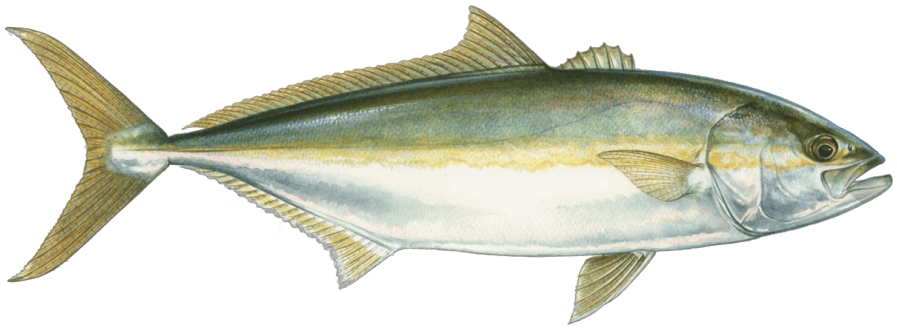
White Seabass & California Yellowtail

Atractoscion nobilis

Seriola lalandi



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California and Eastern Central Pacific

Bottom gillnet, Drift gillnets, Hooks and lines

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Seafood Watch Standard used in this assessment: Fisheries Standard v4

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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 covers the white seabass (*Atractoscion nobilis*) and California yellowtail (*Seriola dorsalis*) fisheries, and the incidental catch and retainment of giant sea bass (*Stereolepis gigas*) in U.S. state and federal waters. These species are mostly concentrated in southern California between Point Conception and the United States–Mexico border. The white seabass fishery also has a component in Monterey Bay. Mexican and recreational fisheries for all three species are not assessed in this report. Because the stocks are shared with Mexico, this report considers stock abundance and fishing mortality information from Mexico and recreational fishing mortality. White seabass and giant sea bass are caught primarily with drift and set gillnets throughout southern California. California yellowtail is primarily caught in southern California using hook and line fishing gear.

Both white seabass and California yellowtail were rated as moderate concerns for abundance and fishing mortality. White seabass is not overfished, nor is overfishing occurring, though all sources of fishing mortality, including from Mexico and the recreational fishery, surpassed this level in at least one year. There is no formal stock assessment or reference point for California yellowtail, and the species is not highly vulnerable. Giant sea bass is listed as “Critically Endangered” by the International Union for the Conservation of Nature (IUCN). Fishing mortality for giant sea bass is unknown because no scientific research has been done to establish population trends, and it is illegal to target the species, although it is thought that populations are increasing. Giant sea bass was rated a high concern for abundance and fishing mortality because of the lack of stock information.

Set and drift gillnets are of highest concern for impacts on other species, particularly humpback whale. Other main species considered in this assessment include common thresher shark, gray whale, spiny dogfish, shortfin mako shark, and white shark. Gillnets are prohibited in a substantial proportion of representative habitats and the fishery is limited entry, both of which help mitigate some bycatch impacts. The southern stock of California flounder, also known as California halibut, also overlaps with the white seabass set gillnet fishery.

The California Department of Fish and Wildlife (CDFW) manages these fisheries under the authority of the California Fish and Game Commission. Management strategy, bycatch strategy, enforcement, and inclusion is moderately effective for all three gear types (except bycatch strategy and enforcement for the handline fisheries is considered highly effective). Management measures temporally and spatially limit fishing activities, but lack appropriate reference points. A stock assessment was completed for white seabass in 2016, utilizing data through 2013. There is also a fishery management plan for white seabass. There is no stock assessment or fishery management plan for California yellowtail or giant sea bass. The lack of data collection in the set and drift gillnet fisheries is considered ineffective because it does not provide essential stock or bycatch information for management.

Ecosystem-based fisheries management is considered a moderate concern for all three gear types, because of substantial uncertainty about the species’ roles in the ecosystem and how their removal may be affecting the food web. There are limited impacts to the substrate with all gear types, and set gillnet management has warranted a modifying score increase because a substantial proportion of representative habitats are protected from bottom contact.

California yellowtail and white sea bass caught in California with handlines are rated Yellow, while California

yellowtail and white seabass caught in California with set and drift gillnets are rated Red. These ratings are mainly driven by a lack of data collection and analysis, concerns about bycatch of giant sea bass, and concerns about gillnet impacts to other species, particularly humpback whale. Giant sea bass caught in California with drift gillnets and set gillnets are rated Red. There is high concern regarding abundance and fishing mortality on this stock. Also, gillnet impacts to other species, particularly humpback whale, are a concern.

Final Seafood Recommendations

SPECIES | FISHERY	C 1 TARGET SPECIES	C 2 OTHER SPECIES	C 3 MANAGEMENT	C 4 HABITAT	OVERALL	VOLUME (MT) YEAR
California yellowtail | Eastern Central Pacific | United States | California | Drift gillnets	2.644	1.000	2.000	3.873	**Avoid (2.127)**	Unknown
California yellowtail | Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines	2.644	2.644	3.000	3.464	**Good Alternative (2.919)**	6 (MT) 2022
California yellowtail | Eastern Central Pacific | United States | California | Set gillnets	2.644	1.000	2.000	3.240	**Avoid (2.035)**	Unknown
Giant sea bass | Eastern Central Pacific | United States | California | Drift gillnets	1.732	1.000	2.000	3.873	**Avoid (1.914)**	0 (MT) 2022
Giant sea bass | Eastern Central Pacific | United States | California | Set gillnets	1.732	1.000	2.000	3.240	**Avoid (1.830)**	2 (MT) 2022
White seabass | Eastern Central Pacific | United States | California | Drift gillnets	2.644	1.000	2.000	3.873	**Avoid (2.127)**	Unknown
White seabass | Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines	2.644	2.644	3.000	3.464	**Good Alternative (2.919)**	16 (MT) 2022
White seabass | Eastern Central Pacific | United States | California | Set gillnets	2.644	1.000	2.000	3.240	**Avoid (2.035)**	Unknown

In 2022, approximately 3 mt of giant sea bass were landed in gillnet fisheries (including both set and drift gillnet). For the hook and line fishery, data were not available for 2022, but because of the historically minimal incidental catch with this gear, it is assumed to be 0 mt (CDFW 2024).

Data by gear type (set versus drift gillnet) are not publicly available, so landings are reported for all gillnet gear together. California yellowtail landings in gillnet fisheries (including both set and drift gillnet) were about 5.6 mt in 2022, and in the hook and line fishery were 6.7 mt in 2022 (CDFW 2024). White seabass landings in gillnet fisheries (including both set and drift gillnet) were 50.3 mt in 2022, and in the hook and line fishery were 16.6 mt in 2022 (CDFW 2024).

Summary

California yellowtail and white sea bass caught in California with handlines are rated Yellow, while California yellowtail and white seabass caught in California with set and drift gillnets are rated Red. These ratings are mainly driven by a lack of data collection and analysis, and by concerns about bycatch of giant sea bass and the gillnet impacts to other species, particularly humpback whale. Giant sea bass caught in California with drift gillnets and set gillnets is rated Red. There is high concern regarding abundance and fishing mortality on this

stock. Also, gillnet impacts to other species, particularly humpback whale, are a concern.

