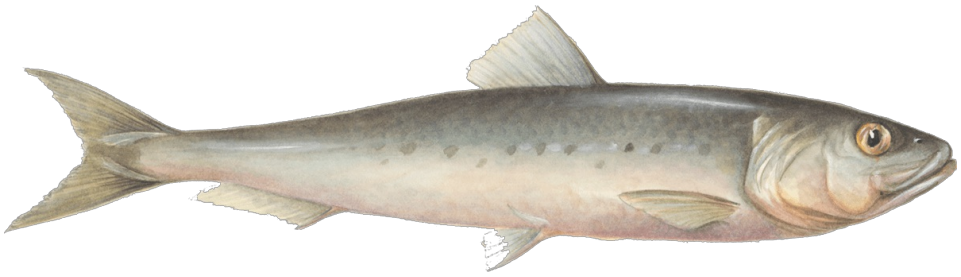
Sardines (Japan)

Sardinops melanostictus, Trachurus japonicus, Scomber japonicus, Seriola quinqueradiata



Northwest Pacific

Purse seines, Stationary uncovered pound nets

Report ID 27868

December 4, 2023

Seafood Watch Standard used in this assessment: Fisheries Standard v4

Table of Contents

About Seafood Watch

Monterey Bay Aquarium's Seafood Watch program evaluates the environmental sustainability of wild-caught and farmed seafood commonly found in the United States marketplace. Seafood Watch defines sustainable seafood as originating from sources, whether wild-caught or farmed, which can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems. The program's goals are to raise awareness of important ocean conservation issues and empower seafood consumers and businesses to make choices for healthy oceans.

Seafood Watch's science-based ratings are available at www.SeafoodWatch.org. Each rating is supported by a Seafood Watch assessment, in which the fishery or aquaculture operation is evaluated using the Seafood Watch standard.

Seafood Watch standards are built on our guiding principles, which outline the necessary environmental sustainability elements for fisheries and aquaculture operations. The guiding principles differ across standards, reflecting the different impacts of fisheries and aquaculture.

- Seafood rated Best Choice comes from sources that operate in a manner that's consistent with our guiding principles. The seafood is caught or farmed in ways that cause little or no harm to other wildlife or the environment.

- Seafood rated Good Alternative comes from sources that align with most of our guiding principles. However, one issue needs substantial improvement, or there's significant uncertainty about the impacts on wildlife or the environment.

- Seafood rated Avoid comes from sources that don't align with our guiding principles. The seafood is caught or farmed in ways that have a high risk of causing harm to wildlife or the environment. There's a critical conservation concern or many issues need substantial improvement.

Each assessment follows an eight-step process, which prioritizes rigor, impartiality, transparency and accessibility. They are conducted by Seafood Watch scientists, in collaboration with scientific, government, industry and conservation experts and are open for public comment prior to publication. Conditions in wild capture fisheries and aquaculture operations can change over time; as such assessments and ratings are updated regularly to reflect current practice.

More information on Seafood Watch guiding principles, standards, assessments and ratings are available at www.SeafoodWatch.org.

Guiding Principles

Seafood Watch defines sustainable seafood as originating from sources, whether fished[1] or farmed, that can maintain or increase production in the long term without jeopardizing the structure or function of affected ecosystems.

The following guiding principles illustrate the qualities that fisheries must possess to be considered sustainable by the Seafood Watch program (these are explained further in the Seafood Watch Standard for Fisheries):

- Follow the principles of ecosystem-based fisheries management.
- Ensure all affected stocks are healthy and abundant.
- Fish all affected stocks at sustainable levels.
- Minimize bycatch.
- Have no more than a negligible impact on any threatened, endangered, or protected species.
- Managed to sustain the long-term productivity of all affected species.
- Avoid negative impacts on the structure, function, or associated biota of aquatic habitats where fishing occurs.
- Maintain the trophic role of all aquatic life.
- Do not result in harmful ecological changes such as reduction of dependent predator populations, trophic cascades, or phase shifts.
- Ensure that any enhancement activities and fishing activities on enhanced stocks do not negatively affect the diversity, abundance, productivity, or genetic integrity of wild stocks.

These guiding principles are operationalized in the four criteria in this standard.Each criterion includes:

- Factors to evaluate and score
- Guidelines for integrating these factors to produce a numerical score and rating

Once a rating has been assigned to each criterion, Seafood Watch develops an overall recommendation. Criteria ratings and the overall recommendation are color coded to correspond to the categories on the Seafood Watch pocket guides and online guide:

Best Choice/Green: Buy first; they're well managed and caught or farmed responsibly.

Good Alternative/Yellow: Buy, but be aware there are concerns with how they're caught, farmed or managed.

Avoid/Red: Take a pass on these for now; they're caught or farmed in ways that harm other marine life or the environment.

[1] "Fish" is used throughout this document to refer to finfish, shellfish and other invertebrates

Summary

This report focuses on the Japanese purse seine and stationary uncovered pound net fisheries targeting Japanese pilchard (*Sardinops melanostictus*), Japanese scad (*Trachurus japonicus*), and Pacific chub mackerel (*Scomber japonicus*). Japanese pilchard, Japanese scad, and Pacific chub mackerel are treated as mono-specific targets at the purse seine set level, since the vessels target these species at different times of the year. The report also covers buri amberjack (*Seriola quinqueradiata*), which is caught in the same fishery but is a main species only in the pound net fishery. The fishery is prosecuted inside Japan's exclusive economic zone (EEZ) in the Tsushima Warm Current with inshore purse seines and inshore pound nets. The purse seine fleet also operates within Japan's EEZ in the Western Pacific Ocean.

The stocks are assessed annually and the latest stock assessments were published in 2022. For buri amberjack, the Tsushima stock of Japanese pilchard, and the Pacific stock of Japanese scad, the current biomass is below a sustainable level. For buri amberjack, the Pacific stock of Japanese pilchard, and the Tsushima stock of Pacific chub mackerel, fishing mortality is above a sustainable level. Both biomass and fishing mortality are at sustainable levels for the Tsushima stock of Japanese scad and the Pacific stock of Pacific chub mackerel.

Stationary uncovered pound net gear deployed in these waters have the potential to interact with a number of species of concern. However, bycatch data are not regularly collected, so potential impacts on these species are evaluated at the level of the taxon.

A robust management system is in place and it shifted to a new strategy with MSY-based reference points in 2021. It is still too early to evaluate the effectiveness of the new system, but this management strategy is expect to be successful.The management strategy scores moderately effective. Independent research in the pound net fishery has identified that this gear encounters loggerhead turtle and green sea turtle. There has been insufficient effort to minimize bycatch of these species, so the bycatch strategy for the pound net fishery scores ineffective. Because of the lack of bycatch data in the purse seine fishery, its bycatch strategy scores a moderate concern. The lack of bycatch data for these species of concern results in a data collection and analysis score of ineffective. Enforcement is based on government oversight and local area social system pressures. This scheme scores moderately effective. Stakeholders are intrinsically integrated into the management system, so inclusion scores moderately effective.

Purse seine gear does not routinely have bottom contact. The type of pound nets used in the fishery are deployed at the beginning of the fishing season and removed at the end. Although there are impacts on the substrate, they are minimal compared to those from pound net gear, which is deployed multiple times throughout the fishing season. Ecosystem-based fishery management is not being pursued in this fishery, and food-web impacts have not been demonstrated. Therefore, the ecosystem-based fisheries management approach scores a moderate concern.

Japanese scad from the Tsushima Warm Current stock caught in Japanese purse seines is rated green because of the health of the stock, improvements to the management strategy, and minimal ecosystem impacts. Similar management strategies and ecosystem impacts are seen for purse seines targeting the Pacific Ocean stock of Japanese scad, both Japanese sardine stocks, and both Pacific chub mackerel stocks. However, due to poor stock health, these stocks all receive a yellow rating. Driven by concerns for impacts on the target species, impacts on bycatch species, and ineffective mitigation of sea turtle bycatch, Japanese pilchard, Japanese scad, Pacific chub mackerel, and buri amberjack caught in stationary uncovered pound nets receive red ratings.

Final Seafood Recommendations

SPECIES | FISHERY	C 1 TARGET SPECIES	C 2 OTHER SPECIES	C 3 MANAGEMENT	C 4 HABITAT	OVERALL	VOLUME (MT) YEAR
Buri | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets	1.000	1.000	1.000	3.000	**Avoid (1.316)**	49,339 (MT) 2020
Japanese pilchard | Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines	1.732	2.236	3.000	3.873	**Good Alternative (2.590)**	55,000 (MT) 2020
Japanese pilchard | Pacific Coast of Japan Stock | Northwest Pacific | Purse seines	1.916	2.236	3.000	3.873	**Good Alternative (2.656)**	627,000 (MT) 2020
Japanese pilchard | Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets	1.732	1.000	1.000	3.000	**Avoid (1.510)**	Unknown
Japanese scad | Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines	4.284	2.236	3.000	3.873	**Best Choice (3.248)**	73,000
Japanese scad | Pacific Coast of Japan Stock | Northwest Pacific | Purse seines	1.732	2.236	3.000	3.873	**Good Alternative (2.590)**	15,000
Japanese scad | Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets	4.284	1.000	1.000	3.000	**Avoid (1.893)**	Unknown
Pacific chub mackerel | Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines	1.526	2.236	3.000	3.873	**Good Alternative (2.509)**	85,647
Pacific chub mackerel | Pacific Coast of Japan Stock | Northwest Pacific | Purse seines	3.318	2.236	3.000	3.873	**Good Alternative (3.047)**	185,712
Pacific chub mackerel | Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets	1.526	1.000	1.000	3.000	**Avoid (1.463)**	5,561 (MT) 2020

Production volumes come from the 2022 stock assessments which provide catch amounts through 2021. The stock assessments did not provide a gear breakdown of the total catch for the Tsushima Warm Current stocks of Japanese sardine or Japanese scad. The total catch for those stocks is assigned to the purse seine gear. The Tsushima Warm Current stock of Pacific chub mackerel provides a gear breakdown which includes categories for purse seines, longlines, and 'other gear.' The total catch from 'other gear' was used for the pound net production volume.

Summary

Japanese scad from the Tsushima Warm Current stock caught in Japanese purse seines is rated green because of the health of the stock, improvements to the management strategy, and minimal ecosystem impacts. Similar management strategies and ecosystem impacts are seen for purse seines targeting the Pacific Ocean stock of Japanese scad, both Japanese sardine stocks, and both Pacific chub mackerel stocks. However, due to poor stock health, these stocks all receive a yellow rating. Driven by concerns for impacts on the target species, impacts on bycatch species, and ineffective mitigation of sea turtle bycatch, Japanese pilchard, Japanese scad, Pacific chub mackerel, and buri amberjack caught in stationary uncovered pound nets receive red ratings.

Scoring Guide

Scores range from zero to five where zero indicates very poor performance and five indicates the fishing operations have no significant impact.

Final Score = geometric mean of the four Scores (Criterion 1, Criterion 2, Criterion 3, Criterion 4).

Best Choice/Green = Final Score >3.2, and no Red Criteria, and no Critical scores

Good Alternative/Yellow = Final score >2.2-3.2, and neither Harvest Strategy (Factor 3.1) nor Bycatch Management Strategy (Factor 3.2) are Very High Concern2, and no more than one Red Criterion, and no Critical scores

Avoid/Red = Final Score ≤2.2, or either Harvest Strategy (Factor 3.1) or Bycatch Management Strategy (Factor 3.2) is Very High Concern or two or more Red Criteria, or one or more Critical scores.

[2] Because effective management is an essential component of sustainable fisheries, Seafood Watch issues an Avoid recommendation for any fishery scored as a Very High Concern for either factor under Management (Criterion 3).

Introduction

Scope of the analysis and ensuing recommendation

This report focuses on the Japanese purse seine and stationary uncovered pound net fisheries targeting Japanese pilchard (*Sardinops melanostictus*), Japanese scad (*Trachurus japonicus*), and Pacific chub mackerel (*Scomber japonicus*). The report also covers buri amberjack (*Seriola quinqueradiata*), which is caught in the same fishery but is a main species only in the pound net fishery. The fishery is prosecuted inside Japan's EEZ in the Tsushima Warm Current with inshore purse seines and inshore pound nets. The purse seine fleet also operates within Japan's EEZ in the Western Pacific Ocean.

Species Overview

Japanese pilchard (*Sardinops melanostictus*)

Japanese pilchard is widely distributed throughout the northwestern Pacific Ocean. Near Russia, populations extend up to the Gulf of Tartary (Sarr et al. 2021). There are two stocks of Japanese pilchard found in the waters near Japan: the Tsushima Warm Current stock and the Pacific Ocean stock. The Tsushima Warm Current stock occurs in the Sea of Japan and the East China Sea. The Pacific Ocean stock is found offshore in the Western and Central Pacific Ocean. The Tsushima Warm Current stock spawns from January to June and the Pacific Ocean stock spawns from November to June (Sarr et al. 2021). The stocks are known to experience large fluctuations in abundance, driven by fishing pressure and environmental conditions that influence recruitment (Sarr et al. 2021).

Japanese scad (*Trachurus japonicus*)

Japanese scad is distributed around Japan in the Sea of Japan, the East China Sea, and Pacific coastal areas along the Kuroshio Current. The species is mainly distributed around the continental shelf. There are two stocks in the waters around Japan: the Tsushima Warm Current stock and the Pacific Ocean stock. The Pacific Ocean stock mainly occurs along the Kuroshio Current (Kanaji et al. 2009). The stock comprises multiple cohorts that overlap and spawn at slightly different times throughout the spawning period (Kanaji et al. 2009).

