Blue Seafood Guide Assessment Report

Red seabream Setouchi East, Setouchi West-Central, and Sea of Japan - East China Sea stocks

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(Image from trueworldfoods.co.uk)

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, red seabream are managed as three stocks: Setouchi (Seto Inland Sea) East, Setouchi West-Central, and Japan Sea - East China Sea (hereafter Japan Sea). As of 2018, FRA stock assessments determined that the Setouchi East stock was at a high level, while the Setouchi West-Central and Japan Sea stocks were at a medium level. However, MSY-based stock assessments suggested that all three stocks were likely well below MSY in 2015. Enhancement activities take place where seabream 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 bastard halibut are broadly understood, but ecosystem impacts of halibut 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 Nagasaki 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.

BSG qualification outcome

Red seabream does not qualify for inclusion in the BSG because there are concerns about the status of the wild stocks. There is significant enhancement of seabream, which makes determination of the wild-origin stock more challenging, and recent evaluations of SSB_{2015} / SSB_{MSY} suggested that stock status is potentially poor. There are also concerns about ecosystem impacts from artificial production of juveniles, and impacts from fishing gear on habitat are uncertain.

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	Red seabream (*Pagrus major*), *madai* (マダイ)
Fishery location and season	This stock in Setouchi (the Seto Inland Sea) and off the Japan Sea - East China Sea coast from Shimane to Kagoshima prefectures (Fig. 1). Fisheries generally operate year-round, although some prefectures may implement gear-specific seasonal and/or area closures.
Gear type(s)	The main gears are small bottom trawl (小型底びき網), boat seine (船曳網), and set net (定置網). Handlines (釣り・延縄) are also commonly used to harvest sea bream from the Japan Sea - East China Sea stock.
Catch quantity (weight)	Catches from the two Setouchi stocks are comparable, about 1,900 t and 2,000 t per year for East and West-Central, respectively. Catches are substantially larger for the Japan Sea - East China Sea stock at about 6,100 t per year.
Management authorities	Fishery cooperative associations, prefectural governments, National Research Institute of Fisheries and Environment of Inland Sea, Japan Sea Fisheries Research Institute, Seikai National Fisheries Research Institute, Fisheries Agency of Japan

Figure 1. Distribution of the red seabream stocks around Japan. From left to right: Setouchi

East, Setouchi West-Central, and Japan Sea - East China Sea. The distribution is shown or outlined in pink, and spawning areas are shown in orange. Images from http://abchan.fra.go.jp/digests2018/html/2018_45.html, http://abchan.fra.go.jp/digests2018/html/2018_46.html http://abchan.fra.go.jp/digests2018/html/2018_47.html)

Description of the fishery

In Japan, red seabream are managed as three stocks: Setouchi (Seto Inland Sea) East, Setouchi West-Central, and Japan Sea - East China Sea (hereafter referred to as the Japan Sea stock). Stock structure has not been determined empirically. Catches of the Japan Sea stock are the largest, on the order of 6,000 t per year, while catches from the two Setouchi stocks are each about 2,000 t each year (Table 1). Prefectures with significant fisheries for the Japan Sea stock are Fukuoka, Nagasaki, and Kumamoto (Nakagawa and Yoshimura 2017). There also recreational fisheries for seabream, which were estimated to produce 8.4% of the total Japan Sea catch in 2008.

There is significant enhancement of these stocks, where juveniles (also called seedlings) are artificially produced and released into the wild. Numbers of released juveniles are highest for the Japan Sea stock, but release numbers for that stock have decreased in recent years, resulting in lower total releases (Table 1). Although not the focus of this assessment, there is also direct aquaculture production of red seabream via rearing in sea cages. Aquaculture production is greater than wild capture production (FRA 2015).