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 covers the white seabass (*Atractoscion nobilis*) and California yellowtail (*Seriola dorsalis*) fisheries and the incidental catch and retainment of giant sea bass (*Stereolepis gigas*) in U.S. state and federal waters. These species are mostly concentrated in southern California between Point Conception and the United States–Mexico border. The white seabass fishery also has a component in Monterey Bay. Mexican and recreational fisheries for all three species are not assessed in this report. Because the stocks are shared with Mexico, this report considers stock abundance and fishing mortality information from Mexico and recreational fisheries. White seabass and giant sea bass are caught primarily with drift and set gillnets throughout southern California. California yellowtail is primarily caught in southern California using hook and line fishing gear.

Species Overview

White seabass (*Atractoscion nobilis*) is a large, mobile, substratum predatory fish that primarily inhabits the coastal waters of southern California, United States and Baja California, Mexico (Allen et al. 2007). It is also found in the northern Gulf of California (CDFW 2020){CDFW 2023b}. During periods of higher ocean temperatures such as El Niño Southern Oscillation (ENSO) events, white seabass has been observed as far north as Juneau, Alaska (Donohoe 1997)(Allen et al. 2007)(Allen et al. 2007). Contrary to its name, white seabass is not a true bass but the largest member of the croaker family (Sciaenidae). It attains sizes up to 1.7 m and weights to 41 kg (CDFG 2002). Length frequency distributions indicate a variation in size from Southern California to Southern Baja California. The mean length of white seabass sampled was 81.5 cm in Southern Baja California, 113.8 cm in Northern Baja California, and 118.6 cm in Southern California. Length sampled in all regions ranged from 31.0 cm to 156.0 cm (Romo-Curiel et al. 2015). White seabass rapidly increases in size in the first 8 years of life, and its growth rate slows thereafter (Romo-Curiel et al. 2015). Information on the size and age for maturity is limited, but the most recent stock assessment looked at estimates based on data from Clark (1930) and PIER, noting that older values are likely underestimates and female maturity occurs closer to 86 cm rather than around 60 cm as previously thought (Valero and Waterhouse 2016)(CDFW 2024). The maximum observed age is estimated at 27 years (Valero and Waterhouse 2016). Pelagic spawning occurs from March to July (peaking in May), from 2 hours before sunset to 4.5 hours after sunset, and in the greatest amount in the 5 days during and after the new moon (Aalbers 2008). Females spawn with approximately 458,000 to 3,914,000 eggs per batch (CDFW 2020). Adult white seabass eat a variety of fishes and invertebrates including northern anchovy (*Engraulis mordax*), Pacific sardine (*Sardinops sagax*), blacksmith (*Chromis punctipinnis*), silversides (*Atherinopsidae* spp.), Pacific mackerel (*Scomber japonicus*), market squid (*Loligo opalescens*), and pelagic red crab (*Pleuroncodes planipes*) (Thomas 1968).

White seabass has been fished since the 1890s, with landings fluctuating widely over time (CalCOFI 2013). Since the early 1980s, U.S. vessels have not been permitted to fish in Mexican waters for white seabass (CalCOFI 2013). By the 1980–81 fishing season, the fishery had collapsed to 10% of its historic catch (Allen et al. 2007), and annual landings remained low for the next 15 years (CalCOFI 2013). According to the most recent stock assessment (2016), abundance remains historically low (Valero and Waterhouse 2016). In 1983, the California State Legislature passed legislation funding research into artificial propagation (aquaculture) for depleted finfish. Since 1986, the Ocean Resources Enhancement and Hatchery Program (OREHP), managed by the California Department of Fish and Wildlife (CDFW) (formerly the California Department of Fish and Game), has propagated, reared, and released white seabass juveniles into the ocean with the goal “to

enhance populations of marine finfish species important to California for their sport and commercial fishing value" (CDFG 2010c). A review of the program, published in 2017, stated that one of the achievements of the OREHP is its "contributions to research discoveries surrounding the biology and culture of all life stages of White Seabass," though it determined that the "survival of hatchery fish and the contribution of hatchery fish to the White Seabass fishery" has been low (California Sea Grant 2017).

CDFW manages all white seabass fisheries in California, including the commercial fishery using set and drift gillnets south of Point Conception and the hook and line fishery in Monterey Bay that are being considered in this assessment. In the past 20 years, gillnet restrictions have prohibited fishing in state waters and waters less than 109.7 m (60 FM). Even with these restrictions, most commercial white seabass is still landed in set and drift gillnets (CalCOFI 2013). There is a minimum size limit of 71.12 cm (28 in), the fishery is closed from March 15 to June 15 to protect spawning aggregations, and there is an annual review of the 2002 fishery management plan (CDFG 2002)(CDFW 2020). There is a large recreational fishery for white seabass, though it is not addressed in this report. But fishing mortality from all sources, including the recreational and Mexican fisheries, is considered because there is evidence of movement between the United States and Mexico, suggesting a transboundary nature of the stock (Aalbers 2008).

California yellowtail (*Seriola dorsalis*; formerly *Seriola lalandi*) (Martinez-Takeshita et al. 2015) is a large, fast-swimming, coastal, pelagic species (Love 1996) and a highly prized game fish in southern California (CDFW 2022c). The species ranges from southern Washington, United States to Mazatlán, Mexico (CDFG 2001), with northerly movement into California from Mexico in the spring and summer with warm ocean temperatures (Baxter 1960)(CDFW 2022c). The maximum recorded size is 1.5 m and 36.3 kg (80 lb) (Love 1996). All females older than 3 years are 71.12 cm (28 in) and are capable of spawning, which occurs in summer months (CDFW 2022c). Older females are capable of spawning multiple times per season, and a 9.1 kg (20 lb) fish is capable of producing 940,000 eggs during one season (CDFW 2022c). Adult California yellowtail eat Pacific sardine, northern anchovy, jack mackerel (*Trachurus symmetricus*), Pacific mackerel, market squid, and pelagic red crabs (CDFW 2022c).

Fishing for California yellowtail has existed since the late 1800s, predominantly south of Point Conception {CDFW 2023c}. The commercial fishery is largely incidental to the commercial white seabass drift and set gillnet fisheries (Baxter 1960), but also has a southern California hook and line component. The fisheries are managed by the CDFW. Commercial catch declined significantly due to the elimination of purse seining in California waters and reduced demand (Collins 1973). Landings dropped again following the 1994 gillnet bans in state waters, because California yellowtail is denser in nearshore waters {CDFW 2023c}. Currently, there is no stock assessment or fishery management plan in place for California yellowtail.