Pacific chub mackerel (*Scomber japonicus*)

Pacific chub mackerel is distributed in the East China Sea, around Japan, and extends into the Pacific Ocean via the Kuroshio Current (Kume et al. 2021). The species primarily inhabits coastal waters over the continental shelf and is typically found at depths ranging from 0 to 300 m (Collete & Nauen 1983). The populations fished by the Japanese fleet are recognized as the Tsushima Warm Current stock and the Pacific Ocean stock. Individuals make a northerly migration to feed from June to September and will migrate back south to spawn from November to January (Chen et al. 2009).

Buri amberjack (*Seriola quinqueradiata*)

Buri amberjack is found in the coastal waters of Japan on both the Pacific Ocean side and the Sea of Japan side. Mature adults migrate south into the East China Sea from winter to spring to spawn. During the summer and fall, the mature adults will migrate back north. The population that the Japanese pound net fishers targets is considered a single stock (FRA 2021l).

Table 1. Common and market names of species rated in this assessment (ASFIS 2020)(FDA 2022).

Scientific name	FDA common name	FDA acceptable market name	FAO/ASFIS common name
Sardinops melanostictus	Japanese pilchard	Pilchard or sardine	Japanese pilchard
Trachurus japonicus	Japanese scad	Jack mackerel	Japanese jack mackerel
Scomber japonicus	Pacific chub mackerel	Chub mackerel or mackerel	Pacific chub mackerel
Seriola quinqueradiata	Buri	Amberjack	Japanese amberjack

Production Statistics

This is a multispecies fishery in which the primary species caught shifts on decadal scales as the abundance of each species shifts out of phase with each other. The changes in catch composition have been linked with regime shifts in key environmental factors that influence recruitment (Yatsu 2019).

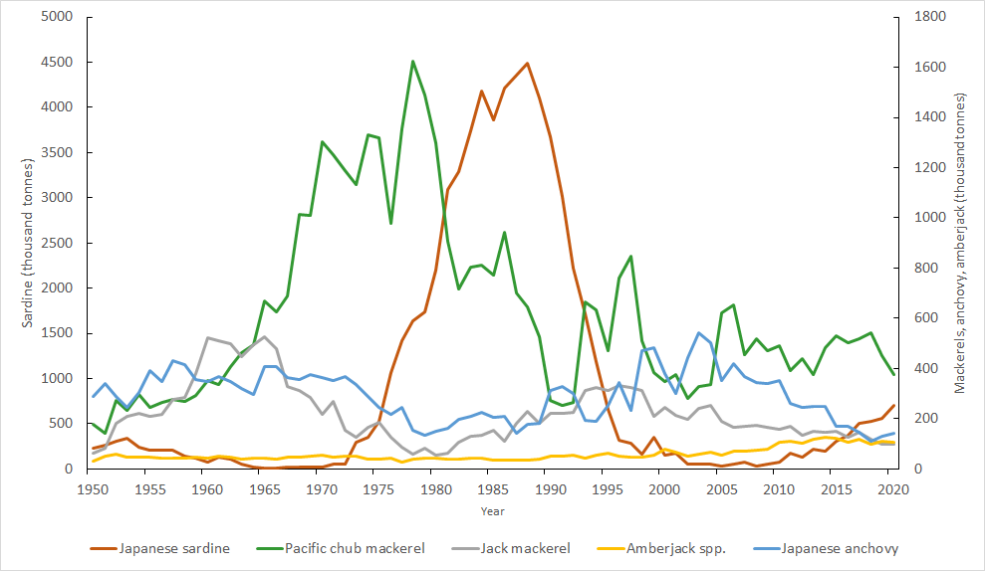


Figure 1. Annual catch of Japanese pilchard, Pacific chub mackerel, Japanese scad, buri species, and Japanese anchovy landed by Japanese vessels. Includes landings from commercial and recreational sources. Data from FAO global capture production quantity (1950–2020) database (FAO 2021).

In the 1960s and 1970s, mackerel was the main target of offshore purse seine fishers (Makino 2018). Catch of Japanese pilchard started to take off after 1975. Before then, the annual catch of pilchard was less than 500,000 tons. By 1983, the annual catch averaged 2.5 million tons. The catch rate remained at this high level until a precipitous decline started in 1990. From 1995 to 2001, the annual catch ranged from 100,000 to 300,000 tons (FRA 2021b). During this decline in pilchard catch, the anchovy and mackerel landings increased (Makino 2018). But, fishing mortality in the 1990s put a serious strain on the abundance of these species. This high level of fishing mortality was partly due to investments aimed at developing the pilchard fishing industry.

During the pilchard boom of the 1980s, money was funneled into building fishing vessels and processing infrastructure. When the abundance of Japanese pilchard crashed, there was a mismatch in the available processing infrastructure and the abundance of the target species. The fishing fleet had swelled in size and now needed to target other species to see a return on investment. Fishers began targeting anchovy and mackerel more heavily. Pacific chub mackerel was on track to increase in abundance, with strong year classes in 1992 and 1996. But, this bounce back in abundance was stymied because fishers began targeting juvenile Pacific chub mackerel for the high price that the fish could fetch (Makino 2018).

In 2001, a new management framework called the Resource Recovery Plan was adopted to address the overfishing issues (Makino 2018). Pilchard, mackerel, and anchovy were among the species selected for special management attention under this framework. Total allowable catches (TACs) were introduced and the government began working closely with fishers under a comanagement framework (Makino 2011)(Makino 2018).

From 2001 to 2010, Japanese pilchard catch remained below 100,000 tons annually. In the following decade, catch steadily increased and reached 622,000 tons in 2020 (FRA 2021b). Pacific chub mackerel catch remained around 100,000 to 200,000 tons annually from 2003 to 2014. From 2015 to 2018, it hovered around 300,000 tons annually. Japanese scad catch has declined since the 1990s, and it currently averages around 200,000 tons annually (FRA 2021a)(FRA 2021b).

Anchovy catch has been on the decline in the 21st century (FRA 2021i). The abundance of the species has declined in tandem with changes in environmental conditions that influence recruitment. Japanese anchovy is not currently a main species in this fishery.

Japanese amberjack

Historically, wild catch of buri amberjack has been dominated by the pound net fishery. Starting in the 1960s, purse seine landings began to increase and eventually surpassed pound net landings in 2002. The overall catch of buri amberjack decreased from the 1960s through the 1980s, and began to increase again in the 1990s. From 2002 to 2016, purse seines landed the majority of wild capture buri amberjack. From 2017 to the present, pound nets once again have become the major source of wild capture buri amberjack (FRA 2021l). Historic landings of the species are difficult to parse because several species were included under the umbrella term "yellowtail" in the landing records (FRA 2021l). In 2014, annual landings for all gear types combined were 125,000 tons, and in 2020, landings were 105,000 tons (FRA 2021l).

Importance to the US/North American market.

Publicly available data on US imports of pilchard, scad, and mackerels likely underestimates the true extent of the amount of product being imported. A few factors obfuscate the true amount of product being imported. First, these species are often exported from Japan to another country for processing before being sent to the US. Second, some of these species are processed into secondary product forms, such as fish meal or fish oil (Makino 2018). Finally, the datasets sometimes aggregate multiple species into one larger, generalized category, such as "mackerel."

According to the NOAA Foreign Trade dataset, annual imports of pilchard and scad into the United States market are on the order of several hundred metric tons (NOAA 2021).. Annual mackerel imports range from 500 to 1,200 metric tons (NOAA 2021). Japan exports both Pacific chub mackerel and blue mackerel, so it is likely that these data are a combination of both species. The NOAA does not report on the imports of buri amberjack.

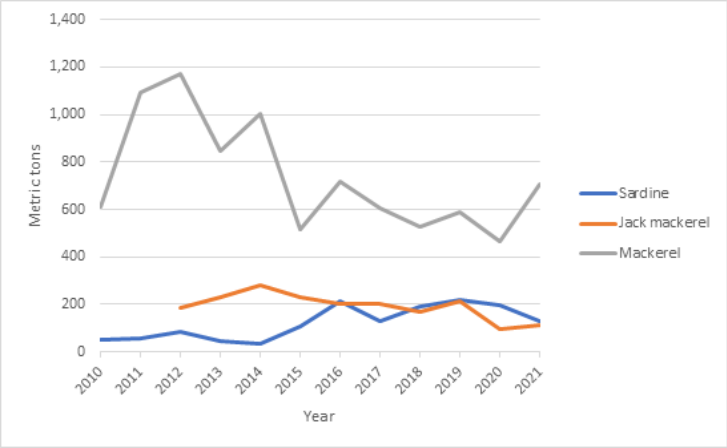


Figure 2. Annual United States imports of sardine (pilchard), jack mackerel (Japanese scad), and mackerel from Japan 2010–21. Data from NOAA (NOAA 2021).

Common and market names.

Other market names for Japanese pilchard: pilchard or sardine.

Other market names for Japanese scad: horse mackerel or jack mackerel.

Other market names for Pacific chub mackerel: chub mackerel or mackerel.

Other market names for buri amberjack: yellowtail, yellowtail amberjack, Japanese yellowtail, or Japanese amberjack.

Primary product forms

Japanese pilchard: canned in water or oil, dried and salted, frozen whole, fish meal.

Japanese scad: canned in either water, oil, or tomato sauce; frozen whole.

Pacific chub mackerel: canned in water or oil, dried and salted, smoked, frozen whole.

Buri amberjack: sashimi, fresh fillet, frozen fillet, frozen whole, rounds.

Assessment

This section assesses the sustainability of the fishery(s) relative to the Seafood Watch Standard for Fisheries, available at www.seafoodwatch.org. The specific standard used is referenced on the title page of all Seafood Watch assessments.

Criterion 1: Impacts on the species under assessment

This criterion evaluates the impact of fishing mortality on the species, given its current abundance. When abundance is unknown, abundance is scored based on the species' inherent vulnerability, which is calculated using a Productivity-Susceptibility Analysis. The final Criterion 1 score is determined by taking the geometric mean of the abundance and fishing mortality scores. The Criterion 1 rating is determined as follows:

- ***Score >3.2=Green or Low Concern***
- ***Score >2.2 and ≤3.2=Yellow or Moderate Concern***
- ***Score ≤2.2 = Red or High Concern***

Rating is Critical if Factor 1.3 (Fishing Mortality) is Critical.

Guiding principles

- *Ensure all affected stocks are healthy and abundant.*
- *Fish all affected stocks at sustainable level*

Criterion 1 Summary

BURI			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets	1.000: High Concern	1.000: High Concern	Red (1.000)

JAPANESE PILCHARD			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Pacific Coast of Japan Stock | Northwest Pacific | Purse seines	3.670: Low Concern	1.000: High Concern	Red (1.916)
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets	1.000: High Concern	3.000: Moderate Concern	Red (1.732)

JAPANESE SCAD			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Pacific Coast of Japan Stock | Northwest Pacific | Purse seines	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets	3.670: Low Concern	5.000: Low Concern	Green (4.284)

PACIFIC CHUB MACKEREL			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines	2.330: Moderate Concern	1.000: High Concern	Red (1.526)
Pacific Coast of Japan Stock | Northwest Pacific | Purse seines	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets	2.330: Moderate Concern	1.000: High Concern	Red (1.526)

The stock assessments are conducted for the Pacific Ocean and Tsushima Warm Current stocks. The Pacific Ocean stock is found along the southwest portion of Japan extending up to the Kuroshio area and offshore into the Kuroshio Extension (Yatsu 2019). The Pacific Ocean stock is fished by an offshore fleet of medium and large purse seiners that operates inside Japan's EEZ (Makino 2018). The Tsushima Warm Current stocks occur along the southwest coast of Japan, extending south into the East China Sea and the Yellow Sea (Wang et al. 2020). These stocks are fished in Japan's inshore waters using pound nets and small purse seines. The stock assessments estimate abundance and reference points based on the spawning biomass (SB). The reference points used for the various stocks are defined in the same way across all the stock assessments. The target reference point is the amount of spawning biomass that achieves a maximum sustainable yield (SB_{MSY}). The limit reference point is the SB that achieves 60% of MSY. The ban reference point, or the point at which the fishery is closed, is the SB that achieves 10% of MSY. The reference points for Japanese pilchard attempt to capture the influence of environmental factors on recruitment by modeling "normal" and "high" recruitment periods. The appropriate model is selected based on current trends in recruitment and environmental conditions. In addition, the stock assessments for these species are conducted annually, so the reference points are responsive to the fluctuations in abundance that these species are known to exhibit. The target, limit, and ban reference points are considered appropriate for these species (Okamura et al. in press).

None of the species included in this assessment are considered key forage species (see Appendix 1 for more information).

Criterion 1 Assessments

SCORING GUIDELINES

Factor 1.1 - Abundance
Goal: Stock abundance and size structure of native species is maintained at a level that does not impair recruitment or productivity.

- *5 (Very Low Concern) — Strong evidence exists that the population is above an appropriate target abundance level (given the species' ecological role), or near virgin biomass.*
- *3.67 (Low Concern) — Population may be below target abundance level, but is at least 75% of the target level, OR data-limited assessments suggest population is healthy and species is not highly vulnerable.*

- *2.33 (Moderate Concern) — Population is not overfished but may be below 75% of the target abundance level, OR abundance is unknown and the species is not highly vulnerable.*
- *1 (High Concern) — Population is considered overfished/depleted, a species of concern, threatened or endangered, OR abundance is unknown and species is highly vulnerable.*

Factor 1.2 - Fishing Mortality
Goal: Fishing mortality is appropriate for current state of the stock.