Table 1. Japanese fisheries catches (wild capture landings in t) and numbers of artificially-produced juveniles released (in thousands) for the Setouchi East, Setouchi West-Central, and Japan Sea - East China Sea stocks of red seabream. Data available at http://abchan.fra.go.jp/digests2017/index.html

Year	Setouchi East		Setouchi West-Central		Japan Sea - East China Sea		Total	
	Catch	Released juveniles	Catch	Released juveniles	Catch	Released juveniles	Catch	Released juveniles
2007	1,719	792	2,537	1,387	6,710	6,840	10,966	9,019
2008	1,771	789	2,396	1,189	6,505	5,240	10,672	7,218
2009	2,089	957	2,368	1,208	6,472	5,760	10,929	7,925
2010	2,039	492	2,281	1,795	5,610	5,020	9,930	7,307
2011	2,431	755	2,285	1,391	7,065	4,490	11,781	6,636
2012	1,902	526	2,115	1,116	6,568	4,190	10,585	5,832

2013	1,788	552	2,114	1,427	5,506	3,310	9,408	5,289
2014	2,041	715	1,991	1,436	5,965	3,075	9,997	5,226
2015	1,985	1,005	2,051	1,301	6,291	3,201	10,327	5,507
2016	1,947		2,035		6,299		10,281	

Although fishing is technically allowed year round, some regions may set specific fishery openings and closures, e.g. by gear type.

Unit of Assessment(s)

There are three Units of Assessment for red sea bream:

	Stock	Gears
UoA 1	Setouchi (Seto Inland Sea) East	small trawl, boat seine and set net
UoA 2	Setouchi West-Central	small trawl, boat seine and set net
UoA 3	Japan Sea - East China Sea	small trawl, boat seine, hand line and set net

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 red seabream stocks, CPUE or spawning stock biomass is used as the stock status indicator. The total range of past indicator estimates is divided into three parts, and the part that the most recent abundance estimate falls into determines the status. There are no limit or target reference points that trigger management actions for these stocks.

Fishing effort in Japan is largely regulated through input controls (Makino 2011). For bastard halibut, effort is managed by regulating the number of vessels that can fish, and some prefectures or fishery cooperatives implement fishery openings and closures. In terms of output controls, there are minimum size limits but not catch limits.

Stock status outcome (1.1.1)

Scoring category	Red for all three UoAs

Rationale:
There is significant enhancement of seabream, which makes determination of the wild-origin stock more challenging, and a recent evaluation of SSB_{2015} / SSB_{MSY} suggested that status of all three stocks is potentially poor. Details are provided below.

Setouchi East stock

Catch per unit effort (CPUE, in kg/day) for small bottom trawl vessels is used as the stock status indicator. The threshold between low and medium status is 1.76 kg/day, while the threshold between medium and high status is 5.35 kg/day (Yamamoto and Osaka 2017a). The 2017 CPUE estimate was 5.55 kg/day, and thus status was determined to be high (Fig. 2). However, seabream fisheries are enhanced through release of artificially produced juveniles, and the CPUE indicator does not distinguish between wild and artificial-origin seabream. Thus, it is difficult to determine whether the wild population itself is abundant, without the contribution of enhancement. Enhancement is significant, with over 1 million juveniles released in 2015 (Table 2). Wild capture landings and numbers of juveniles released have been fairly steady over the past ten years (Table 2).