Giant sea bass (*Stereolepis gigas*) is a large, coastal pelagic species that is distributed from Humboldt Bay, California, United States to Mexico (Masuda et al. 1984). Giant sea bass is estimated to attain an age of at least 76 years {Hawk and Allen 2014}. Giant sea bass occurs nearshore, along drop-offs, and in kelp. Large giant sea bass are usually found in waters deeper than 30 m, and smaller fish are more commonly found in sandy habitat or in kelp (Eschmeyer at al. 1983)(Benseman and Allen 2018). Few studies have been done on the reproduction of giant sea bass, with one 1971 study estimating the age at maturity to be 11 to 13 years (Fitch and Lavenberg 1971). A recent study shed some light on its reproductive behavior, with evidence suggesting that courtship occurs in late afternoon before dusk and spawning occurs just after dusk (Clark 2016). Another has noted that some giant sea bass at Santa Barbara Island in California aggregate annually during spawning months at the same location {Spector 2022}. Because this species is slow-growing and

matures at a relatively old age, giant sea bass is vulnerable to overfishing.

Giant sea bass was heavily exploited in the United States and Mexico in the early 1900s. In the U.S., commercial landings peaked in 1932 at 115 metric tons (mt) and rapidly declined the following year. Commercial landings in Mexico had a similar decline, though it occurred more gradually. Landings in the Mexican commercial fishery averaged 50.9 mt for 2000–16 (Ramírez-Valdez et al. 2021). Historical existence of spawning aggregations of giant sea bass on the southern Pacific coast of Baja California, once reported by fishers, has disappeared (Sala et al. 2003). But it is likely that the stock in Mexico did not experience a collapse similar to that of the California stock (Ramírez-Valdez et al. 2021). In 1981, the California State Legislature passed a law that prohibited the take of giant sea bass, except incidental take in the commercial gillnet and trammel net fisheries of two fish per trip. Also, the law allowed up to 1,000 lb of giant sea bass taken in Mexican waters to be landed in the United States, with a limit of 3,000 lb in a calendar year. The law was changed in 1988 to reduce incidental catch of giant sea bass to one fish per trip (FGC §8380). CDFW has reported that anecdotal evidence from sightings by scuba divers off La Jolla, Anacapa Island, and Catalina Island indicates that there may be an increase in abundance (CDFG 2010b). The effective population size was estimated at 500 individuals, with evidence that the population is expanding in the region (Chabot et al. 2015). But sampling of the Mexican commercial fleet's landings suggests that this is an underestimate (Ramírez-Valdez et al. 2021). The study suggests that the actual population size may be large enough to no longer be treated as "Critically Endangered" by the IUCN, but it ultimately advocates for treating the population size as unknown (Ramírez-Valdez et al. 2021).

Production Statistics

White seabass landings in gillnet fisheries (including both set and drift gillnet) have ranged from 45 to 65 mt annually since 2019 and from 7 to 20 mt annually during the same period for the hook and line fishery (NOAA 2024). Even in the years with a relatively high proportion of landings by hook and line, landings data indicate that a majority of the hook and line vessels opportunistically land white seabass rather than directly target it (CalCOFI 2013).

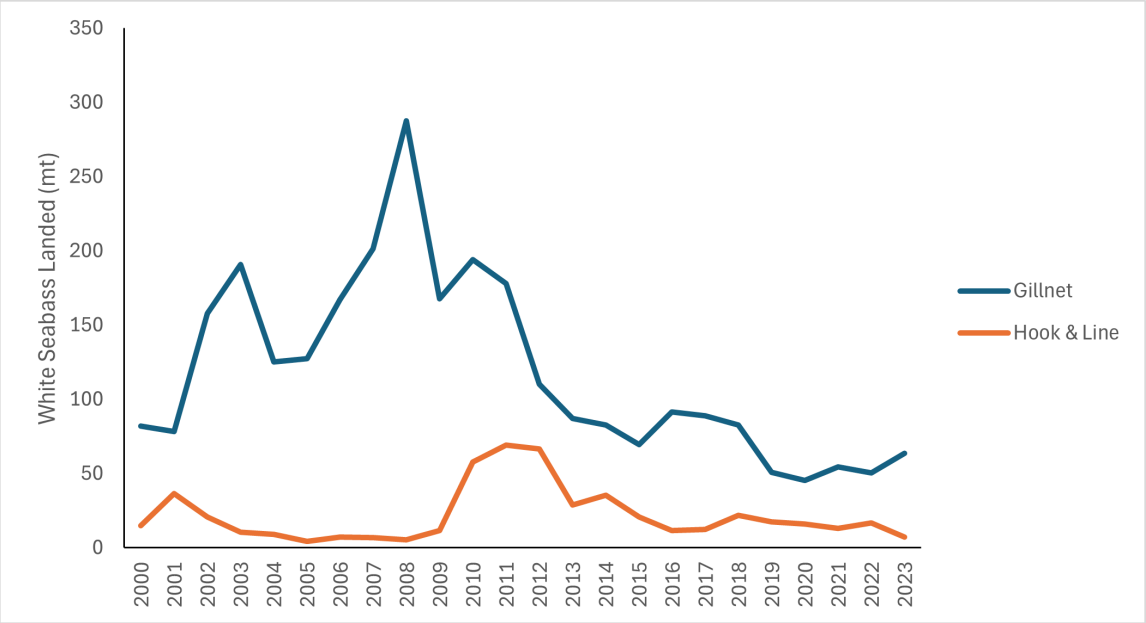

Figure 1: Annual landings of white seabass in California from 2000 to 2023 by either gillnet gear (includes both set and drift gillnet) or hook and line gear. Data from (CDFW 2024).

California yellowtail is generally caught incidentally to the white seabass fishery (CDFG 2001). California yellowtail landings in gillnet fisheries (including both set and drift gillnet) have ranged between 3 and 8 mt annually since 2019 and between 4 and 12 mt annually during the same period for the hook and line fishery (NOAA 2024).