- *5 (Low Concern) — Probable (>50%) that fishing mortality from all sources is at or below a sustainable level, given the species ecological role, OR fishery does not target species and fishing mortality is low enough to not adversely affect its population.*
- *3 (Moderate Concern) — Fishing mortality is fluctuating around sustainable levels, OR fishing mortality relative to a sustainable level is uncertain.*
- *1 (High Concern) — Probable that fishing mortality from all source is above a sustainable level.*

Buri

Factor 1.1 - Abundance

East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets

High Concern

Annual stock assessments are conducted for yellowtail. The stock assessment uses "yellowtail" as an umbrella term for yellowtail and buri amberjack. This is due to historic data collect practices which combined the landings for these two species, making it impossible to assess one without the other. The stock assessment tracks spawning biomass based on cohort analysis using landings data from Japan and South Korea. In 2021, the abundance of the stock was below the limit reference point with SB_{2021}/SB_{MSY} = 0.59 (FRA 2022g). The stock has been below the target reference point for the entire timeseries examined. Though it was above the limit reference point during the 2012-2020 period (FRA 2022g). Since the stock abundance is below the limit reference point, Abundance is scored a "High concern."

Factor 1.2 - Fishing Mortality

East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets

High Concern

Fishing pressure for this stock is above the target reference point. In 2021, F_{2021}/F_{MSY} = 1.21. Fishing pressure has been above the reference point for the entire timeseries examined in the stock assessment (FRA 2022g). Therefore, Fishing Mortality is scored a "High concern."

Japanese pilchard

Factor 1.1 - Abundance

Pacific Coast of Japan Stock | Northwest Pacific | Purse seines

Low Concern

A stock assessment was conducted for the Pacific Ocean stock in 2022. The stock assessment tracks spawning biomass based on cohort analysis using landings data. In 2021, SB_{2021}/SB_{MSY} = 1.86. This stock is above the target reference point and has been since 2017 (FRA 2022a). However, there is some criticism about the methods employed in the stock assessment (Teo 2021). Therefore, Abundance is scored a "Low concern."

Justification:

The stock assessment has been criticized for violating assumptions of the virtual population analysis model used to estimate the stock dynamics and for relying solely on Japanese landing data. The 2022 stock assessment began incorporating foreign landings data (FRA 2022a) (FRA 2022b). However, the remaining issues have led the stock assessment to underestimate the uncertainty related to short-term projections of reference points and spawning biomass. This ultimately raises concerns about the appropriateness of the current reference points in relation to management objectives (Teo 2021).

The recent stock assessment and the estimated spawning biomass being above SB_{MSY} are good signs. But, the scientific controversy regarding the stock assessment methodology means that the stock does not qualify for a score of "Very low concern."

Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets

High Concern
A stock assessment was conducted for the Tsushima Warm Current stock in 2022. The stock assessment tracks spawning biomass based on cohort analysis using landings data. In 2021, the abundance of the stock was below the limit reference point with SB_{2021}/SB_{MSY} = 0.25 (FRA 2022b). The stock has been below the limit reference point since 1995. Therefore, Abundance is scored a "High concern."

Factor 1.2 - Fishing Mortality

Pacific Coast of Japan Stock | Northwest Pacific | Purse seines

High Concern
The Pacific Ocean stock fishing pressure in 2021 was assessed as being above F_{MSY}. For 2021, F_{2021}/F_{MSY} = 1.62. Fishing pressure has remained above the target reference point in every year since 1990, except for three years (FRA 2022a). Therefore, Fishing Mortality is scored a "High concern.

Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets

Moderate Concern
The Tsushima Warm Current stock fishing pressure in 2021 was assessed as being below F_{MSY}. For 2021, F_{2021}/F_{MSY} = 0.65. Fishing pressure has fluctuated around the F_{MSY} for the past decade. It is currently below the target reference point, but above the limit reference point (FRA 2022b). Since F is fluctuating around F_{MSY}, Fishing Mortality is scored a "Moderate concern."

Japanese scad

Factor 1.1 - Abundance

Pacific Coast of Japan Stock | Northwest Pacific | Purse seines

High Concern
A stock assessment was conducted for the Pacific Ocean stock in 2022. The stock assessment tracks spawning biomass based on cohort analysis using landings data. In 2021, the abundance of the stock was below the limit reference point, with SB_{2021}/SB_{MSY} = 0.45 (FRA 2022c). Abundance of the stock has remained below the limit reference point since 2007 (FRA 2022c). Therefore, Abundance is scored a "High concern."

Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets

Low Concern
A stock assessment was conducted for the Tsushima Warm Current stock in 2022. The stock assessment tracks spawning biomass based on cohort analysis using landings data. In 2022, SB_{2021}/SB_{MSY} = 1.15. This is the second year in a row that the stock was above the target reference point following the 2005-2019 period when the stock was consistently below the target reference point (FRA 2022d). Despite the stock being above the target reference point, there is some criticism about the methods employed in the stock assessment (Teo 2021). Therefore, Abundance is scored a "Low concern."

Justification:
The stock assessment has been criticized for the way that age and length data were binned and for relying solely on Japanese landing data. These issues have led the stock assessment to underestimate the uncertainty related to short-term projections of reference points and spawning biomass. This ultimately raises concerns about the appropriateness of the current reference points in relation to management objectives (Teo 2021).

Factor 1.2 - Fishing Mortality

Pacific Coast of Japan Stock | Northwest Pacific | Purse seines

Moderate Concern
The Pacific Ocean stock fishing pressure in 2021 was assessed as being below the target reference point of F_{MSY}. For 2021, F_{2021}/F_{MSY} = 0.81. This is the first time that fishing pressure has dropped below the target reference point since 2012 (FRA 2022c). It is considered to be fluctuating around the target. Therefore, Fishing Mortality is scored a "Moderate concern."

Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets

Low Concern
The Tsushima Warm Current stock fishing pressure in 2021 was assessed as being below the target reference point of F_{MSY}. For 2021, F_{2021}/F_{MSY} = 0.77. Fishing pressure has remained below the target reference point since 2016 (FRA 2022d). Therefore, Fishing Mortality is scored a "Low concern."

Pacific chub mackerel

Factor 1.1 - Abundance

Pacific Coast of Japan Stock | Northwest Pacific | Purse seines

Low Concern
A stock assessment was conducted for the Pacific Ocean stock in 2022. The stock assessment tracks spawning biomass based on cohort analysis using landings data. In 2021, SB_{2021}/SB_{MSY} = 1.06. The stock is above the target reference point and has been fluctuating around that point since 2017 (FRA 2022e). Therefore, Abundance is scored a "Low concern."

Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets

Moderate Concern

A stock assessment was conducted for the Tsushima Warm Current stock in 2022. The stock assessment tracks spawning biomass based on cohort analysis using landings data. In 2021, the abundance of the stock was below the limit reference point, with SB_{2021}/SB_{MSY} = 0.51 (FRA 2022f). Abundance of the stock has been fluctuating around the limit reference point since 2000 and has remained below 75% of SB_{MSY} for most of that time. Even though the limit reference point used by management is 60% of MSY, Seafood Watch considers 50% of MSY to be an appropriate limit reference point. Because the abundance is >50% of MSY, Abundance is scored a "Moderate concern."

Factor 1.2 - Fishing Mortality

Pacific Coast of Japan Stock | Northwest Pacific | Purse seines

Moderate Concern

The Pacific Ocean stock fishing pressure in 2021 was assessed as being just below F_{MSY}. For 2021, F_{2021}/F_{MSY} = 0.98. Fishing pressure was above the target reference point 2017-2020 and the recent drop in fishing pressure means that it is fluctuating around the reference point (FRA 2022e). Therefore, Fishing Mortality is scored a "Moderate concern."

Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets

High Concern

The Tsushima Warm Current stock fishing pressure in 2021 was assessed as being above F_{MSY}. For 2021, F_{2021}/F_{MSY} = 1.20. Fishing pressure has consistently remained above the target reference point since 2000 (FRA 2022f). Therefore, Fishing Mortality is scored a "High concern."

Criterion 2: Impacts on Other Species

All main retained and bycatch species in the fishery are evaluated under Criterion 2. Seafood Watch defines bycatch as all fisheries-related mortality or injury to species other than the retained catch. Examples include discards, endangered or threatened species catch, and ghost fishing. Species are evaluated using the same guidelines as in Criterion 1. When information on other species caught in the fishery is unavailable, the fishery's potential impacts on other species is scored according to the Unknown Bycatch Matrices, which are based on a synthesis of peer-reviewed literature and expert opinion on the bycatch impacts of each gear type. The fishery is also scored for the amount of non-retained catch (discards) and bait use relative to the retained catch. To determine the final Criterion 2 score, the score for the lowest scoring retained/bycatch species is multiplied by the discard/bait score. The Criterion 2 rating is determined as follows:

- ***Score >3.2=Green or Low Concern***
- ***Score >2.2 and ≤3.2=Yellow or Moderate Concern***
- ***Score ≤2.2 = Red or High Concern***

Rating is Critical if Factor 2.3 (Fishing Mortality) is Crtitical

Guiding principles

- *Ensure all affected stocks are healthy and abundant.*
- *Fish all affected stocks at sustainable level.*
- *Minimize bycatch.*

Criterion 2 Summary

Criterion 2 score(s) overview

This table(s) provides an overview of the Criterion 2 subscore, discards+bait modifier, and final Criterion 2 score for each fishery. A separate table is provided for each species/stock that we want an overall rating for.

BURI			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets	1.000	1.000: < 100%	Red (1.000)

JAPANESE PILCHARD			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines	2.236	1.000: < 100%	Yellow (2.236)
Pacific Coast of Japan Stock | Northwest Pacific | Purse seines	2.236	1.000: < 100%	Yellow (2.236)
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets	1.000	1.000: < 100%	Red (1.000)

JAPANESE SCAD			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines	2.236	1.000: < 100%	Yellow (2.236)
Pacific Coast of Japan Stock | Northwest Pacific | Purse seines	2.236	1.000: < 100%	Yellow (2.236)
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets	1.000	1.000: < 100%	Red (1.000)

PACIFIC CHUB MACKEREL			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines	2.236	1.000: < 100%	Yellow (2.236)
Pacific Coast of Japan Stock | Northwest Pacific | Purse seines	2.236	1.000: < 100%	Yellow (2.236)
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets	1.000	1.000: < 100%	Red (1.000)

Criterion 2 main assessed species/stocks table(s)

This table(s) provides a list of all species/stocks included in this assessment for each 'fishery' (as defined by a region/method combination). The text following this table(s) provides an explanation of the reasons the listed species were selected for inclusion in the assessment.

EAST CHINA SEA (TUNG HAI), SEA OF JAPAN | PACIFIC, NORTHWEST | PURSE SEINES

SUB SCORE: 2.236 DISCARD RATE: 1.000 **SCORE: 2.236**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Japanese pilchard	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Marine mammals	1.000: High Concern	5.000: Low Concern	Yellow (2.236)

EAST CHINA SEA (TUNG HAI), SEA OF JAPAN | PACIFIC, NORTHWEST | PURSE SEINES

SUB SCORE: 2.236 DISCARD RATE: 1.000 **SCORE: 2.236**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Marine mammals	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Japanese scad	3.670: Low Concern	5.000: Low Concern	Green (4.284)

EAST CHINA SEA (TUNG HAI), SEA OF JAPAN | PACIFIC, NORTHWEST | PURSE SEINES

SUB SCORE: 2.236 DISCARD RATE: 1.000 **SCORE: 2.236**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Pacific chub mackerel	2.330: Moderate Concern	1.000: High Concern	Red (1.526)
Marine mammals	1.000: High Concern	5.000: Low Concern	Yellow (2.236)

EAST CHINA SEA (TUNG HAI), SEA OF JAPAN | PACIFIC, NORTHWEST | STATIONARY UNCOVERED POUND NETS

SUB SCORE: 1.000 DISCARD RATE: 1.000 **SCORE: 1.000**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Buri	1.000: High Concern	1.000: High Concern	Red (1.000)
Green turtle	1.000: High Concern	1.000: High Concern	Red (1.000)
Loggerhead turtle	1.000: High Concern	1.000: High Concern	Red (1.000)
Pacific chub mackerel	2.330: Moderate Concern	1.000: High Concern	Red (1.526)
Japanese pilchard	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Marine mammals	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Japanese scad	3.670: Low Concern	5.000: Low Concern	Green (4.284)

NORTHWEST PACIFIC | JAPAN | PURSE SEINES

SUB SCORE: 2.236 DISCARD RATE: 1.000 **SCORE: 2.236**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Japanese pilchard	3.670: Low Concern	1.000: High Concern	Red (1.916)
Marine mammals	1.000: High Concern	5.000: Low Concern	Yellow (2.236)

NORTHWEST PACIFIC | JAPAN | PURSE SEINES

SUB SCORE: 2.236 DISCARD RATE: 1.000 **SCORE: 2.236**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Japanese scad	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Marine mammals	1.000: High Concern	5.000: Low Concern	Yellow (2.236)

NORTHWEST PACIFIC | JAPAN | PURSE SEINES			
SUB SCORE: 2.236	DISCARD RATE: 1.000	**SCORE: 2.236**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Marine mammals	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Pacific chub mackerel	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)

Purse seine

The purse seine fishery is opportunistically mono-specific and the primary species caught in the fishery shifts on decadal scales. The changes in catch composition have been linked with regime shifts in key environmental factors that influence recruitment (Yatsu 2019). The fishery has not implemented routine dockside monitoring, onboard observers, or independent verification of catch composition. The annual landings data are self-reported, generally coming from fisheries cooperation associations (FCAs), and the data are broken down by gear type. The large purse seine vessels fish the Pacific Ocean stocks offshore. The medium and small purse seiner vessels and pound net operations target the Pacific Ocean and Tsushima Warm Current stocks in nearshore waters. The annual self-reported catch composition data for the purse seine fleet in 2019 and 2020 suggests that the fishery is multispecies (MAFF 2022).

Table 2. Annual catch composition from the purse seine fleet in 2019 and 2020. Only species that compose >5% of landings for one of the three gear types reported here were included. Data from FRA (MAFF 2022).