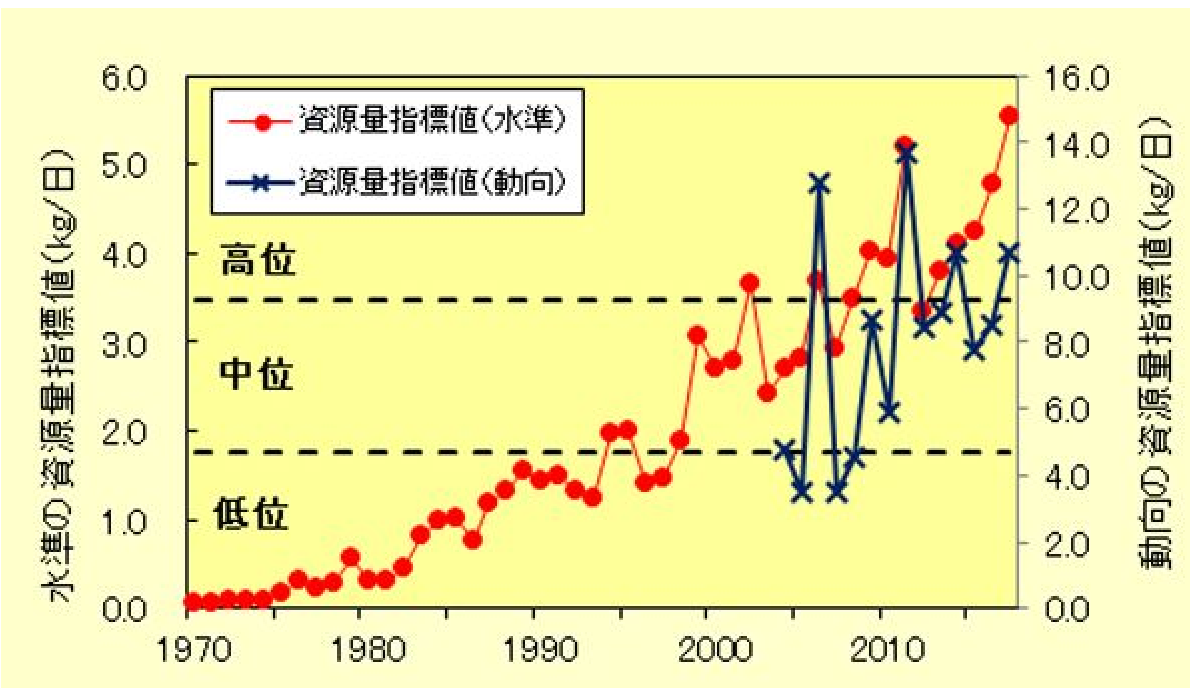

Figure 2. Biomass indicator CPUE (kg/day, red dots) and population trend CPUE (kg/day, blue x's) for the Setouchi East stock of red seabream.

Table 2. Wild-capture landings, juvenile release numbers, catches for aquaculture, and biomass indicator CPUE estimates over time for the Setouchi East stock of red seabream. Data from Yamamoto and Osaka 2017a.

Year	Landings (t)	Juvenile releases (thousands)	Catches for aquaculture (t)	CPUE (kg/day)
2007	1,719	792	1,580	2.92
2008	1,771	789	1,322	3.48
2009	2,089	957	1,069	4.03
2010	2,039	492	1,064	3.94
2011	2,431	755	652	5.19
2012	1,902	526	970	3.36
2013	1,788	552	952	3.80
2014	2,041	715	711	4.28
2015	1,985	1,005	427	4.58
2016	1,947			5.35

According to a preliminary, MSY-based assessment conducted in March 2018 for the Council for Promotion of Regulatory Policy Reform, the Japan Sea stock of red seabream was well below a sustainable abundance level in 2015, with an SSB_{2015} / SSB_{MSY} ratio of 0.20.

Setouchi West-Central stock

Spawning stock biomass (SSB), calculated using cohort analysis, is used as the stock status indicator. The threshold between low and medium status is 2,535 t, and the threshold between medium and high status is 5,069 t (Yamamoto and Osaka 2017b). In 2018 the estimated SSB resulted in a determination of medium status, and SSB showed a stable trend from 2012 to 2016 (Yamamoto and Osaka 2017b; Fig. 3). However, seabream fisheries are enhanced through release of artificially produced juveniles, and the SSB estimated in the stock assessment does not appear to distinguish between wild and artificial-origin seabream. Thus, it is difficult to determine whether the wild population itself is abundant, without the contribution of enhancement. Enhancement is significant, with about 1.3 million juveniles released in 2015 (Table 3). Numbers of juveniles released have been fairly steady over the past ten years (Table 3). Wild capture landings and estimated exploitation rates have been fairly steady over time (Fig. 4, Table 3).