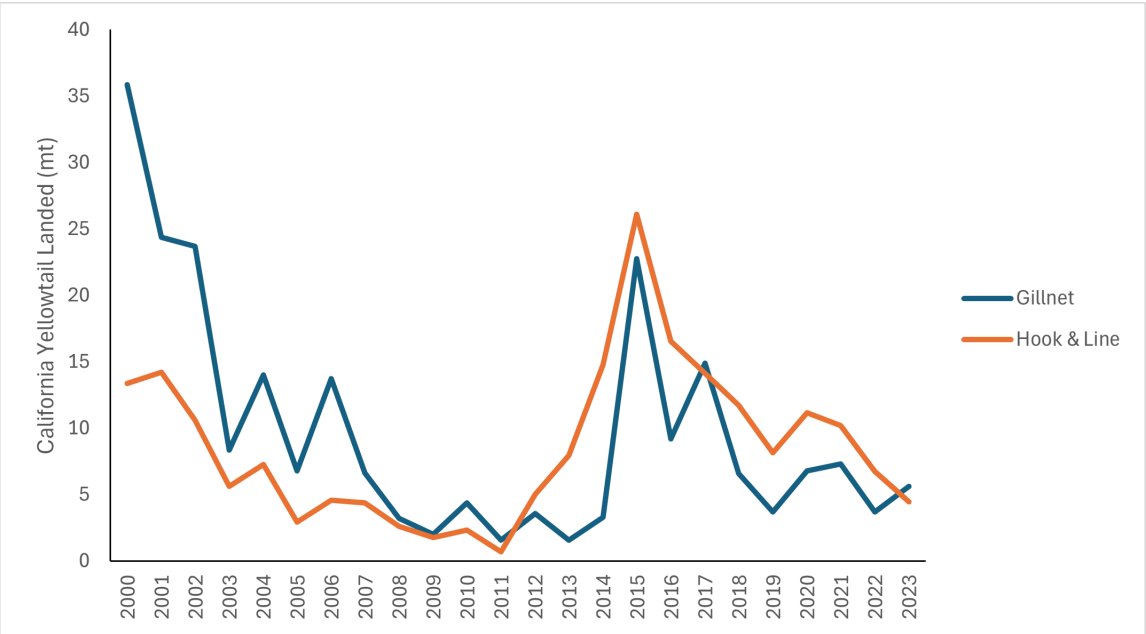

Figure 2: Annual landings of California yellowtail in California from 2000 to 2023 by either gillnet gear (includes both set and drift gillnet) or hook and line gear. Data from (CDFW 2024).

As mentioned, there is no commercial fishery for giant sea bass in California, and landings are from incidental take in the commercial gillnet and trammel net fisheries, or taken in Mexican waters and landed in the United States (FGC §8380). From 1994 to 2021, the average annual landings of giant sea bass by set gillnets was approximately 4,665 lbs (2.12 mt) and by drift gillnets was 434 lbs (0.2 mt), together making up approximately 98% of the landings of giant sea bass. Landings of giant sea bass by hook and line gear generally make up one percent or less of annual landings (less than 0.05 mt annually, on average) (CDFW 2024), so they are considered negligible.

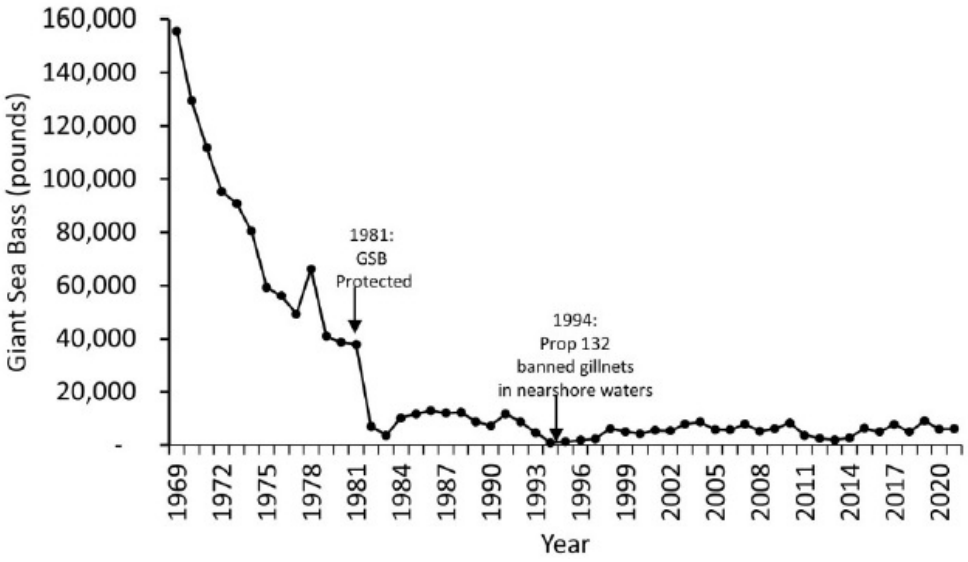

Figure 3: Commercial landings (lbs) of giant sea bass in California from all gear types combined from 1969 to 2021 (Figure 1 from (Haggerty and Valle 2024)).

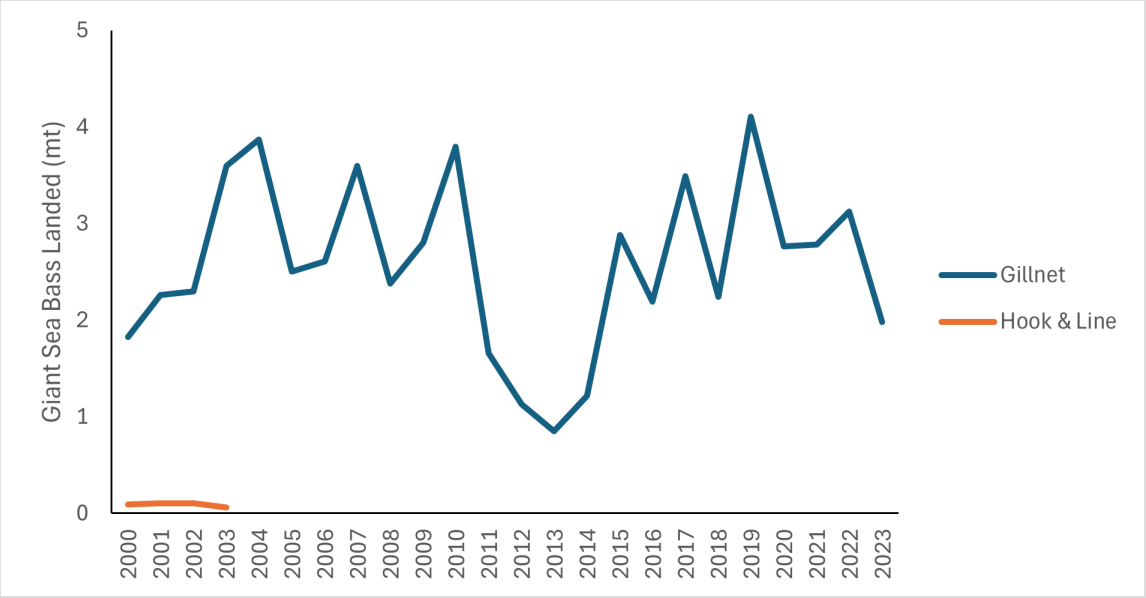

Figure 4: Annual landings of giant sea bass in California from 2000 to 2023 by either gillnet gear (includes both set and drift gillnet) or hook and line gear. Landings by hook and line gear were nearly negligible in the early 2000s, with the following years either resulting in no landings or the landings data were held confidential. Data from (CDFW 2024).

Importance to the US/North American market.

Import and export data from the National Marine Fisheries Service (NMFS) Foreign Trade Database do not differentiate between various species of seabass or grouper {NMFS 2017d}. Therefore, precise import and export data for white seabass and giant sea bass are unavailable. White seabass and giant sea bass exports from the U.S. are believed to be negligible. Mexico is the only foreign source of white seabass imports into the United States, making up about 75% of white seabass sold in this market (CDFW 2024){Fajardo-Yamamoto etal. 2022}. Imports of giant sea bass into the United States are generally unknown and believed to be negligible, although Mexico is the only potential foreign source of giant sea bass.