Species	**2019**	**2020**
Japanese pilchard	40.5%	50.1%
Japanese scad	8.1%	7.5%
Mackerel	33.1%	26.5%
Round herring	4.9%	3.2%
Japanese anchovy	5.3%	5.0%
Buri amberjack	1.8%	2.8%

This Fisheries Research and Education Agency of Japan (FRA) catch composition data is likely masking the true nature of the purse seine fishery because the data is aggregated to an annual timescale. Monthly purse seine catch composition data from the ports of Chioshi and Ishinomaki for the period of 2017-2022 shows that there is a seasonality to landings of sardine, scad (horse mackerel), mackerel, and anchovy (FRA, unpublished data).

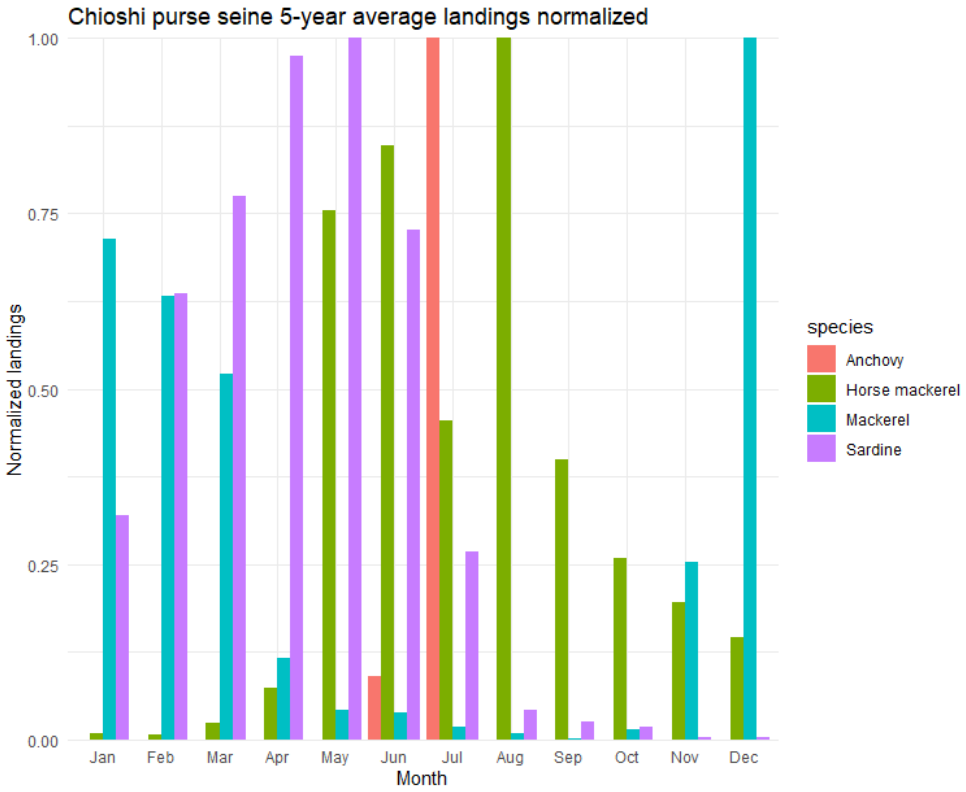


Figure 2: Monthly purse seine landings in the port of Chioshi averaged over 2018-2022. Data was normalized because sardine landings are orders of magnitude higher than landings for other species. Landings data was provided by FRA to SFW through a Wild Planet Foods data request.

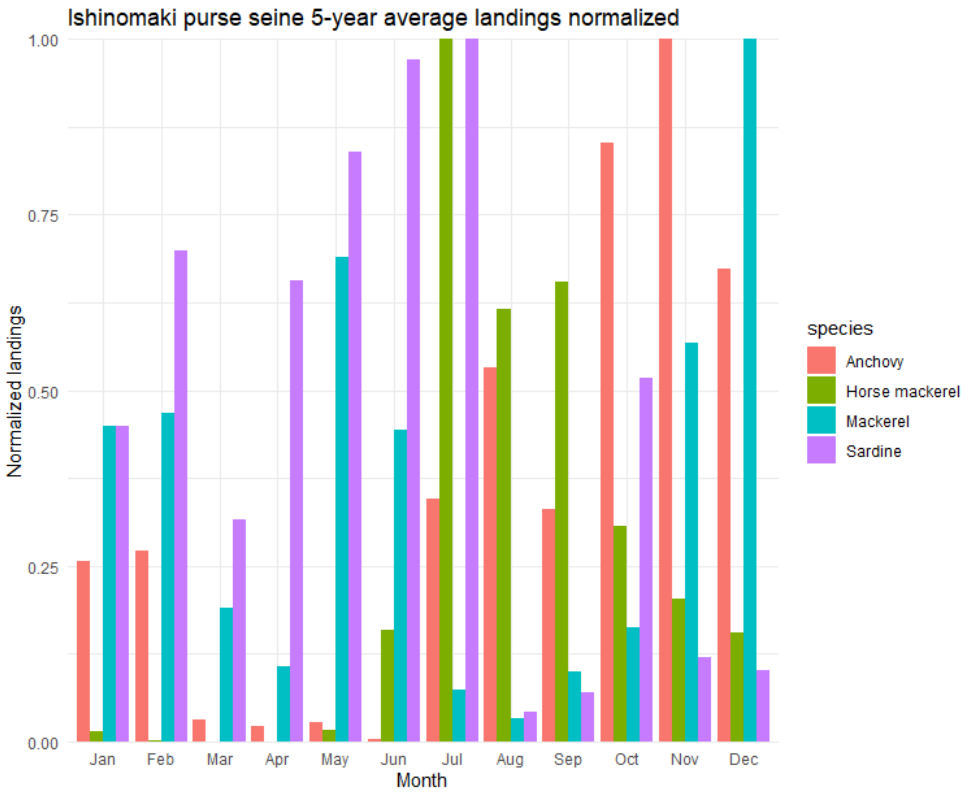


Figure 3: Monthly purse seine landings in the port of Ishinomaki averaged over 2018-2022. Data was normalized because sardine landings are orders of magnitude higher than landings for other species. Landings data was provided by FRA to SFW through a Wild Planet Foods data request.

A private company conducted an independent study of set-level catch composition which suggests that purse seine sets targeting sardine are mono-specific (W. Carvalho, Wild Planet Foods, unpublished data) (see Appendix 2). The study was commissioned by Wild Plant Foods/Tsuruhachi Company. Purse seine landings data was collected by their supplier in the port of Ishinomaki from March 1, 2023 to May 30,2023. The study found that sardine was >95% of the catch composition for vessels associated with that broker (W. Carvalho, unpublished data). An inspection company, Nippon Kaiji Kentei Kyokai, was employed to examine purse seine offloads in the port of Chioshi on March 20, 2023. The inspection found that the landings were 99.2% sardine (W. Carvalho, unpublished data). While this study has a limited spatial and temporal scope, the finer scale resolution shows that aggregation in the annual catch composition dataset masks some key aspects of how this fishery is conducted. Based on the results from this study and the monthly purse seine catch data, the purse seine fishery is treated as mono-specific for sardine in this assessment.

Monthly landings for sardine overlap with both scad and mackerel. Since sardine is mono-specific, it shows that the purse seine fishery can target a single species even when there is heavy seasonal overlap in landings. The monthly landings show a much more pronounced temporal separation in landings for scad and mackerel. Set-level catch composition data was not available for these two species. However, the specificity of the sardine landings suggests that it is very likely that two species, which have much more pronounce temporal separation, would not be caught together. As such, Japanese scad and Pacific chub mackerel are also treated as mono-specific landings in this assessment.

Stationary uncovered pound nets

Identification of species main species or a bycatch species in the pound net fishery was carried out using the annual landings survey data from 2019 and 2020. Finer scale data was not available for this gear type. Japanese pilchard, Japanese scad, Pacific chub mackerel, and buri amberjack all accounted for >5% of catch composition. Since all these species are targets and landed, they were treated as main species for C1. The catch composition data did not identify any C2 species. In general, there is a small amount of discards that do not appear in the dataset, but it is low enough that these discards would not account for >5%

of the catch composition (Watanabe 2004). The data also does not include bycatch of endangered, threatened, or protected (ETP) species.

Table 3. Annual catch composition from the pound net fishery in 2019 and 2020. Only species that compose >5% of landings for one of the three gear types reported here were included. Data from FRA (MAFF 2022).

Species	**2019**	**2020**
Japanese pilchard	21.0%	20.8%
Japanese scad	5.7%	5.2%
Mackerel	20.7%	17.8%
Round herring	0.5%	0.5%
Japanese anchovy	2.8%	3.6%
Buri amberjack	18.3%	17.4%

ETP species and UBM

Neither the purse seine nor pound net fisheries have routine dockside monitoring, independent verification of landings composition, or onboard observers (Komatsu 2020). The Unknown Bycatch Matrix (UBM) was used to identify taxa of bycatch species that were not landed but meet the criteria for main species (Seafood Watch Standard for Fisheries v4). The UBM identifies marine mammals and sharks as taxa of concern caught in both gear types. Bycatch data on sharks is collected by MAFF, and the low level of bycatch from this taxon suggests that the taxon is not heavily affected by either gear type (MAFF 2022). The UBM also identified seabirds caught in pound nets as a potential taxon of concern. An FRA productivity-susceptibility analysis (PSA) indicates that seabirds are not a high concern for pound nets (FRA 2018). Pound nets interact with several sea turtle species, including green turtles and loggerhead turtles (Gilman et al. 2010) (NOAA & USFWS 2020).

Criterion 2 Assessment

SCORING GUIDELINES

Factor 2.1 - Abundance
(same as Factor 1.1 above)

Factor 2.2 - Fishing Mortality
(same as Factor 1.2 above)

Factor 2.3 - Modifying Factor: Discards and Bait Use
Goal: Fishery optimizes the utilization of marine and freshwater resources by minimizing post-harvest loss. For fisheries that use bait, bait is used efficiently.

Scoring Guidelines: The discard rate is the sum of all dead discards (i.e. non-retained catch) plus bait use divided by the total retained catch.

Ratio of bait + discards/landings	Factor 2.3 score
<100%	1
>=100	0.75

Green turtle

Factor 2.1 - Abundance

East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets

High Concern
The range of the East Indian–West Pacific distinct population segment (DPS) of green turtle extends into coastal waters of Japan. This species is listed as "Threatened" under the United States Endangered Species Act (NOAA 2015). Therefore, abundance of the species is scored a "High concern."

Factor 2.2 - Fishing Mortality

East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets

High Concern
Green sea turtles have been observed being caught in Japan's coastal pound net fishery (Gilman et al. 2010). Data on bycatch of the species are not routinely collected. The level of mortality and the impact of the fishery on the population trend of the DPS are unknown. In the absence of bycatch data, information from similar fisheries around the world was used as a proxy (operationalized in the Unknown Bycatch Matrix - see Appendix 2 in the Seafood Watch Fisheries Standard v4) to score Fishing Mortality, resulting in a score of "High concern."

Loggerhead turtle

Factor 2.1 - Abundance

East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets

High Concern
The North Pacific Ocean DPS of loggerhead sea turtle is listed as "Endangered" under the U.S. Endangered Species Act (NOAA & USFWS 2020). Abundance for the species is scored a "High concern."

Factor 2.2 - Fishing Mortality

East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets

High Concern
The North Pacific Ocean DPS of loggerhead sea turtle nests at beaches in Japan. Although bycatch information is limited, the pound net fishery is the most significant contributor to bycatch of loggerhead sea turtle in Japanese fisheries (NOAA & USFWS 2020). Because this fishery is a substantial contributor to loggerhead sea turtle mortality, Fishing Mortality is scored a "High concern."

Marine mammals

Factor 2.1 - Abundance

East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines
Northwest Pacific | Japan | Purse seines
East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets

High Concern
Marine mammals were identified as a main species in this fishery by using the Unknown Bycatch Matrix (which operationalizes data from similar fisheries around the world - see Appendix 2 in the Seafood Watch Standard for Fisheries v4). Because this is a highly vulnerable taxon, Abundance scores a "High concern."

Factor 2.2 - Fishing Mortality

East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines
Northwest Pacific | Japan | Purse seines
East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets

Low Concern
Following the scoring in the Unknown Bycatch Matrix, this taxon scores a "Low concern."

Factor 2.3 - Discard Rate/Landings

East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines
Pacific Coast of Japan Stock | Northwest Pacific | Purse seines
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets

< 100%
Landings survey data from the fishery show that nontarget species are being landed and reported, even for species that compose <5% of total landings (MAFF 2021). So discards are assumed to be much smaller than landings. This is supported by more general estimations of discards from Japanese fisheries, which estimate average discards at 14.2% (Kelleher 2005). More recent estimations of pelagic purse seine discards were even smaller at 3.9% (Pérez Roda et al. 2019).

Criterion 3: Management Effectiveness

Five factors are evaluated in Criterion 3: Management Strategy and Implementation, Bycatch Strategy, Scientific Research/Monitoring, Enforcement of Regulations, and Inclusion of Stakeholders. Each is scored as either 'highly effective', 'moderately effective', 'ineffective,' or 'critical'. The final Criterion 3 score is determined as follows:

- *5 (Very Low Concern) — Meets the standards of 'highly effective' for all five factors considered.*
- *4 (Low Concern) — Meets the standards of 'highly effective' for 'management strategy and implementation' and at least 'moderately effective' for all other factors.*
- *3 (Moderate Concern) — Meets the standards for at least 'moderately effective' for all five factors.*
- *2 (High Concern) — At a minimum, meets standards for 'moderately effective' for Management Strategy and Implementation and Bycatch Strategy, but at least one other factor is rated 'ineffective.'*
- *1 (Very High Concern) — Management Strategy and Implementation and/or Bycatch Management are 'ineffective.'*
- *0 (Critical) — Management Strategy and Implementation is 'critical'.*

The Criterion 3 rating is determined as follows:

- ***Score >3.2=Green or Low Concern***
- ***Score >2.2 and ≤3.2=Yellow or Moderate Concern***
- ***Score ≤2.2 = Red or High Concern***

Rating is Critical if Management Strategy and Implementation is Critical.