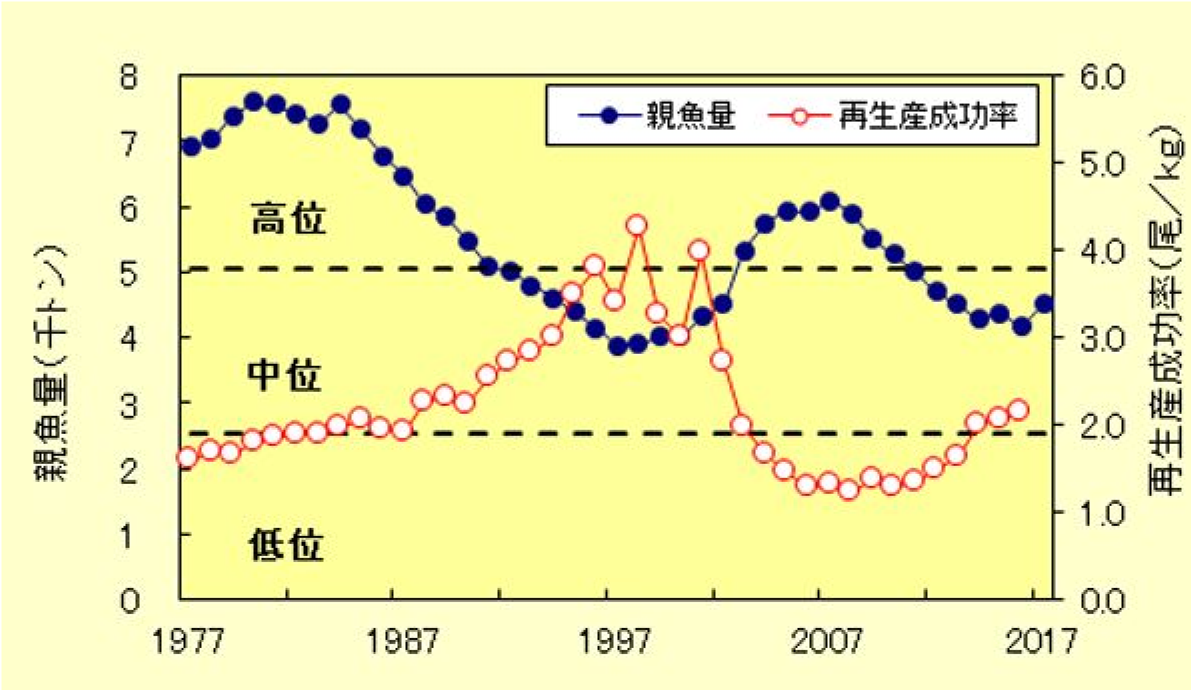

Figure 3. Estimated spawning stock biomass (blue circles, in thousands of t) and recruitment rate (white circles, numbers of recruits per kg of SSB) over time for the Setouchi West-Central stock of red seabream. The dashed line represents the threshold between medium (中位) and low status (低位) level. Figure from http://abchan.fra.go.jp/digests2018/html/2018_46.html

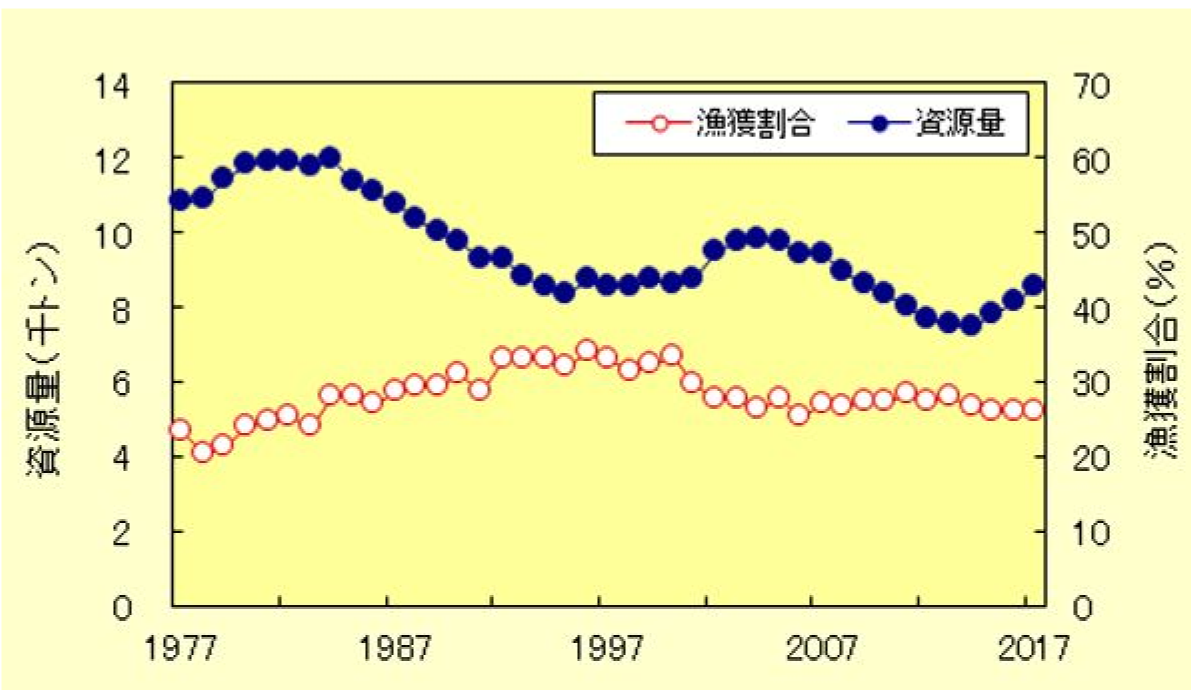

Figure 4. Estimated total biomass (blue circles) and exploitation rate (white circles, catch divided by estimated biomass) over time for the Setouchi West-Central stock of red seabream. Figure from http://abchan.fra.go.jp/digests2018/html/2018_46.html