Import and export data from the NMFS Foreign Trade Database group California yellowtail with “marine fish nspf” (not specified further) {NMFS 2017d}. Therefore, precise import and export data for yellowtail are unavailable. California yellowtail exports from the United States are believed to be negligible, with Mexico as the only potential foreign source of California yellowtail imports into the United States.

The value of giant sea bass to commercial fishing is negligible, estimated at $12,600 per year. It should be noted that the nonconsumptive value of giant sea bass to the recreational diving industry was estimated at $2.3 million per year, because it is a popular species for divers to encounter in the waters of Southern California. The value of the white seabass commercial fishery has fluctuated between $600,000 and $850,000 per year from 2019 to 2023 (CDFW 2024). The value of the California yellowtail commercial fishery has fluctuated between $80,000 and $200,000 per year from 2017 to 2021 {CDFW 2024b}.

Common and market names.

The common name for *Atractoscion nobilis* is white seabass. The market name is seabass, and other vernacular names include corbina and California white seabass (US FDA 2023).

The common name for *Seriola dorsalis* (formerly *Seriola lalandi*) is yellowtail. The market names are yellowtail or amberjack, and other vernacular names include California yellowtail, great amberjack, horse-eye bonito, coronado, mossback, forktail, forkie, yeller, kingfish, jurel, and yellowtail jack (US FDA 2023).

The common name for *Stereolepis gigas* is giant sea bass, although in California it is commonly referred to as black sea bass. Market names include bass, black sea bass, giant black sea bass, and California black seabass.

Primary product forms

White seabass is sold whole or as fillets, both fresh and frozen. California yellowtail is sold as fillets, which can be fresh, frozen, or salted and dried (Smith-Vaniz 1995). Giant sea bass is sold as fresh fillets.

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

CALIFORNIA YELLOWTAIL			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Eastern Central Pacific | United States | California | Drift gillnets	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Eastern Central Pacific | United States | California | Set gillnets	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)

GIANT SEA BASS			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Eastern Central Pacific | United States | California | Drift gillnets	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Eastern Central Pacific | United States | California | Set gillnets	1.000: High Concern	3.000: Moderate Concern	Red (1.732)

WHITE SEABASS			
REGION / METHOD	ABUNDANCE	FISHING MORTALITY	SCORE
Eastern Central Pacific | United States | California | Drift gillnets	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Eastern Central Pacific | United States | California | Set gillnets	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)

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.*

California yellowtail (Seriola dorsalis)

Factor 1.1 - Abundance

Eastern Central Pacific | United States | California | Drift gillnets
Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines
Eastern Central Pacific | United States | California | Set gillnets

Moderate Concern

There is no formal stock assessment or reference points for the California yellowtail stock, and the species is not highly vulnerable. Therefore, abundance is deemed a moderate concern.

Justification:

There is no stock assessment for California yellowtail. A 2001 report by the California Department of Fish and Game suggested that, although the size of the California yellowtail stock is smaller than in the 1950s, it could still support substantial harvest pressure (CDFG 2001). An age and size shift in harvest was observed in commercial passenger fishing vessel (CPFV) data from the 1970s compared to the 1980s and 1990s, with more recent catches dominated by 2- and 3-year-old fish compared to the 1970s, which was dominated by 6- to 9-year-old fish (CDFG 2001). Recent evidence from 1966 to 2013 suggests that the trophy size of California yellowtail decreased in the 1970s and has been increasing since then {Bellquist et al. 2016}. This report also takes into account the California yellowtail stock in Mexico, where biomass is unknown (SAGARPA 2010).

Productivity Attributes	Value	Score (1 = low risk; 2 = medium risk; 3 = high risk)	Reference
Average age at maturity (years)	3	1	(CDFG 2001)
Average maximum age (years)	22	2	(Ben-Aderet et al. 2020)
Fecundity (egg/yr)	458,000 to 3,914,000	1	(Baxter 1960) (CDFG 2001)
Average maximum size (cm) (not to be used when scoring invertebrate species)	150	2	(Love 1996)
Average size at maturity (cm) (not to be used when scoring invertebrate species)	71	2	(CDFG 2001)
Reproductive strategy	Broadcast spawner	1	(Baxter 1960) (CDFG 2001)
Trophic level	4.1	3	
Density dependent (invertebrates only)			
Productivity subscore		**1.71**	

Susceptibility Attribute	Information	Score (1 = low risk; 2 = medium risk; 3 = high risk)	Reference
Areal overlap	Unknown	3	(CDFG 2001)
Vertical overlap	Targeted species	3	(CDFG 2001)
Selectivity of fishery	Not considered “high risk”	2	(CDFG 2001)
Post-capture mortality	Targeted species	3	(CDFG 2001)
Susceptibility subscore		**2.33**	

Productivity-Susceptibility Score	2.89
Vulnerability Rating (high, medium, low)	Medium

Factor 1.2 - Fishing Mortality

Eastern Central Pacific | United States | California | Drift gillnets
Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines
Eastern Central Pacific | United States | California | Set gillnets

Moderate Concern

California yellowtail is by and large commercially caught incidentally to the white seabass fishery (CDFG 2001). Fishing mortality of California yellowtail is unknown and there are no reference points. Fishing mortality in Mexico is also unknown (Baja California Gobierno Del Estado 2018). When biomass is unknown relative to reference points, Seafood Watch Criteria deem fishing mortality a moderate concern.

Giant sea bass (Stereolepis gigas)

Factor 1.1 - Abundance

Eastern Central Pacific | United States | California | Drift gillnets
Eastern Central Pacific | United States | California | Set gillnets

High Concern

The International Union for the Conservation of Nature (IUCN) first listed giant sea bass as “Critically Endangered” in 1996 and updated this assessment in 2004 with the same category (IUCN 2004). The effective population size was estimated at 500 individuals, with evidence that the population is expanding in the region (Chabot et al. 2015). It has been found that the effective population size of species may be considered as 10% of the census population size, meaning the population may be around 5,000 individuals, although there is some uncertainty about how this value may be applied, because of varying life history characteristics across species and the suggested growth of this population (Chabot et al. 2015). Sampling of the Mexican commercial fleet’s landings suggests that this is an underestimate (Ramírez-Valdez et al. 2021). The study suggests that the actual population size may be large enough to no longer be treated as “Critically Endangered” by the IUCN, but it ultimately advocates for treating the population size as unknown (Ramírez-Valdez et al. 2021)(House et. al. 2016). But because of the uncertainties surrounding stock data and reference points, abundance is considered a high concern.

Factor 1.2 - Fishing Mortality

Eastern Central Pacific | United States | California | Drift gillnets
Eastern Central Pacific | United States | California | Set gillnets

Moderate Concern

Fishing mortality for giant sea bass is unknown because no scientific research has been done to establish population trends (CDFG 2010b). There is no estimate of F, so it follows that there are no

reference points for fishing mortality. Because giant sea bass fishing mortality is unknown, fishing mortality is deemed a moderate concern.