Guiding principle

- The fishery is managed to sustain the long-term productivity of all impacted species.

Five factors are evaluated in Criterion 3: Management Strategy and Implementation, Bycatch Strategy, Scientific Research/Monitoring, Enforcement of Regulations, and Inclusion of Stakeholders. Each is scored as either 'highly effective', 'moderately effective', 'ineffective,' or 'critical'. The final Criterion 3 score is determined as follows:

Criterion 3 Summary

FISHERY	MANAGEMENT STRATEGY	BYCATCH STRATEGY	DATA COLLECTION AND ANALYSIS	ENFORCEMENT	INCLUSION	SCORE
East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Highly effective	**Yellow (3.000)**
East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Highly effective	**Yellow (3.000)**
East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Highly effective	**Yellow (3.000)**
East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets	Moderately Effective	Ineffective	Ineffective	Moderately Effective	Highly effective	**Red (1.000)**
Northwest Pacific | Japan | Purse seines	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Highly effective	**Yellow (3.000)**
Northwest Pacific | Japan | Purse seines	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Highly effective	**Yellow (3.000)**
Northwest Pacific | Japan | Purse seines	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Highly effective	**Yellow (3.000)**

Criterion 3 Assessment

SCORING GUIDELINES

Factor 3.1 - Management Strategy and Implementation
Considerations: What type of management measures are in place? Are there appropriate management goals, and is there evidence that management goals are being met? Do manages follow scientific advice? To achieve a highly effective rating, there must be appropriately defined management goals, precautionary policies that are based on scientific advice, and evidence that the measures in place have been successful at maintaining/rebuilding species.

Factor 3.2 - Bycatch Strategy
Considerations: What type of management strategy/measures are in place to reduce the impacts of the fishery on bycatch species and when applicable, to minimize ghost fishing? How successful are these management measures? To achieve a Highly Effective rating, the fishery must have no or low bycatch, or if there are bycatch or ghost fishing concerns, there must be effective measures in place to minimize impacts.

Factor 3.3 - Scientific Research and Monitoring
Considerations: How much and what types of data are collected to evaluate the fishery's impact on the species? Is there adequate monitoring of bycatch? To achieve a Highly Effective rating, regular, robust population assessments must be conducted for target or retained species, and an adequate bycatch data collection program must be in place to ensure bycatch management goals are met.

Factor 3.4 - Enforcement of Management Regulations
Considerations: Do fishermen comply with regulations, and how is this monitored? To achieve a Highly Effective rating, there must be regular enforcement of regulations and verification of compliance.

Factor 3.5 - Stakeholder Inclusion
Considerations: Are stakeholders involved/included in the decision-making process? Stakeholders are individuals/groups/organizations that have an interest in the fishery or that may be affected by the management of the fishery (e.g., fishermen, conservation groups, etc.). A Highly Effective rating is given if the management process is transparent, if high participation by all stakeholders is encouraged, and if there a mechanism to effectively address user conflicts.

Factor 3.1 - Management Strategy And Implementation

East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets
East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines
Northwest Pacific | Japan | Purse seines

Moderately Effective

The fishery is managed with harvest control rules and regulations introduced, implemented, and enforced by a decentralized system of autonomous comanagement (Matsuda et al. 2010). Management of the fishery is separated between layers of organizations that manage different aspects of the fishery based on where fishing occurs. For the distant water and inshore fishing activities, the central government oversees all aspects of management and enforcement (Schmidt 2003). For coastal fisheries within the EEZ, management duties are broken down between the central government, the prefecture government, and fisheries cooperation associations (FCAs) (Schmidt 2003).

In all fishing areas, the central government sets harvest control rules. The Fisheries Research and Education Agency of Japan provides scientific analysis and sets the allowable biological catch (ABC). The ABC is treated as a recommendation that is taken into consideration by the Fisheries Policy Council when they set the TAC (Makino 2011). The pilchard, scad, and chub mackerel stocks use harvest control rules established by the Fisheries Policy Council at the "Seminar on Resource Management Policies," which was held in September 2020 (Yasuda & Kishida 2019). The harvest control rules currently include target, limit, and ban reference points. Before the 2020 revision of the Fisheries Act, MSY-based reference points were not in place. Only limit and ban reference points based on empirical reference points were used (Ichinokawa et al. 2017). The revised Fisheries Act introduced MSY-based reference points that are slowly being rolled out (Okamura et al. in press). There is a roadmap to complete the MSY-based reference points by 2023 (FRA 2020a). The goal is for 80% of landings to be covered by MSY-based TAC management by the end of 2023. MSY-based TACs were implemented for the species in this assessment starting in the 2021 fishing year.

The new MSY-based reference points have shown that the majority of species caught in this fishery have been overfished or experiencing overfishing for at least 10 years. The previous management strategies employed in this fishery failed to rebuild the stocks (Wang et al. 2020). The new MSY-based reference points are expected to be effective, but the success of the implementation is still unknown. The 2021 stock assessments report on the status of the stocks through 2020, which was right before the fishery switched over to MSY-based TACs. It is still too early to know how the change in management strategy will impact the health of the stocks, but MSY-based reference points and TACs are expected to help improve the stocks.

The management strategy for these stocks is based on scientific analysis and is implemented through a well-developed system of governance. Japan recently changed their management strategy to implement MSY-based reference points and TACs. This type of management strategy is expected to help the stocks to recover, but it is too soon to assess the impact of the change. Since the instruments are in place to ensure effective implementation of this new management strategy, this fishery scores "Moderately effective."

Justification:

In the coastal fisheries, the Fisheries Policy Council provides the TAC, but does not handle any other aspects of management. The prefecture government oversees the setting of the fishing season, closed areas, and other regulations. The prefecture grants the rights to manage harvest allocations to the FCAs (Schmidt 2003). The FCAs are organizations of local fishers who manage the fishery and the resources in a local geographic area. Within the FCAs, there are Fisheries Management Organizations (FMOs). The FMOs are groups of fishers who are in the same geographic area and who participate in the same fishery (Uchida & Makino 2008). The FCAs handle TAC allocation while the FMOs set additional regulations such as size limits, fishing areas, and fishing season (Makino 2011)(Matsuda et al. 2010).

Factor 3.2 - Bycatch Strategy

East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines
Northwest Pacific | Japan | Purse seines

Moderately Effective
Bycatch in this multispecies fishery is generally minimal because the majority of catch is landed (Watanabe 2004). The Unknown Bycatch Matrix has identified that this gear type likely interacts with species of concern, namely marine mammals. There is no evidence that the fishery has implemented widespread strategies for bycatch management. On the other hand, because the fishery collects only landings data, there is no evidence that the purse seine fishery is causing significant impacts on the species of concern (Komatsu 2020). Because of the lack of information but low risk nature of the fishery, the effectiveness of the current approach to bycatch is deemed "Moderately effective."

East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets

Ineffective
Loggerhead and green sea turtles have been encountered in Japanese coastal pound nets (Ishihara 2007). There is growing understanding that this type of fishery is a significant contributor to sea turtle mortality (Gilman et al. 2010). Research into bycatch reduction techniques to reduce fishery impacts on the species is ongoing (Shiode et al. 2021). But, these bycatch reduction techniques have not been implemented yet. Therefore, Bycatch Strategy for the pound net fishery is considered "Ineffective."

Factor 3.3 - Scientific Data Collection and Analysis

East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines
Northwest Pacific | Japan | Purse seines

Moderately Effective
The Fisheries Research and Education Agency of Japan (FRA) conducts annual stock assessments on the predominant species caught in this multispecies fishery. Abundance is estimated and predicted from cohort analysis based on domestic landings data and bolstered by fishery-independent surveys, which contribute to recruitment estimation (FRA 2019)(FRA 2021a). Annual domestic landings statistics are collected via the sea-surface fishery production statistics survey. This survey relies on self-reported landings data and spatial catch information provided by landings organizations or fisheries management bodies. In cases where the information cannot be self-reported, statistical researchers conduct interviews to collect the relevant data (MAFF 2021). Species that are managed by TAC have increased data reporting requirements. For these species, catch must be reported no later than the 10^{th} day of the month following the date that the catch is landed (FRA 2020b). All the species caught in the purse seine fishery are managed by TAC, though the use of TACs has historically been limited. Only 8 species were managed by TAC from the start of TAC implementation in 1997 until the Revised Fisheries Act in 2020. Since then, the number of TAC managed species has expanded and that means that data collection requirements are improving for other species (FRA 2020b).

Fishers have resisted implementing dockside monitoring, independent verification of catch data, and observer programs (Komatsu 2020). Although the situation can be improved, the purse seine fishery does not have a high risk of interacting with ETP species. Thus, these are not major issues for data collection and analysis.

The stock assessments for particularly important species are peer-reviewed. Stock assessments are routinely reviewed by domestic scientists and are also reviewed by foreign scientists at less frequent intervals. Based on this review schedule, FRA generally considers the advice of the domestic reviewers useful for management purposes and takes the input of foreign reviews as indications of long-term areas for improvements (FRA 2020). For the 2021 sardine stock assessments, the foreign reviewer noted that the data being used violate a fundamental assumption of the stock assessment model and that there are issues with uncertainty associated with predicted spawning stock biomass, which can lead to issues with the way that the allowable biological catch is calculated (Teo 2021). The domestic reviewers acknowledged the data shortcomings and determined that the stock assessments employed the best possible methods, given the data that were available at the time (Goto 2020a)(Goto 2020b)(Iwata 2020a)(Iwata 2020b). Based on these findings, the stock assessments were accepted for management use (FRA 2020).

Overall, it is a good sign that stock assessments, reference points, and catch limits are being evaluated annually. There

is some scientific disagreement over the methods employed in the stock assessments, plus there is a lack of onboard observers and a lack of bycatch data collection. However, the stock assessments employ the most appropriate methods, given the available data, and bycatch of ETP species is not likely, so these concerns do not hinder management effectiveness for the purse seine fishery. Therefore, Scientific Data Collection and Analysis is deemed "Moderately effective."

East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets

Ineffective

The Fisheries Research and Education Agency of Japan (FRA) conducts annual stock assessments on the predominant species caught in this multispecies fishery. Abundance is estimated and predicted from cohort analysis based on domestic landings data and bolstered by fishery-independent surveys, which contribute to recruitment estimation (FRA 2019)(FRA 2021a). Annual domestic landings statistics are collected via the sea-surface fishery production statistics survey. This survey relies on self-reported landings data and spatial catch information provided by landings organizations or fisheries management bodies. In cases where the information cannot be self-reported, statistical researchers conduct interviews to collect the relevant data (MAFF 2021). Species that are managed by TAC have increased data reporting requirements. For these species, catch must be reported no later than the 10^{th} day of the month following the date that the catch is landed (FRA 2020b). Japanese pilchard, Japanese scad, and Pacific chub mackerel are all managed by TAC. The use of TACs has historically been limited and, notably, buri amberjack is not managed by TAC. Only 8 species were managed by TAC from the start of TAC implementation in 1997 until the Revised Fisheries Act in 2020. Since then, the number of TAC managed species has been expanding and that means that data collection requirements are improving for other species (FRA 2020b).

Fishers have resisted implementing dockside monitoring, independent verification of catch data, and observer programs (Komatsu 2020). This has resulted in inadequate reporting of bycatch and interactions with species of concern. Bycatch of green and loggerhead sea turtles has been identified in the pound net fishery through independent research efforts (Ishihara 2007) (NOAA & USFWS 2020). These independent research efforts have been able to highlight concerns about bycatch of turtles in the pound net fishery. However, the potential bycatch impacts from this fishery cannot be fully understood because the current data collection strategy does not track bycatch of turtles or other species of concern. This is a critical shortcoming in the current data collection and analysis methods.

The stock assessments for particularly important species are peer-reviewed. Stock assessments are routinely reviewed by domestic scientists and are also reviewed by foreign scientists at less frequent intervals. Based on this review schedule, FRA generally considers the advice of the domestic reviewers useful for management purposes and takes the input of foreign reviews as indications of long-term areas for improvements (FRA 2020). For the 2021 sardine stock assessments, the foreign reviewer noted that the data being used violate a fundamental assumption of the stock assessment model and that there are issues with uncertainty associated with predicted spawning stock biomass, which can lead to issues with the way that the allowable biological catch is calculated (Teo 2021). The domestic reviewers acknowledged the data shortcomings and determined that the stock assessments employed the best possible methods, given the data that were available at the time (Goto 2020a)(Goto 2020b)(Iwata 2020a)(Iwata 2020b). Based on these findings, the stock assessments were accepted for management use (FRA 2020).

Overall, it is a good sign that stock assessments, reference points, and catch limits are being evaluated annually. There is some scientific disagreement over the methods employed in the stock assessments, plus there is a lack of onboard observers and a lack of bycatch data collection. This is a more serious concern in the pound net fishery because this gear type is known to contribute to the mortality of highly vulnerable species. Therefore, this fishery's Scientific Data Collection and Analysis is deemed "Ineffective."

Factor 3.4 - Enforcement of and Compliance with Management Regulations

East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets
East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines
Northwest Pacific | Japan | Purse seines

Moderately Effective

Fishers that operate in Japan's EEZ are required to have a prefecture license. This license allows the fishery to operate in the EEZ within the borders of the prefecture which granted the license. The central government determines how many licenses can be issued by each prefecture, and this acts as a cap on fishing effort (Yagi 2002). There are 17 fisheries which require a minister license. These licenses allow the owner to operate in any prefecture's waters or in international waters (MAFF 2021d).