Table 3. Wild-capture landings, juvenile release numbers, and aquaculture catches over time for the Setouchi East stock of red seabream. Data from Yamamoto and Osaka 2017b.

Year	Landings (t)	Juvenile releases (thousands)	Catches for aquaculture (t)
2007	2,537	1,387	2,071
2008	2,396	1,189	1,414
2009	2,368	1,208	1,800
2010	2,281	1,795	1,604
2011	2,285	1,391	1,744
2012	2,115	1,116	1,531
2013	2,114	1,427	1,531
2014	1,991	1,436	1,504
2015	2,051	1,301	1,592
2016	2,035		1,800

According to a preliminary, MSY-based assessment conducted in March 2018 for the Council for Promotion of Regulatory Policy Reform, the Japan Sea stock of red seabream was well below a sustainable abundance level in 2015, with an SSB_{2015} / SSB_{MSY} ratio of 0.32.

Japan Sea - East China Sea stock

Spawning stock biomass (SSB), calculated using cohort analysis, is used as the stock status indicator for the Japan Sea stock. The threshold between low and medium status is 10,000 t (http://abchan.fra.go.jp/digests2018/html/2018_47.html). In 2018 the estimated SSB resulted in a determination of medium status, and SSB showed a stable trend from 2012 to 2016 (Nakagawa and Yoshimura 2017; Fig. 5). However, seabream fisheries are enhanced through release of artificially produced juveniles, and the SSB estimated in the stock assessment does not appear to distinguish between wild and artificial-origin seabream. Thus, it is difficult to determine whether the wild population itself is abundant, without the contribution of enhancement. Fishing mortality on the overall stock has been fairly steady over time, although slightly lower in recent years (Fig. 6).