Justification:

Giant sea bass was heavily exploited in the United States and Mexico in the early 1900s. In the U.S., commercial landings peaked in 1932 at 115 mt and rapidly declined the following year. Commercial landings in Mexico had a similar decline, though it occurred more gradually. As described in the Introduction, current law prohibits the take of giant sea bass except one fish per trip as incidental catch in the commercial gillnet and trammel net fisheries (FGC §8380). Consequently, commercial landings since 2000 have consistently remained between 1 and 4 mt annually. CDFW has reported that anecdotal evidence from sightings by scuba divers off La Jolla, Anacapa Island, and Catalina Island indicates that there may be an increase in abundance (CDFG 2010b). The current effective population size is estimated at 500 individuals, with evidence that the population is expanding in the region (Chabot et al. 2015). But that may be an underestimate, and the actual population size is being treated as unknown (Ramírez-Valdez et al. 2021). A 2014–15 survey at Catalina Island also suggests that giant sea bass is recovering, when compared to historical data for the island {House et al. 2016}.

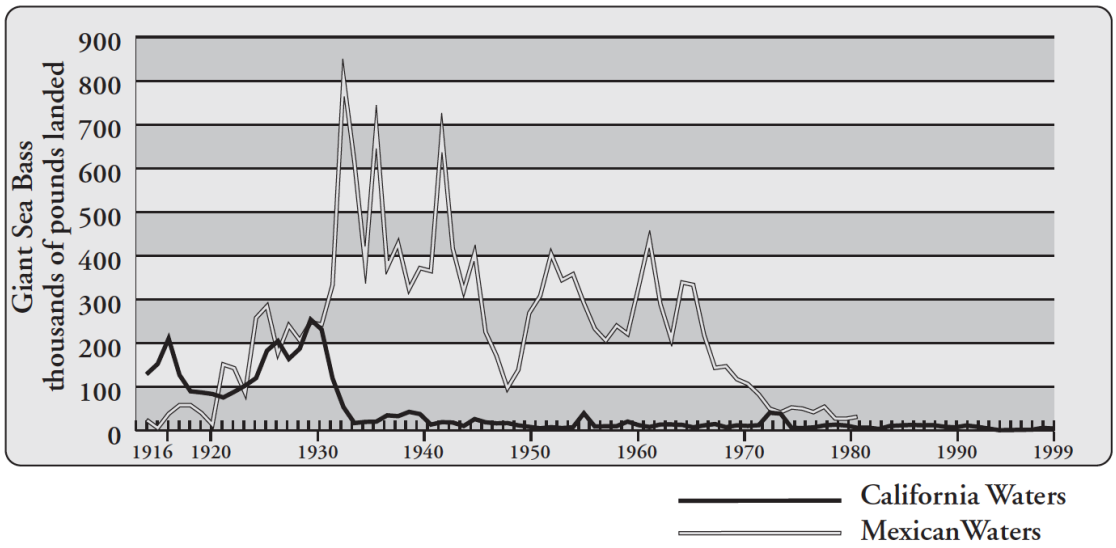

Figure 5: Commercial landings of giant sea bass by location, 1916–1999.

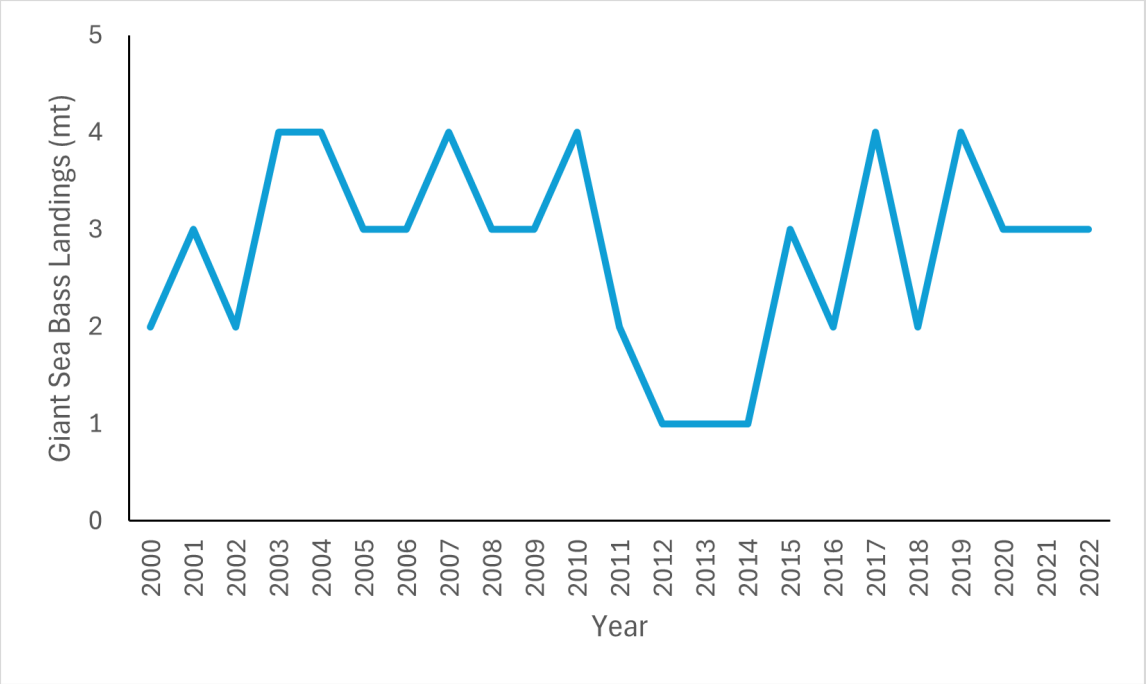

Figure 6: Landings of giant sea bass in California (all gear types) from 2000 to 2022 (NOAA 2024).

White seabass (Atractoscion nobilis)

Factor 1.1 - Abundance

Eastern Central Pacific | United States | California | Drift gillnets
Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines
Eastern Central Pacific | United States | California | Set gillnets

Moderate Concern

The most recent U.S. stock assessment for white seabass was conducted in 2016, although the data in this assessment were from at least 10 years ago and are not considered recent for the purposes of this assessment. White seabass was not considered overfished (Valero and Waterhouse 2016) (CDFG 2002), and according to the IUCN is still rated "Least Concern." The biomass of white seabass in Mexico is unknown, and there is uncertainty surrounding whether the white seabass in California and Mexico should be considered the same stock, because recent genetic data suggest the presence of distinct subpopulations, although further research is needed (Baja California Gobierno Del Estado 2018)(Romo-Curiel et al. 2016). There is a lack of stock data available, although it is considered "Least Concern" by the IUCN; therefore, white seabass abundance is deemed a moderate concern.

Justification:

The most recently published FMP annual review report was for the 2021 to 2022 season, and CDFW and FGC concluded that an overfishing condition does not exist and is not imminent {CDFW 2023b}. The first stock assessment for white seabass was published in 2016. Before this, the best information

was a fisheries management plan (FMP) published in 2002, and an annual review of the white seabass fishery management is conducted (CDFG 2002). The maximum sustainable yield (MSY) biomass was estimated at 7,257.5 mt (16 million lb), and the MSY proxy, including a natural mortality rate of 0.1, was 725.7 mt (1.6 million lb) (CDFG 2002). According to the 2016 assessment, the white seabass population was at 27% depletion in 2015, just above the B_{MSY} of 0.24 depletion (Valero and Waterhouse 2016). White seabass is an aggregate spawner, which increases its vulnerability to overfishing (CDFG 2002). Since the stock assessment, harvest trends have declined, and the current stock status is unknown. No changes to the FMP have been made.