The comanagement framework reinforces compliance through peer-group pressure (Schmidt 2003). FCAs and FMOs are small, local organizations made up of the fishers who are utilizing the resources. A large part of the compliant behavior observed in the EEZ has been attributed to the social control that results from a localized fishing community structure (Schmidt 2003).

Landings data are reported to the FRA (MAFF 2021). But, this is typically done through the FCA. The data are aggregated, and individual fisher landings are not readily available. Fishers have resisted implementing dockside monitoring, independent verification of catch data, and observer programs (Komatsu 2020). In general, the TACs have been adhered to. Since their implementation in 1997, the TACs have only been exceeded in three years. In 2007, the TAC was exceeded for pilchard. In 1997 and 2005, it was exceeded for mackerels (JAFIC 2022); however, it is important to note that the mackerel TAC is shared between multiple species of mackerel.

Japan has a notable problem with illegal, unreported, and unregulated fishing (IUU) (Macfadyen & Hosch 2021). The Ministry of Agriculture, Forestry, and Fisheries publishes data on arrests for poaching. Poaching arrests have been steadily declining since 2007. In 2019, 138 arrests were made for poaching of unspecified fish species (MAFF 2021b). This broad category is where poaching within this fishery would be classified, but it also includes species from other fisheries. So, it is possible that there is IUU fishing occurring in this particular fishery, but the extent is uncertain.

Considering the compliance systems in place and the lack of independent verification, Enforcement of and Compliance with Management Regulations in this fishery is "Moderately effective."

Factor 3.5 - Stakeholder Inclusion

East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets
East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines
Northwest Pacific | Japan | Purse seines

Highly effective

Stakeholders are intrinsically intertwined in the management process through the structure of fisheries cooperative associations (FCAs) and fisheries management organizations (FMOs). FMOs comprise the fishers who prosecute the fishery within the geographic area overseen by the FCA. Through this comanagement structure, fishers play a large role in the decision-making process (Matsuda et al. 2010).

In general, Japan's system of fisheries management does of good job of integrating stakeholders through the vertical integration of fisheries management. This system separates decision-making power through various levels of management organizations that extend from the national government down to FMOs (Komatsu 2020). Since the Revised Fisheries Act came into effect in 2020, stakeholder inclusion has increased. Review meetings were introduced for discussing resource management policies. These meetings are open to all (Hanzawa et al. 2021). Further, regional committees shifted from elections to appointments and now have a mandate to include members who represent the public interest (Godo 2020).

The management structure in Japan and these fisheries do a good job of including stakeholders in the decision-making process, and the Revised Fisheries Act has provided additional opportunities for stakeholder inclusion in the process. Therefore, Stakeholder Inclusion is scored "Highly effective."

Criterion 4: Impacts on the Habitat and Ecosystem

This Criterion assesses the impact of the fishery on seafloor habitats, and increases that base score if there are measures in place to mitigate any impacts. The fishery's overall impact on the ecosystem and food web and the use of ecosystem-based fisheries management (EBFM) principles is also evaluated. Ecosystem Based Fisheries Management aims to consider the interconnections among species and all natural and human stressors on the environment. The final score is the geometric mean of the impact of fishing gear on habitat score (factor 4.1 + factor 4.2) and the Ecosystem Based Fishery Management score. The Criterion 4 rating is determined as follows:

- ***Score >3.2=Green or Low Concern***
- ***Score >2.2 and ≤3.2=Yellow or Moderate Concern***
- ***Score ≤2.2 = Red or High Concern***

Guiding principles

- Avoid negative impacts on the structure, function or associated biota of marine habitats where fishing occurs.
- Maintain the trophic role of all aquatic life.
- Do not result in harmful ecological changes such as reduction of dependent predator populations, trophic cascades, or phase shifts.
- Ensure that any enhancement activities and fishing activities on enhanced stocks do not negatively affect the diversity, abundance, productivity, or genetic integrity of wild stocks.
- Follow the principles of ecosystem-based fisheries management.

Rating cannot be Critical for Criterion 4.

Criterion 4 Summary

FISHERY	FISHING GEAR ON THE SUBSTRATE	MITIGATION OF GEAR IMPACTS	ECOSYSTEM-BASED FISHERIES MGMT	FORAGE SPECIES?	SCORE
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines	Score: 5	Score: 0	Moderate Concern	No	**Green (3.873)**
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines	Score: 5	Score: 0	Moderate Concern		**Green (3.873)**
Tsushima Warm Current Stock | East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines	Score: 5	Score: 0	Moderate Concern		**Green (3.873)**
East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets	Score: 3	Score: 0	Moderate Concern	No	**Yellow (3.000)**
Pacific Coast of Japan Stock | Northwest Pacific | Purse seines	Score: 5	Score: 0	Moderate Concern	No	**Green (3.873)**
Pacific Coast of Japan Stock | Northwest Pacific | Purse seines	Score: 5	Score: 0	Moderate Concern		**Green (3.873)**
Pacific Coast of Japan Stock | Northwest Pacific | Purse seines	Score: 5	Score: 0	Moderate Concern		**Green (3.873)**

See Appendix 1 for more information on key forage fish, how they were identified, and how the key forage fish status influenced scoring in this report.

Criterion 4 Assessment

SCORING GUIDELINES

Factor 4.1 - Physical Impact of Fishing Gear on the Habitat/Substrate

Goal: The fishery does not adversely impact the physical structure of the ocean habitat, seafloor or associated biological communities.

- *5 - Fishing gear does not contact the bottom*
- *4 - Vertical line gear*
- *3 - Gears that contacts the bottom, but is not dragged along the bottom (e.g. gillnet, bottom longline, trap) and is not fished on sensitive habitats. Or bottom seine on resilient mud/sand habitats. Or midwater trawl that is known to contact bottom occasionally. Or purse seine known to commonly contact the bottom.*
- *2 - Bottom dragging gears (dredge, trawl) fished on resilient mud/sand habitats. Or gillnet, trap, or bottom longline fished on sensitive boulder or coral reef habitat. Or bottom seine except on mud/sand. Or there is known trampling of coral reef habitat.*
- *1 - Hydraulic clam dredge. Or dredge or trawl gear fished on moderately sensitive habitats (e.g., cobble or boulder)*
- *0 - Dredge or trawl fished on biogenic habitat, (e.g., deep-sea corals, eelgrass and maerl)*
  Note: When multiple habitat types are commonly encountered, and/or the habitat classification is uncertain, the score will be based on the most sensitive, plausible habitat type.

Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts
Goal: Damage to the seafloor is mitigated through protection of sensitive or vulnerable seafloor habitats, and limits on the spatial footprint of fishing on fishing effort.

- *+1 —>50% of the habitat is protected from fishing with the gear type. Or fishing intensity is very low/limited and for trawled fisheries, expansion of fishery's footprint is prohibited. Or gear is specifically modified to reduce damage to seafloor and modifications have been shown to be effective at reducing damage. Or there is an effective combination of 'moderate' mitigation measures.*
- *+0.5 —At least 20% of all representative habitats are protected from fishing with the gear type and for trawl fisheries, expansion of the fishery's footprint is prohibited. Or gear modification measures or other measures are in place to limit fishing effort, fishing intensity, and spatial footprint of damage caused from fishing that are expected to be effective.*
- *0 —No effective measures are in place to limit gear impacts on habitats or not applicable because gear used is benign and received a score of 5 in factor 4.1*

Factor 4.3 - Ecosystem-Based Fisheries Management
Goal: All stocks are maintained at levels that allow them to fulfill their ecological role and to maintain a functioning ecosystem and food web. Fishing activities should not seriously reduce ecosystem services provided by any retained species or result in harmful changes such as trophic cascades, phase shifts or reduction of genetic diversity. Even non-native species should be considered with respect to ecosystem impacts. If a fishery is managed in order to eradicate a non-native, the potential impacts of that strategy on native species in the ecosystem should be considered and rated below.

- *5 — Policies that have been shown to be effective are in place to protect species' ecological roles and ecosystem functioning (e.g. catch limits that ensure species' abundance is maintained at sufficient levels to provide food to predators) and effective spatial management is used to protect spawning and foraging areas, and prevent localized depletion. Or it has been scientifically demonstrated that fishing practices do not have negative ecological effects.*
- *4 — Policies are in place to protect species' ecological roles and ecosystem functioning but have not proven to be effective and at least some spatial management is used.*
- *3 — Policies are not in place to protect species' ecological roles and ecosystem functioning but detrimental food web impacts are not likely or policies in place may not be sufficient to protect species' ecological roles and ecosystem functioning.*
- *2 — Policies are not in place to protect species' ecological roles and ecosystem functioning and the likelihood of detrimental food impacts are likely (e.g. trophic cascades, alternate stable states, etc.), but conclusive scientific evidence is not available for this fishery.*
- *1 — Scientifically demonstrated trophic cascades, alternate stable states or other detrimental food web impact are resulting from this fishery.*

Factor 4.1 - Physical Impact of Fishing Gear on the Habitat/Substrate

East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines
Northwest Pacific | Japan | Purse seines

Score: 5
The purse seines target open-water species and bottom contact is negligible.

East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets

Score: 3
The type of set net utilized in this fishery is deployed and left in the water throughout the fishing season. The net comprises a series of chambers that become progressively smaller and more difficult for the fish to escape. It is anchored to the bottom so that it does not drift away (Munprasit et al. 2012). Fishers empty catch from the final chamber every few days (FAO 2015). Because the net is not fully removed and redeployed through the fishing season, impacts to the substrate are minimal.

Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts

East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines
Northwest Pacific | Japan | Purse seines

Score: 0
The gear being used is considered benign.

East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets

Score: 0
There is no evidence that gear modifications have been made to reduce impacts on the substrate.

Factor 4.3 - Ecosystem-based Fisheries Management

East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Stationary uncovered pound nets
East China Sea (Tung Hai), Sea of Japan | Pacific, Northwest | Purse seines
Northwest Pacific | Japan | Purse seines

Moderate Concern
The fish caught in this fishery are managed using single-species reference points and TACs (Uchida & Makino 2008). The stock assessments attempt to account for fluctuations in abundance by conducting annual stock assessments that model multiple recruitment scenarios based on the current environmental conditions (FRA 2021a). However, the stock assessments and management practices do not account for the ecological role of the species being fished. Rather, the TACs are based on the reference points for individual species, while impacts to other species or the ecosystem are not being factored into this process. None of the targeted fish are considered key forage species (See Appendix 1 for more information on key forage species determination). Detrimental food web impacts from the fishery have not been demonstrated. Therefore, Ecosystem-Based Fishery Management scores a "Moderate concern."

Acknowledgements

Scientific review does not constitute an endorsement of the Seafood Watch® program, or its seafood recommendations, on the part of the reviewing scientists. Seafood Watch® is solely responsible for the conclusions reached in this report.

Seafood Watch would like to thank Hiroshi Okamura from FRA and Makoto Suzuki from Sailors for the Sea Japan, as well as four anonymous reviewers for graciously reviewing this report for scientific accuracy.

References

ASFIS 2020. ASFIS list of species for fishery statistics purposes. Version 2020.1. Accessed August 8 2022.

Chen, X., L. Gang, B. Feng, and S. Tian. 2009. Habitat suitability index of chub mackerel (*Scomber japonicus*) from July to September in the East China Sea. Journal of Oceanography 65:93-102.

FAO. 2015. Symposium on the impacts of fishing on the environment. Bangkok, Thailand, 6-10 May 2013.

FAO. 2021. Global capture production quantity (1950-2020) [online database]. Food and Agriculture Organization of the United Nations. Available at: https://www.fao.org/fishery/statistics-query/en/capture/capture_quantity.

FDA 2022. The Seafood List. Accessed August 8 2022.

FRA. 2018. SH"U"N Project Evaluation Results Yellowtail Western Sea of Japan Ver 1.0.0. Japan Fisheries Research and Education Agency. (In Japanese.)

FRA. 2019. SH"U"N project evaluation results: Maaji East China Sea. Japan Fishery Research and Education Agency. (In Japanese.)

FRA. 2020. Response to the stock assessment peer review report. Japan Fishery Research and Education Agency. (In Japanese.)

FRA. 2020a. About new resource management. Japan Fishery Research and Education Agency. (In Japanese.)

FRA. 2020b. Basic resource management policy. Japan Fishery Research and Education Agency. (In Japanese.)

FRA. 2021a. Stock assessment of Japanese sardine Pacific stock in 2021. Japan Fishery Research and Education Agency. (In Japanese.)

FRA. 2021b. Stock assessment of Japanese sardine Tsushima stock in 2021. Japan Fishery Research and Education Agency. (In Japanese.)

FRA. 2021i. Stock assessment of Japanese anchovy Pacific stock in 2021. Japan Fishery Research and Education Agency. (In Japanese.)

FRA. 2021l. Stock assessment of yellowtail in 2021. Japan Fishery Research and Education Agency. (In Japanese.)

FRA. 2022a. Resource assessment of sardine Pacific stocks in 2022. Japan Fishery Research and Education Agency. (In Japanese.)

FRA. 2022b. Resource assessment of Tsushima Warm Current stock of sardines in 2022. Japan Fishery Research and Education Agency. (In Japanese.)

FRA. 2022c. Resource assessment of Pacific horse mackerel stocks in 2022. Japan Fishery Research and Education Agency. (In Japanese.)

FRA. 2022d. Resource assessment of the Tsushima Warm Current stock of horse mackerel in 2022. Japan Fishery Research and Education Agency. (In Japanese.)

FRA. 2022e. Resource assessment of Pacific mackerel stock in 2022. Japan Fishery Research and Education Agency. (In Japanese.)