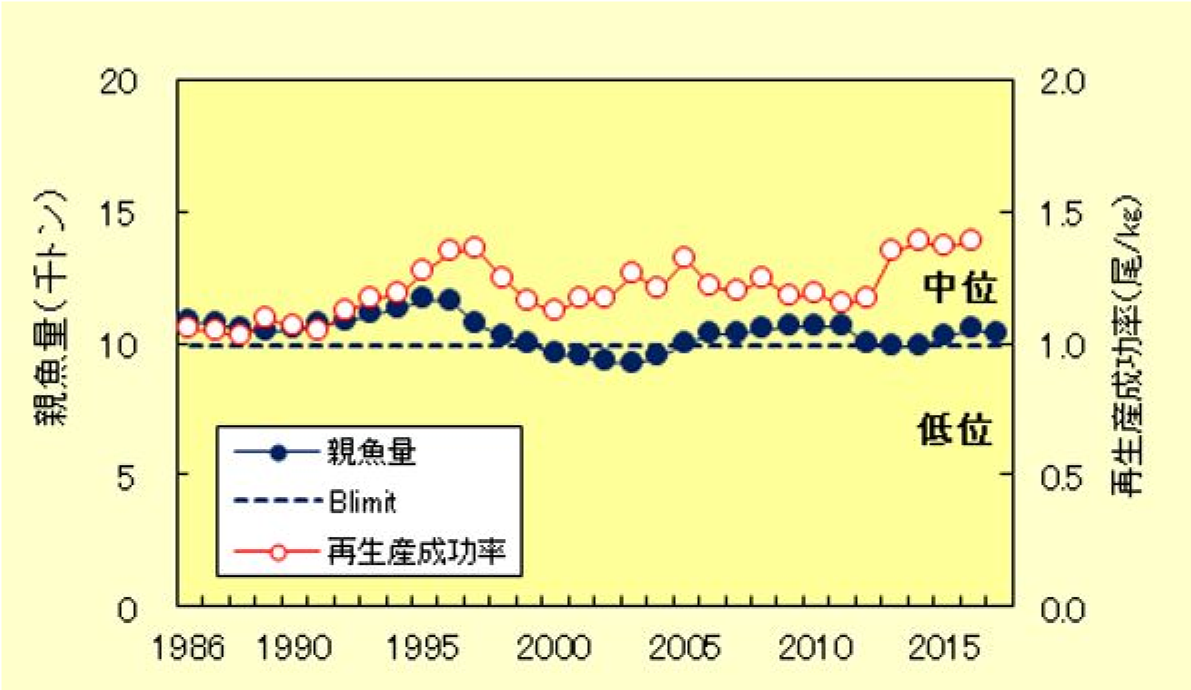

Figure 5. Estimated spawning stock biomass (blue circles, in thousands of t) and recruitment rate (white circles, numbers of recruits per kg of SSB) over time for the Japan Sea stock of red seabream. The dashed line represents the threshold between medium (中位) and low status (低位) level. Figure from http://abchan.fra.go.jp/digests2018/html/2018_47.html

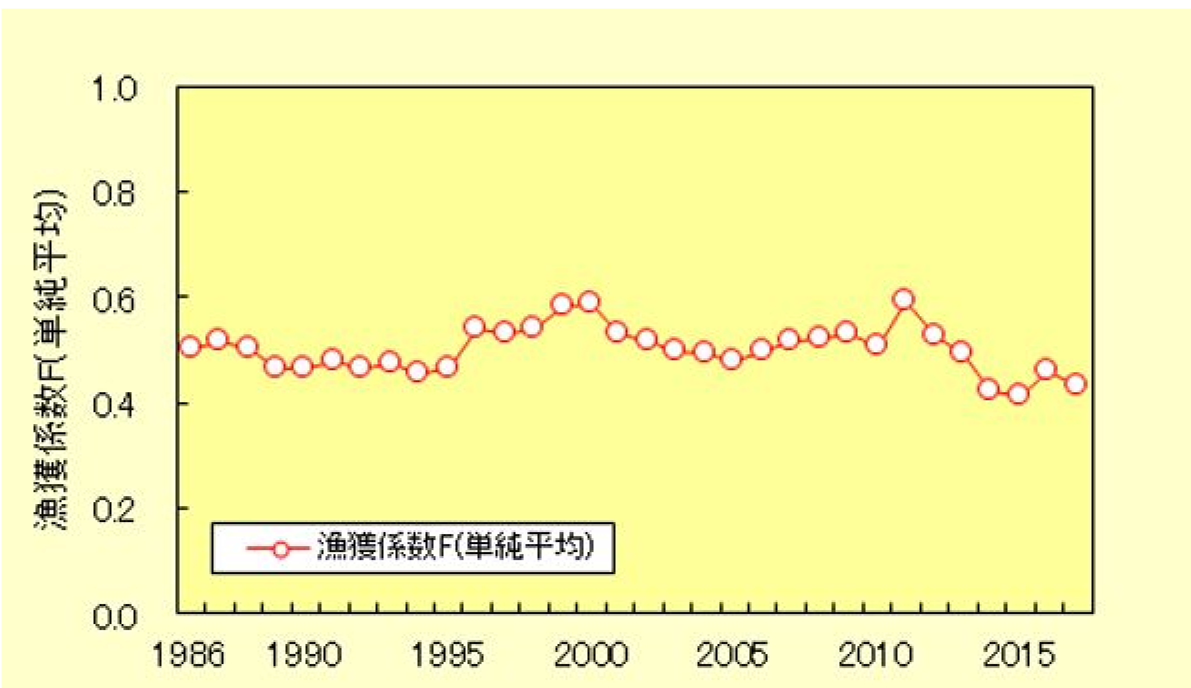

Figure 6. Estimated fishing mortality rate F over time for the Japan Sea stock of red seabream.

For the Japan Sea stock, enhancement was implemented starting in 1970, with millions of juveniles released per year. The scale of enhancement has decreased in recent years, from 9 million in 1998 to about 3.2 million in 2015 (Fig. 7). Juveniles (seedlings) are artificially produced using wild, native adults and released to enhance natural recruitment to the fishery. Larval seabream consume zooplankton, which are cultured and used as feed in the production facilities (Hagiwara et al. 2016). Seedling production involves feeding the larvae (Foscarini 1988) and possibly use of chemicals for disease treatment. Following best environmental practice, impacts of enhancement activity on sustainability of the wild stock should be considered.