Factor 1.2 - Fishing Mortality

Eastern Central Pacific | United States | California | Drift gillnets
Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines
Eastern Central Pacific | United States | California | Set gillnets

Moderate Concern

According to the 2016 stock assessment, MSY is 306 mt, corresponding to a depletion of 0.24 (Valero and Waterhouse 2016). The combined commercial and recreational mortality for the species has not exceeded MSY since 2011. Throughout 2010 to 2020, both commercial and recreational fishing mortality steadily declined. Annual commercial landings for the period averaged 137 mt while annual recreational landings averaged 48 mt.

U.S. fishing mortality is currently below the reference point, but the reference point is less conservative than F_{MSY}, and it does not include take in Mexico. Some historic information on retained catch in Mexico is included in the 2016 stock assessment (see p. 133 of Valero and Waterhouse 2016), but total fishing mortality in Mexico is still unknown because recent data combine white seabass with 14 other species (Baja California Gobierno Del Estado 2018). A recent study reconstructed historical landings of white seabass in Mexico and found them to range between 500 and 1,500 mt over the past two decades {Fajardo-Yamamoto 2022}. Therefore, it is possible that fishing mortality for the entire stock has been above MSY in additional years. For these reasons, and because the stock assessment uses data at least 10 years old, fishing mortality is deemed unknown and of moderate concern.

Justification:

A 2007 fisheries-independent survey of juvenile white seabass indicated that white seabass was in the process of recovery (Allen et al. 2007). Although fishing mortality has remained below set reference points, the 2016 stock assessment determined that these reference points were not appropriate: “MSY is estimated by this stock assessment at less than half of that reported by previous works and to occur at a relatively low fraction of the unexploited female spawning biomass” (Valero and Waterhouse 2016). The current fishing mortality is below F_{MSY}, having steadily declined since 2011.

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.

CALIFORNIA YELLOWTAIL			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Eastern Central Pacific | United States | California | Drift gillnets	1.000	1.000: < 100%	Red (1.000)
Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines	2.644	1.000: < 100%	Yellow (2.644)
Eastern Central Pacific | United States | California | Set gillnets	1.000	1.000: < 100%	Red (1.000)

GIANT SEA BASS			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Eastern Central Pacific | United States | California | Drift gillnets	1.000	1.000: < 100%	Red (1.000)
Eastern Central Pacific | United States | California | Set gillnets	1.000	1.000: < 100%	Red (1.000)

WHITE SEABASS			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Eastern Central Pacific | United States | California | Drift gillnets	1.000	1.000: < 100%	Red (1.000)
Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines	2.644	1.000: < 100%	Yellow (2.644)
Eastern Central Pacific | United States | California | Set gillnets	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.

EASTERN CENTRAL PACIFIC | UNITED STATES | CALIFORNIA | DRIFT GILLNETS			
SUB SCORE: 1.000	DISCARD RATE: 1.000	**SCORE: 1.000**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Humpback whale	1.000: High Concern	1.000: High Concern	Red (1.000)
Giant sea bass	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
White shark	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
California yellowtail	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
White seabass	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Common thresher shark	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Gray whale	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Shortfin mako shark	3.670: Low Concern	5.000: Low Concern	Green (4.284)

EASTERN CENTRAL PACIFIC | UNITED STATES | CALIFORNIA | HANDLINES AND HAND-OPERATED POLE-AND-LINES			
SUB SCORE: 2.644	DISCARD RATE: 1.000	**SCORE: 2.644**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
California yellowtail	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
White seabass	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)

EASTERN CENTRAL PACIFIC | UNITED STATES | CALIFORNIA | SET GILLNETS			
SUB SCORE: 1.000	DISCARD RATE: 1.000	**SCORE: 1.000**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Humpback whale	1.000: High Concern	1.000: High Concern	Red (1.000)
California flounder	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Giant sea bass	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
White shark	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
California yellowtail	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
White seabass	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Spiny dogfish	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Common thresher shark	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Gray whale	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Shortfin mako shark	3.670: Low Concern	5.000: Low Concern	Green (4.284)

Bycatch is mostly of concern in the gillnet fisheries, because the hook and line fishery is quite species

selective. Although bycatch does occur with hook and line, no species occur in large enough numbers to be included in this report. Also, hook and line fishers make significant efforts to release unwanted bycatch alive, including releasing them without removing them from the water.

Observer data were available for the California set gillnet fishery through the NMFS Observer Program for the following years: 2007, 2010, 2011, 2012, 2013, and 2017. These data include the set gillnet fisheries in this assessment, although the data are not exclusively from these fisheries, so data may be included for set gillnet fisheries that target other species. Observer data were not available for the California drift gillnet fisheries considered in this assessment, so there is uncertainty surrounding impacts on other species. Although there are differences between set and drift gillnet gear, the mesh size requirements for these fisheries are similar; thus, the set gillnet observer data have been used as a proxy to determine which "other species" should be considered under Criterion 2, because they are likely similar across the gear types. Although some species are being considered here under both gear types, impacts to spiny dogfish and California flounder are being considered only for set gillnet gear because these demersal species are not expected to have significant interactions with drift gillnet gear.

For both the set and drift gillnet fisheries, humpback whale and gray whale are of concern, although humpback whale is a strategic stock and warrants a lower score due to the greater risks to its populations. Long-beaked common dolphin, short-beaked common dolphin, California sea lion, and California harbor seal are also potential bycatch species; however, the estimated injury or mortality is rare and not expected to significantly affect populations, so they were not included in this report. Sea otter, though listed as "Threatened" under the Endangered Species Act (ESA), was not included as bycatch in the gillnet fisheries because the set gillnet depth restrictions eliminated overlap with sea otter, resulting in sea otter entanglement that is at or near zero.

Sharks and rays that were included for their level of concern by the IUCN and for gillnet gear impacts on their populations are spiny dogfish, common thresher shark, shortfin mako shark, and white shark. Other species that have had interactions with gillnet gear but have populations in good standing or are not expected to be substantially affected by this fishery include soupfin shark, swell shark, leopard shark, pacific angel shark, brown smoothhound shark, horn shark, pacific electric ray, bat ray, and sevengill shark.

Brandt's cormorant, double-crested cormorant, common mure, and pelagic cormorant have instances of being caught in gillnets in California, but are of "Least Concern" (and none attributed directly to this fishery), so they are not included in this report. There are instances of unidentified birds (including cormorants and gulls, species not identified) being caught; however, the management measures restricting the use of gillnets in shallower, nearshore areas suggest that the contribution of this fishery to bird mortality is minimal.

