historical biomass estimates. Landings information is collected for all major gear types. The assessments are reviewed internally and also externally by experts and officials (JFA and FRA 2015). 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.

Ecosystem impacts - Principle 2

Willowy flounder is primarily caught by offshore and small-type bottom trawl (沖合底びき網, 小型底びき網). Other gear types such as bottom gillnets (刺網) are also used to harvest flounder, but quantities are relatively small, less than 10% of total catches (Table 1). In addition to willowy flounder, trawls catch many different species including other flatfishes, squids, and octopuses. Catch composition is highly dependent on fishing location and practices.

Although MAFF compiles national-level catch statistics separated by fishing gear, there are no catch composition data for fishing vessels that are specifically targeting willowy flounder. 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

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

This indicator is not considered due to lack of information.

Other species management (2.2.2)

Scoring category	Not considered

This indicator is not considered due to lack of information.

ETP species information (2.3.3)

Scoring category	Not considered

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

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 and bottom gillnets 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 both gear types, while impacts on marine mammals, seabirds, and sharks are expected to be high (Table 2). 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 and bottom gillnets based on the Monterey Bay Aquarium SFW Unknown Bycatch Matrices.

Bycatch susceptibility category	Region	Bottom trawl	Bottom gillnet
		Score	Score
Sea turtle	North Pacific	3	2
Marine mammal	Northwest Pacific	1	1
Seabird	Northwest Pacific	2	1
Shark	Northwest Pacific	1	2
Benthic invertebrates	N/a	2	3
Finfish	N/a	2.5	2
Forage fish	N/a	2	2
Corals and other biogenic habitats	N/a	1	2

ETP species management (2.3.2)

Scoring category	Not considered

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

Rationale:
Willowy flounder is a benthic species that inhabits sandy/muddy areas at 400m depth or less. They are fished on the continental shelf, on or close to the sea bottom. Most catches are from depths between 80 and 100 m during the winter spawning season, and between 120 to 140 m during the rest of the year. According to SFW guidance, bottom trawls used over resilient mud/sand 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.

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

Rationale:
The main encountered habitats (sand and mud) are resilient, and thus bastard halibut fisheries appear unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm. However, it cannot be said that serious impacts are highly unlikely, especially for trawl gear since it contacts the bottom.

Habitats management (2.4.2)

Scoring category	Yellow

Rationale:

Bottom trawls cannot be operated within coastal areas according to the Basic Fishery Law (Article 52, Paragraph 1)[1]. There are fewer explicit restrictions on operations of bottom gillnets and set nets, 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

Rationale:
Trophic relationships involving willowy flounder are broadly understood, but ecosystem impacts of flounder 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. Flounder prey on crustaceans and polychaetes (Igarashi 1980). It is not known what species prey on the flounder, although they are probably consumed by flatfish predators.

Ecosystem outcome (2.5.1)

Scoring category	Yellow

Rationale:
Fisheries harvest significant quantities of willowy flounder, but CPUE has been high in recent years, suggesting that the 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

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). Halibut 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).

[1] http://jamarc.fra.affrc.go.jp/enganbiz/bizbox/sokobikiami/okisokotoha/okisoko.htm

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

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

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

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

Rationale:
Individual prefectures that fish this stock have some management objectives and/or measures in place, such as those described in the Ibaraki Prefecture Resource Management Guidelines for 2011 to 2016 (http://www.jfa.maff.go.jp/form/pdf/8ibaraki.pdf). There is also a North Pacific flatfish resource recovery plan applicable to willowy flounder that was first implemented in 2003 (http://www.jfa.maff.go.jp/j/suisin/s_keikaku/pdf/taiheiyoukarei.pdf). The resource recovery plan is reportedly still in effect, although the document is dated only to 2010. Based on published management documents, implicit objectives that are consistent with appropriate management of target stocks and ecosystem impacts exist. However, up-to-date, explicit objectives consistent with the precautionary approach are not apparent.

Decision-making processes (3.2.2)

Scoring category	Yellow

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

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

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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