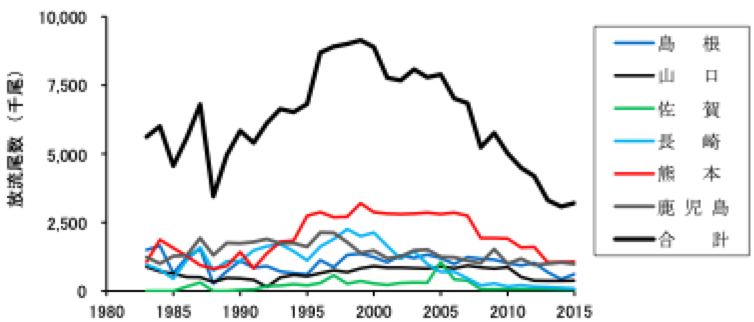

図 14.　県別マダイ種苗放流数の経年変化

Figure 7. Releases of artificially produced seabream juveniles over time for the Japan Sea stock. The upper black line shows the total, whilst the other lines are for individual prefectures (blue = Shimane, black = Yamaguchi, green = Saga, cyan = Nagasaki, red = Kumamoto, grey = Kagoshima). Figure from Nakagawa and Yoshimura 2017.

Using cohort analysis in simulation models, stock assessment scientists estimate the numbers of 1 year old recruits, including those of wild origin. The numbers of juveniles released and total numbers of 1 year old recruits the next year does not appear to be tightly correlated. In recent years since about 2013, estimated numbers of 1 year old recruits have been increasing while the number of juveniles released has been decreasing (Fig. 8). The proportion of artificial-origin fish within each age group (in numbers of fish) is also estimated. These estimates are rough due to lack of detailed data, but they suggested a low proportion of artificial origin fish in 2016 (2.7%; Nakagawa and Yoshimura 2017). Wild population abundance does not appear tightly correlated with numbers of seedlings released, and hence may not be dependent on artificial seedling production.

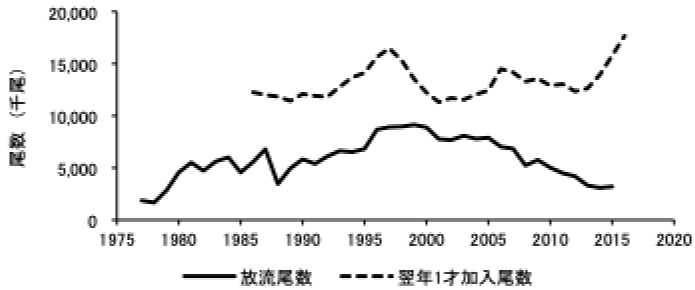

Figure 8. Numbers of juveniles released (solid line) and numbers of 1 year old recruits the next year (dashed line) over time.

According to a preliminary, MSY-based assessment conducted in March 2018 for the Council for Promotion of Regulatory Policy Reform, the Japan Sea stock of red seabream was well below a sustainable abundance level in 2015, with an SSB_{2015} / SSB_{MSY} ratio of 0.10.

Based on all of the information above, wild stock status may be above a limit reference point, but the presence of significant enhancement makes the stock assessment result more challenging to interpret. In addition, the MSY-based analysis result is a concern. Thus we precautionarily rate this indicator as red.

Stock rebuilding outcome (1.1.2)

Scoring category	Not considered

Rationale:
Enhancement, specifically releases of artificially-produced juvenile seabream, is the primary strategy used to maintain stocks. There are no rebuilding plans, in part because enhancement is broadly viewed as a beneficial practice.

Harvest strategy (1.2.1)

Scoring category	Yellow

Rationale:
Information collected to support the harvest strategy includes landings at major ports, numbers caught by age, aquaculture statistics, CPUE for specific vessel types, and research conducted by the Japan Fisheries Agency and national research institutes (Nakagawa and Yoshimura 2017, Yamamoto and Osaka 2017a and 2017b). FRA scientists assess the stocks every year and estimate an acceptable biological catch (ABC) for each stock. Gear specifications (e.g. minimum mesh size) and fishery closed seasons and areas are used to maintain productivity and manage fishing effort. 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.