FRA. 2022f. Resource assessment of the Tsushima Warm Current stock of mackerel in 2022. Japan Fishery Research and

Education Agency. (In Japanese.)

FRA. 2022g. Resource assessment of yellowtail in 2022. Japan Fishery Research and Education Agency. (In Japanese.)

Gilman, E., J. Gearhart, B. Price, S. Eckert, H. Milliken, J. Wong, Y. Swimmer, D. Shiode, O. Abe, S. H. Peckman, M. Chaloupka, M. Hall, J. Mangel, J. Alfaro-Shigueto, P. Dalzell, and A. Ishizaki. 2010. Mitigating sea turtle by-catch in coastal passive net fisheries. Fish and Fisheries 11:57-88.

Godo, Y. 2021. Amendment to the Fisheries Act in Japan. Accessed from: https://ap.fftc.org.tw/article/2646

Goto, T. 2020a. Sardine Tsushima Warm Current stock peer review report. Japan Fisheries Research and Education Agency. (In Japanese.)

Goto, T. 2020b. Sardine Pacific stock peer review report. Japan Fisheries Research and Education Agency. (In Japanese.)

Hanzawa, Y., S. Yamakawa, & S. Watari. 2021. Possibilities and challenges of stakeholder involvement in participatory modeling in resource management. Nippon Suisan Gakkaishi 87(3):225–242. (In Japanese).

Ichinokawa, M., H. Okamura, & H. Kurota. 2017. The status of Japanese fisheries relative to fisheries around the world. ICES Journal of Marine Science 74(5):1277–1287.

Ishihara, T. 2007. Japan coastal bycatch investigations. i*n* North Pacific Loggerhead Sea Turtle Expert Workshop. Western Pacific Regional Fishery Management Council. Honolulu, HI.

Iwata, S. 2020a. Sardine Tsushima Warm Current stock peer review report. Japan Fisheries Research and Education Agency. (In Japanese.)

Iwata, S. 2020b. Sardine Pacific stock peer review report. Japan Fisheries Research and Education Agency. (In Japanese.)

JAFIC. 2022. Status by fishing season. Japan Fisheries Information Service. Accessed from: http://www.jafic.or.jp/business/eez/tac/fishingseason.html

Kanaji, Y., Y. Watanabe, T. Kawamura, S. Xie, Y. Yamashita, C. Sassa, and Y. Tsukamoto. 2009. Multiple cohorts of juvenile jack mackerel *Trachurus japonicus* in waters along the Tsushima Warm Current. Fisheries Research 95:139-145.

Kelleher, K. 2005. Discards in the world's marine fisheries. An update. FAO Fisheries Technical Paper No. 470, Rome, Italy.

Komatsu, M. 2020. Structural reform model for Japan based on broader perspective needed from the fisheries sector. North Pacific Marine Ecosystem Study Group.

Kume, G., T. Shigemura, M. Okanishi, J. Hirai, K. Shiozaki, M. Ichinomiya, T. Komorita, A. Habano, F. Makino, and T. Kobari. 2021. Distribution, feeding habits, and growth of chub mackerel, *Scomber japonicus*, larvae during a high-stock period in the northern Satsunan area, southern Japan. Frontiers in Marine Science 8(725227): 1-14.

MAFF. 2021. Sea surface fishery production statistics survey. Ministry of Agriculture, Forestry and Fisheries Production, Distribution and Consumption Statistics Division. Accessed from: https://www.e-stat.go.jp/stat-search/files?page=1&toukei=00500216&tstat=000001015174

MAFF. 2021b. Reference materials (current situation of fish poaching). Ministry of Agriculture, Forestry and Fisheries Production, Distribution and Consumption Statistics Division.

MAFF. 2021d. Fishing license system under the Fisheries Act. Ministry of Agriculture, Forestry and Fisheries Production, Distribution and Consumption Statistics Division. (In Japanese.)

MAFF. 2022. Marine fisheries production statistics survey/confirmed report 2020 fisheries and aquaculture production statistics. (In Japanese.)

Makino, M. 2011. A brief institutional history of Japanese fisheries management. Pages 21-39 *in* Fisheries management in Japan: Its institutional features and case studies. Springer, Fish & Fisheries Series 34.

Makino, M. 2018. Rebuilding and full utilization of alternating pelagic species around Japan: a social-ecological approach. Pages 61-73 *in* Garcia, S.M. & Y. Ye. Rebuilding of marine fisheries part 2: case studies. FAO Fisheries and Aquaculture Technical Paper 630/2. Rome, Italy.

Matsuda, H., M. Makino, M. Tomiyama, S. Gelcich, and J. C. Castilla. 2010. Fishery management in Japan. Ecological Research 25:899–907.

Munprasit, A., T. Amornpiyakrit, W. Yingyuad, and T. Arimoto. 2012. Enhancing community-based management through set-net fisheries: a regional fishery collaborative venture. Southeast Asian Fisheries Development Center.

National Oceanic and Atmospheric Administration. 2015. Status review of the green turtle (*Chelonia mydas*) under the Endangered Species Act. National Oceanic and Atmospheric Administration, Southwest Fisheries Science Center. La Jolla, California.

National Oceanic and Atmospheric Administration. 2021. Foreign Trade [online database]. National Oceanic and Atmospheric Administration, Silver Spring, MD. Available: www.fisheries.noaa.gov/foss/

Okamura, H., M. Ichinokawa, & R. Hilborn. In press. Evaluating a harvest control rule to improve the sustainability of Japanese fisheries. doi:10.1101/2020.07.16.207282

Pérez Roda, M.A., E. Gilman, T. Huntington, S.J. Kennelly, P. Suuronen, M. Chaloupka, and P.A.H. Medley. 2019. A third assessment of global marine fisheries discards. FAO Fisheries and Aquaculture Technical Paper, No. 633, Rome, Italy.

Plagányi, É. E., and T. E. Essington. 2014. When the SURFs up, forage fish are key. Fisheries Research 159:68-74.

Sarr, O. & R. Kindong. 2021. Knowledge on the biological and fisheries aspects of the Japanese sardine, *Sardinops melanostictus* (Schlegel, 1846). Journal of Marine Science and Engineering 9(1403):1-19.

Schmidt, C. 2003. Fisheries and Japan: A case of multiple roles. International Symposium of Multiples Roles and Functions of Fisheries Communities Vol. 13.

Seafood Watch. 2020. Seafood Watch standard for fisheries version 4. Monterey Bay Aquarium.

Shiode, D., M. Shiozawa, F. Hu, T. Tokai, and Y. Hirai. 2021. A newly developed soft-type turtle releasing device (Soft-TRD) for setnet fisheries. Aquaculture and Fisheries 6:359-366.

Teo, S. 2021. Report of an independent peer review of four sardine and jack mackerel stock assessments conducted by the Japan Fishery Research and Education Agency (FRA) in 2021. National Oceanic and Atmospheric Administration Southwest Fisheries Science Center. La Jolla, California.

Wang, Y., C. Liang, Y. Wang, W. Xian, and M. L. Palomares. 2020. Stock status assessments for 12 exploited fishery species in the Tsushima Warm Current region, Southwest Japan and East China, using CMSY and BSM methods. Frontiers in Marine Science 7(640):1-11.

Watanabe, Y. 2004. Bycatch and discard fish in the Japanese fisheries. Developments in Food Science 42:25-36.

Watari, S., H. Murase, S. Yonezaki, M. Okazaki, H. Kiyofuji, T. Tamura, T. Hakamada, Y. Kanaji, and T. Kitakado. 2019. Ecosystem modeling in the western North Pacific using Ecopath, with a focus on small pelagic fishes. Marine Ecology Progress

Series 617-618:295-305.

Yagi, N. 2002. Draft country note on Fisheries management systems - Japan. Organization for Economic Co-operation and Development.

Yatsu, A. 2019. Review of population dynamics and management of small pelagic fishes around the Japanese Archipelago. Fisheries Science 85:611-639.

Appendix A: Key Forage Fish Determination

Version 4 of the Seafood Watch Standard for Fisheries updated requirements around 'forage species' (Seafood Watch 2020). These updates influence the scoring in this report in the following ways:

Criterion 4: Requires a greater understanding of forage species role in the ecosystem to receive a score of "Moderate concern" or better.

According to the glossary to the Version 4 of the Seafood Watch Standard for Fisheries (Seafood Watch 2020):

"Forage species play an important role in food webs because they 1) exhibit high connectance to other organisms in the ecosystem and 2) a large amount of energy is channeled through that species. Forage species typically exhibit highly variable productivity, such that there may be high uncertainty in their reference points, making it difficult to evaluate their stock status. The drivers of this variability in productivity may be environmental forcing and/or other factors. As a result of their importance in food webs these stocks require management that is tailored to their specific life histories and ecological roles. Species that generally qualify as forage species include sandeels, sandlances, herrings, menhaden, pilchards, sardines, sprats, anchovies, krill, lanternfish, smelts, capelin, mackerels, silversides, sand smelts, Norway pout (adapted from MSC Fisheries Standard V2.01, p. 14). Other species or stocks may qualify if they meet the definition above."

Identifying Key Forage Species

In order to determine whether a species within a particular ecosystem is defined as a 'forage species,' it must fulfill both of the criteria in the glossary term: 1) exhibits high connectance and 2) serves as a channel for a large amount of energy. To identify their potential key role, a forthcoming white paper commissioned by Seafood Watch computed three indices using data and food webs applied to existing static ecosystem models. The connectance index and the SUpportive Role to Fishery ecosystems (SURF) index were calculated from mass-balanced models and an energy index from energy-balanced models. Excerpts from that study are presented below. The supporting data are available upon request.

Japanese East Coast

In the northern part of the western North Pacific, two currents influence the waters off eastern Japan. The Oyashio Current from the north is a cold-, low-salinity, subarctic current. The Kuroshio Current in the south is a warm, high-salinity subtropical current, influencing the local Japanese sardine and anchovy spawning area, and transitions into the Kuriohsio extension, transporting eggs, larvae, and juveniles of these fishes (Watari et al. 2019). For their food web model, Watari et al. (2019) considered three different regions, including the coastal Oyashio region (186,128 km2), the coastal Kuroshio region (186,220 km^2), and the offshore region (540,754 km^2). For more details, see Watari et al. (2019). For the purpose of this study, these three regions were considered together as one ecosystem and thus an overall area size of 913,102 km^2. Watari et al. (2019) used their model to assess the role of forage fish species in the ecosystem for 2013 for which most data was collected compared to other years.

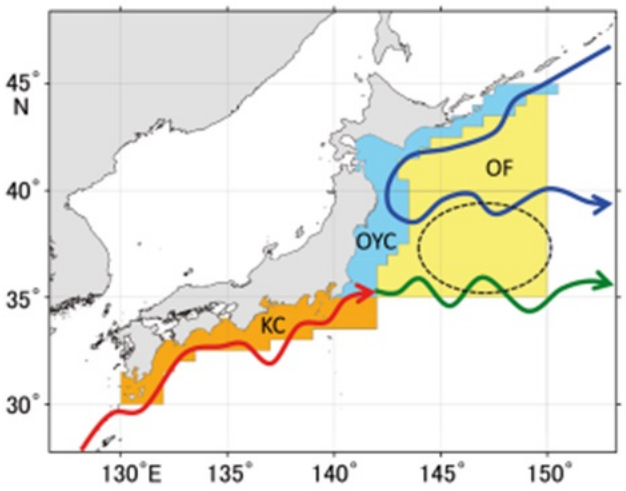


Figure 1: The waters off the Japanese east coast as considered in the food web model developed by Watari et al. (2019) indicating the considered sub-regions with the coastal Oyashio region (OYC) in blue, the coastal Kuroshio region (KC) in orange, and the offshore region (OF) in yellow. Arrows show the Kuroshio Current in red, the Kuroshio extension in green, and the Oyashio Current in blue. Image copied from Watari et al. (2019).

Results

Japanese anchovy off the Japanese Coast is considered to meet the criteria for a forage species. The high occurrence of species' keyness according to the connectance index is due to the fact that this index is affected by species aggregation in general, whilst SURF is mainly affected by aggregation of forage species (Plagányi and Essington 2014). The SURF index is used here to determine whether a species meets the connectance requirement.

Modeled group name	Scientific name	Connectance	SURF Index	Energy
Japanese anchovy	*Engraulis japonicus*	KEY	KEY	KEY
Japanese pilchard	*Sardinops melanostictus*	KEY	-	-
Chub mackerel	*Scomber japonicus*	KEY	-	-
Blue mackerel	*Scomber australasicus*	KEY	-	-

Appendix B: Survey of Choshi landings

Landings data as reported by Tsuruhachi, which is the export broker that works with the local packing plant and auction buyer Takahashi Suisan in Choshi. The data was reported by the plant on 21 different days from February 23rd to May 19th showing total catch of 3,351MT with 53MT of bycatch (98.4% sardines). Nippon Kaiji Kentei Kyokai (NKKK), a third party inspection company, attended the process from unloading to pack-out only on March 20th. On that day 258MT were unloaded from four vessels and NKKK verified 99.03% was sardines. Survey and report commissioned by William Carvalho, Wild Planet Foods.