The harvest strategy could theoretically maintain stock biomass around a 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 red seabream stocks, and 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 about 1969 for these stocks, and CPUE or SSB are estimated and used as abundance indicators. 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 red seabream stocks annually. These assessments use either SSB or CPUE as the abundance indicator and determine stock status relative to reference points based on historical abundance estimates (Nakagawa and Yoshimura 2017, Yamamoto and Osaka 2017a and 2017b). 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 HCRs.

Ecosystem impacts - Principle 2

Red seabream is primarily caught by small bottom trawl (小型底びき網), boat seine (船曳網), handline (釣り・延縄), and set net (定置網).

In terms of Japan's total harvest, small bottom trawls catch about 20% of the harvest, boat seines about 30%, set nets about 14%, and handlines about 11% (http://www.maff.go.jp/j/tokei/kouhyou/kaimen_gyosei/index.html). Small trawls, set nets, and boat seines may be used to catch a variety of species, and catch composition is highly dependent on fishing location and practices. Handlines are potentially more selective for the target species, but again, the other species caught will depend on fishing 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 red seabream. 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 may be used with handlines but not bottom trawls boat seines, or set nets, is also not available. Since information on other species caught is very limited, we could not determine impacts on other species at this time.

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, 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 the two gear types, while impacts on marine mammals, seabirds, and sharks are expected to be high (Table 4). 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.

The Unknown Bycatch matrices do not have a category for set nets, which are a type of trap. Fishes caught by set net generally stay alive in good condition and can be released. Impacts from this gear type may be lower if fishers release ETP species alive.

Table 4. 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

		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:
Red seabream is a demersal species that may be harvested close to or above the ocean bottom. Bottom set nets are typically set over sandy or muddy substrates, while small bottom trawls are dragged close to or along such substrates. According to SFW guidance, bottom set nets (traps) can be considered to have low habitat impacts when used over resilient mud/sand

habitat, while bottom trawls used over such habitats have moderate impacts. Vertical lines including handlines are expected to have very low habitat 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	Red

Rationale:
Red seabream are often found over rocky substrates, though they often also inhabit areas with soft sandy and muddy bottoms, as well as reefs at depths of 10 to 200 m (Gonzales et al. 2015). While sand and mud habitats are relatively resilient, reefs may not be, and thus it is unclear whether seabream fisheries may 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 boat seines 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:

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

Trophic relationships involving red seabream are broadly understood, but ecosystem impacts of seabream 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. Seabream larvae consume zooplankton such as amphipods. As they grow they transition to consuming mysid shrimps, and adults consume crustaceans, shellfish, polychaetes (Kiso 1980). Seabream are preyed upon by large fishes.

Ecosystem outcome (2.5.1)

Scoring category	Red

Rationale:
Fisheries harvest large quantities of seabream, but catches have been stable in recent years, suggesting that the stock is not currently in a depleted state. The more significant concern is ecosystem impacts from aquaculture. Juveniles are artificially produced from broodstock and released into the wild, to be captured as adults in wild-capture fisheries. Juveniles are also reared in ocean net pens, although that type of aquaculture is not the focus of this assessment. The scale of releases has been steady and significant for more than the past ten years (see Tables 2, 3, and 4). If juveniles are produced in an ecologically responsible manner, for example by using genetically diverse broodstock collected from abundant wild populations, ecological impacts from enhancement may be reduced.

Without more information on the ecological impacts of artificial production we are unable to determine how likely the fishery is 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). 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 may have some management objectives and/or measures in place, e.g. as described in the Nagasaki Prefecture Resource Management Guidelines (長崎県資源管理指針) for 2011 to 2016[2] and the Nagasaki Fishery Adjustment Rules (長崎県漁業調整規則).[3] For example, the stated management objective for red seabream is to recover the stock when it is at a low level. The fishery adjustment rules specify closed seasons and areas by gear type. For example, small bottom trawlers (Type 2, including えびこぎ網 which is used to harvest seabream) have closed seasons from 1 March to 30 April and 16 August to 31 October. There are also areas closed to fishing.

Based on these Nagasaki fishery resource management documents, implicit objectives that are consistent with appropriate management of target stocks and ecosystem impacts appear to exist. However, explicit objectives consistent with the precautionary approach are not apparent.

Decision-making processes (3.2.2)

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[2] http://www.jfa.maff.go.jp/form/pdf/35nagasaki.pdf
[3] https://www.pref.nagasaki.jp/suisan/sigen/tyoseikisoku/choseikisokuzenbun.pdf

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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