HEAD OFFICE
9-7, 1-CHOME HATCHOBORI, CHUO-KU
TOKYO 104-0032, JAPAN
TEL : 81-3-3552-1257
FAX : 81-3-3552-4673
URL http://www.nkkk.jp/
BRANCHES
ALL PRINCIPAL PORTS IN JAPAN
OVERSEAS OFFICES
THAILAND, SINGAPORE, MALAYSIA, PHILIPPINES, INDONESIA, CHINA, NETHERLANDS, VIETNAM, HONG KONG MYANMAR
LABORATORIES
YOKOHAMA, OSAKA

NIPPON KAIJI KENTEI KYOKAI
LICENSED BY THE JAPANESE GOVERNMENT
NKKK
FOUNDED IN 1913

INTERNATIONAL INSPECTION & SURVEYING
INSPECTIONS REQUIRED BY REGULATIONS FOR DANGEROUS GOODS, SOLID BULK SUBSTANCES AND NOXIOUS LIQUID SUBSTANCES
MARINE SURVEY AND CARGO INSPECTION
MARINE CONSULTANT
NON-MARINE ADJUSTING
PETROLEUM AND CHEMICAL INSPECTION
LIQUEFIED GAS INSPECTION
CHEMICAL ANALYSIS
TANK CALIBRATION
SAMPLING AND TESTING
CARGO WEIGHING AND MEASURING

(Ref. WKO)

Survey Report

MURORAN
Date : June 25, 2023
Report No. PQ 14 /22

THIS IS TO CERTIFY THAT we, the undersigned, did survey and report upon damage to cargo as follows;

Applicant :	Tsuruhachi Co., Ltd.
Date of Application :	Mar. 06, 2022
Surveyor in charge :	K. Watanabe
Place & Date of Survey :	At the fishi market and the processing factory in Choshi, Chiba Pref. on Mar. 20, 2022
Shipper:	-
Consignee :	-
Insurer :	-
Policy No. & Amount Insured :	-
Name of Carrying Vessel :	
Description and Packing of the Goods :	Fresh Sardine
Shipment from/to :	
Date the goods unloaded :	
Date the goods stored to the Place where Survey held :	
External Condition of Packages When stored :	-
Container No.	
Place and Date of unpacking ex Container :	
Notice of claim against carrier :	
Remarks on delivery :	
Cause of Loss or Damage to the goods :	

This Certificate/Report contains measures to prevent forgery. If you have any question regarding the contents, please refer to the Original of the Certificate/Report.

Marks & Numbers	Description of the Goods	Quantity (No. of Packages)
	Fresh Sardine	

PARTICULARS OF LOSS OR DAMAGE

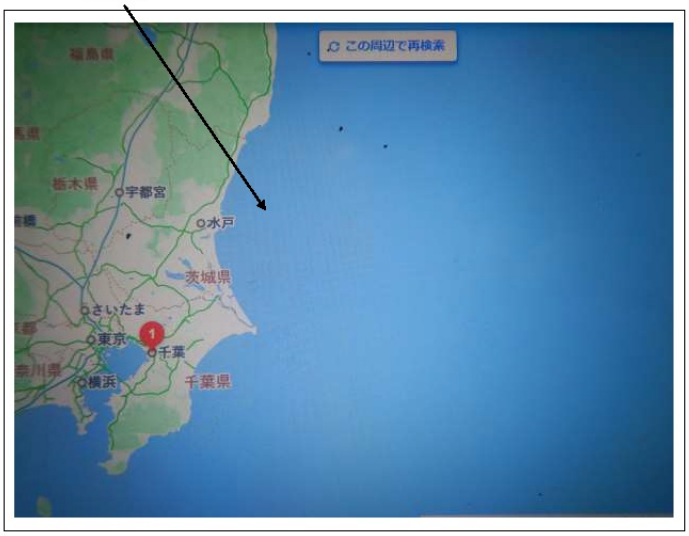
Information:

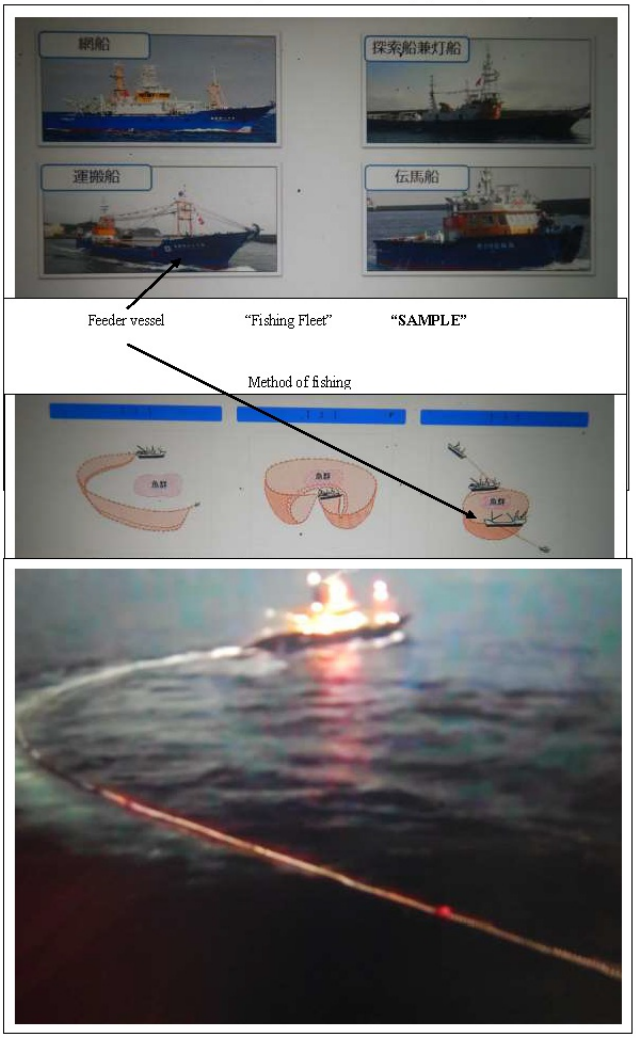
According to the applicant, sardine was caught by domestic large/medium sized purse seine fisheries in this area.

Season: Dec. ~ June

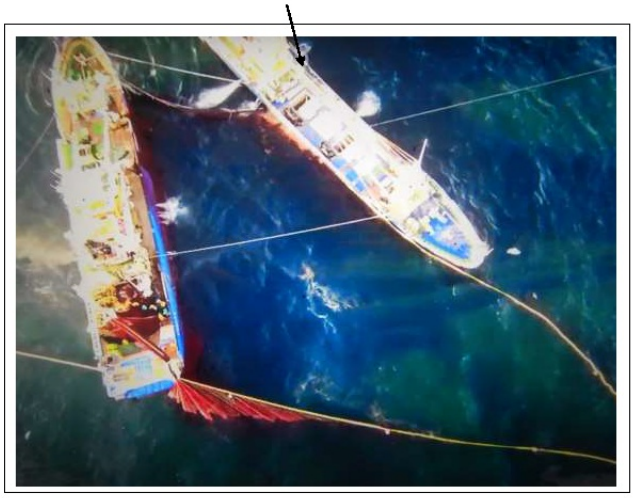
Location: Pacific sea of Choshi port

Number of fishing fleet: 27




網船
探索船兼灯船
運搬船
伝馬船
Feeder vessel
"Fishing Fleet"
"SAMPLE"
Method of fishing

Feeder vessel

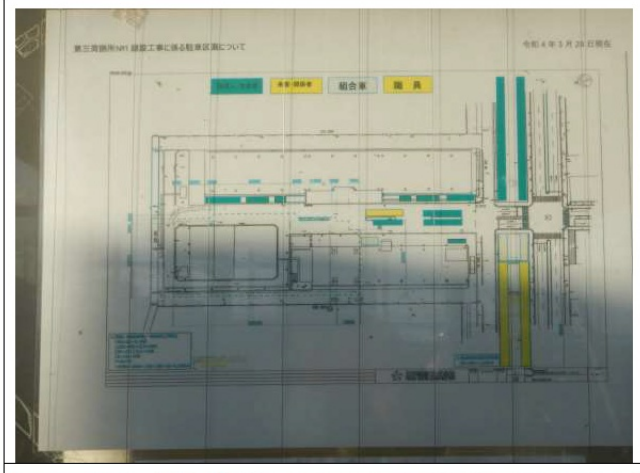


Feeder vessel

On Mar. 20, 2023, we checked Sardine which was caught by purse seine fisheries and a factory in Choshi, Chiba Pref. with the following persons and found as under.

Mr. Kurasawa, Mr. Yamada and Mr. Aminaka of Tsuruhachi Co., Ltd., the applicant

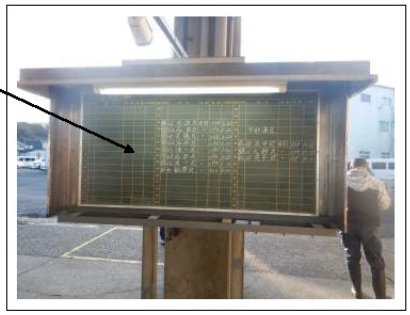
Fish Market: No.2 Choshi Fish Market



Carrying truck

Weigh scale

Discharging plane/day:



Condition of fish:

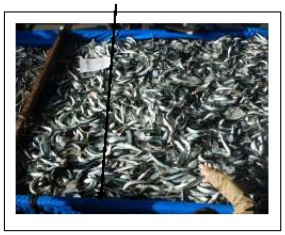
Sample for Auction in Choshi Fish Market:

Sardine: About 90% ~ 99% of all fish by eye

Some mackerel mixed in



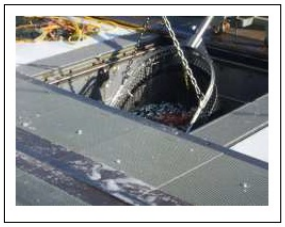


After Auction:

The fish was loaded on the trucks and delivered to a factory for freezing.



In a factory:

During processing, mackerel was sorted as under:

Mixing Ratio:

On Mar. 20, 2023

Name of vessel	Quantity (Tons)	Sardine (Tons)	Mackerel (Tons)	Mixing Ratio (%)
No.62 Ishida Maru	36			
No.67 Ishida Maru	36			
88 Shinei Maru	150			
23 Fukuei Maru	36			
Total	258	255.5	2.5	0.97

Investigation:

According to the applicant, they get the following data during discharging and processing in a factory between Feb. and June, 2023.

Further, on our inspection, mixing ratio on Mar. 20 and May 19 were as under.

Date	Receiving (tons)	Mixing Ratio (%)	Remarks
Feb. 23, 2023	230	4.17	Mackerel (9.6t) Amber Jack: 90kgs
Mar. 20, 2023	258	0.97	Mackerel: (2.5t), Amber Jack: some
Mar. 27, 2023	80	1.25	Mackerel (1.0t), Spanish Mackerel: 4 pcs
Mar. 29, 2023	47	0.85	Mackerel (400kgs)
Mar. 30, 2023	44	0.68	Mackerel (300kgs)
Mar. 31, 2023	204	1.47	Mackerel (3.0tons)
Apr. 01, 2023	204	2.45	Mackerel (5.0tons)
Apr. 05, 2023	208	1.15	Mackerel (2.4tons)
Apr. 10, 2023	202	0.79	Mackerel (1.6tons)
			Amber Jack 8pcs, Sea bass 1pc
Apr. 14, 2023	22	0.77	Mackerel(170kgs)
Apr. 15, 2023	212	1.42	Mackerel (3.0tons)
Apr. 20, 2023	232	3.45	Mackerel (8.0tons)
Apr. 24, 2023	86	1.74	Amber Jack 4pcs Squid 1pc

			Mackerel: (1.5tons)
Apr. 25, 2023	185	2.16	Mackerel (4.0t) Amber Jack: 2pcs
Apr. 28, 2023	188	1.06	Mackerel (2.0tons)
May 10, 2023	195	0.18	Mackerel (350kgs)
May 11, 2023	76	4.61	Mackerel (3.5tons)
May 12, 2023	112	2.23	Mackerel (2.5tons)
May 13, 2023	198	0.91	Mackerel (1.8tons)
May 18, 2023	191	0.18	Mackerel (350kgs), Amber Jack: 1pc
May 19, 2023	177	0.20	Mackerel (350kgs)

Note: Red letter: our inspection

Opinion:

From our findings, we are of the opinion that the mixing ratio of Sardine fishing by domestic large/medium sized purse seine fisheries off Choshi port, Chiba Pref on Mar. 20 was correct.

Further, we checked by photos and data, which were received by the applicant were also as correct.

For all enquiries, please call: Tel 0143-23-5755

Appendix C: Ishinomaki landings report

Purse seine catch bought by Seishin Frozen Product CO.,LTD in the port of Ishinomaki in early 2023. Landings were not verified by a third party. Survey and report commissioned by William Carvalho, Wild Planet Foods.

Date	Vessel	Target Species	Sardine (kgs)	%	Chub/Blue Mackerel	%	Horse Mackerel	%	Anchovy	%	Saury	%	Amberjack	%	Others	%
07/01/2023	23 Fukuei	Sardine	67,835	100											0	
07/01/2023	18 kaiei	Sardine	45,861	100											0	
07/01/2023	26 Soho	Sardine	19,527	93.4	1,387	6.6									1,394	
20/01/2023	Hiyoshi	Sardine	116,375	98.8	1,475	1.2									1,476	
20/01/2023	25 Fudou	Sardine	44,386	98.4	735	1.6									737	
01/02/2023	Hiyoshi	Sardine	86,215	99.1	800	0.9									801	
01/02/2023	16 Soho	Sardine	45,873	97.9	140	0.3							850	1.8	992	
06/02/2023	26 Soho	Sardine	136,701	99.95	74	0.05									74	
13/02/2023	26 Soho	Sardine	69,593	98.5									1,100	1.5	1,102	
13/02/2023	37 Kaiko	Sardine	15,912	100											0	
17/02/2023	26 Soho	Sardine	156,282	99.9	30	0.0							50	0.0	80	
17/02/2023	37 Kaiko	Sardine	39,732	96.9	159	0.3							1,150	2.8	1,312	
24/02/2023	16 Soho	Sardine	160,480	99.3	1,200	0.7									1,201	
22/05/2023	33Zentoku	Sardine	153,775	99.9	30	0.1									30	
22/05/2023	33Fudou	Sardine	37,438	99.7	135	0.3									135	