California flounder, also known as California halibut, has been regularly caught in the California set gillnet fishery, so it is included in this report. Finfish species that have had interactions with gillnet gear but are not of concern or not expected to face substantial impacts from this fishery include California sheephead, ocean sunfish, pacific mackerel, cabezon, lingcod, California scorpionfish, California barracuda, pacific bonito, kelp bass, ocean whitefish, halfmoon, yellowfin tuna, and rockfish.

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

California flounder (Paralichthys californicus)

Factor 2.1 - Abundance

Eastern Central Pacific | United States | California | Set gillnets

High Concern

The first stock assessment for California flounder, also known as California halibut, was completed in 2011 and an updated stock assessment was conducted in 2020. Following peer review, the results of the 2020 stock assessment were deemed inadequate for management use, and the results of the 2011 assessment remain as the authoritative stock assessment for management decisions (CDFW 2020). But, because this is more than 10 years old, it cannot be considered part of this assessment, according to the Seafood Watch standard. California flounder was last assessed for the IUCN Red List in 2010, resulting in a rating of "Least Concern," although this is also out of date per the Seafood Watch standard {IUCN 2010}. Because of the lack of a recent, updated stock assessment or IUCN listing, and a productivity-susceptibility analysis resulting in a determination that this stock is highly vulnerable, a score of high concern is warranted.

Justification:

California flounder has been assessed in two stocks: a southern stock, south of Point Conception, and a central stock, north of Point Conception (CDFW 2011). The southern stock spawning biomass has been estimated to be low since the start of the modeling time period (1971). California flounder is prolific enough and has a high reproductive potential: when environmental conditions are favorable, biomass can increase relatively quickly in a short time. The assumption is that recruitment is independent of stock size at the observed abundance levels. Recruitments since 1999 are estimated to have been low.

Productivity Attributes	Value	Score (1 = low risk; 2 = medium risk; 3 = high risk)	Reference
Average age at maturity (years)	1–3 years	1	(Lesyna and Barnes 2016)
Average maximum age (years)	23–30 years	3	{Maunder 2011 & OPC 2013}
Fecundity (egg/yr)	>300,000 eggs per year	1	{Maunder 2011 & OPC 2013}
Average maximum size (cm) (not to be used when scoring invertebrate species)	108–152 cm	2	{Maunder 2011 & OPC 2013}
Average size at maturity (cm) (not to be used when scoring invertebrate species)	27–47 cm	2	(Lesyna and Barnes 2016)
Reproductive strategy	Broadcast spawner	1	{Allen 1990}
Productivity subscore		**1.667**	

Susceptibility Attribute	Information	Score (1 = low risk; 2 = medium risk; 3 = high risk)	Reference
Areal overlap	Percentage of main geographic range being fished is unknown, but likely to be greater than >30%.	3	{Maunder 2011 & OPC 2013{
Vertical overlap	Considering all fisheries, there is a high degree of overlap between fishing depths and depths of this species.	3	{Maunder 2011 & OPC 2013}

Seasonal Availability	Fisheries are open year-round and overlap with the species more than 6 months out of the year.	3	{Maunder 2011 & OPC 2013}
Selectivity of fishery	Does not meet conditions of “high risk” but is incidentally encountered.	2	{Maunder 2011 & OPC 2013}
Post-capture mortality	Unknown	3	
Susceptibility Subscore		**2.8**	

Productivity-Susceptibility Score	3.26
Vulnerability Rating (high, medium, low)	High

Factor 2.2 - Fishing Mortality

Eastern Central Pacific | United States | California | Set gillnets

Moderate Concern

Fishing mortality is unknown because the most recent stock assessment conducted is more than 10 years old and the direct contribution by this fishery to fishing mortality is unknown. For this uncertainty, a score of moderate concern is warranted.

California yellowtail (Seriola dorsalis)

Factor 2.3 - Discard Rate/Landings

Eastern Central Pacific | United States | California | Drift gillnets

< 100%

The discard to landings ratio for drift gillnets targeting white seabass and California yellowtail have not been estimated (Valero and Waterhouse 2016). The global discard to landings in gillnets is 0.5% (Kelleher 2005). Observer data for California and Oregon drift gillnet fisheries from 2010 to 2021 suggest a discard rate between 25% and 50%, although this is not specific to the California white seabass fishery. The California drift gillnet fishery for swordfish has a discard rate of 66% (Kelleher 2005), but the mesh size is greater than 35.56 cm, whereas the white seabass and California yellowtail fishery has a mesh size of 8.89 to 35.56 cm (CDFW 2020b)(CDFW 2022c). Therefore with no other data, an estimate of the discards to landings ratio is 20% to 40%.

Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines

< 100%

Handlines and hand-operated pole-and-lines fishing is highly selective for the target species. Fishes landed beside the target species generally occur in low numbers (<5% of catch) (Bellman et al. 2012). Bycatch from the white seabass hook and line fishery is assumed to be low, and incidentally caught species are released alive with high post-release survival.

Eastern Central Pacific | United States | California | Set gillnets

< 100%

The discards to landings ratio for gillnet fisheries worldwide is estimated to be an average rate of 10% or a weighted rate of 0.5% (Kelleher 2005). A study of bycatch in small-scale (vessels less than 15 m) set gillnet fisheries in Baja California, Mexico calculated a discards to landings ratio of 34.3% by weight (Shester and Micheli 2011).

NOAA observer data from six years between 2007 and 2017 in California set gillnet fisheries suggest a ratio between 60% and 70%, based on total discards (both returned alive and dead) of all species (including finfish, mammals, birds, and invertebrates) caught in relation to total landings of all species. This likely is not the exact ratio specific to the white seabass set gillnet fishery, because fishery-specific data are limited (Valero and Waterhouse 2016). But observer data specific to this fishery suggest around a 55% discard rate for the most common finfish species. Considering this, it can be estimated that the ratio of bait and discards is likely less than 100% of total landings.

Common thresher shark (Alopias vulpinus)

Factor 2.1 - Abundance

Eastern Central Pacific | United States | California | Drift gillnets
Eastern Central Pacific | United States | California | Set gillnets

Low Concern

The IUCN has listed the common thresher shark as “Vulnerable” with a decreasing population trend {IUCN 2022}. But the most recent stock assessment for the common thresher shark, conducted in 2018, found the population to not be overfished or undergoing overfishing. Fishing intensity was found to be substantially lower than the overfishing threshold, and the estimated number of female sharks was at 62% of its unexploited level. The estimated biomass of 136,800 sharks is also greater than the calculated B_{MSY} of 101,500 sharks. Observer data show that common thresher shark is regularly part of the catch in the set gillnet fishery in California, although in relatively small numbers (and the same is assumed for the drift gillnet fisheries under assessment, based on similar mesh sizes). Therefore, a score of low concern is given.

Factor 2.2 - Fishing Mortality

Eastern Central Pacific | United States | California | Drift gillnets
Eastern Central Pacific | United States | California | Set gillnets

Low Concern

Observer data show that common thresher shark is regularly part of the catch in the set gillnet fishery in California, although in relatively small numbers and generally in nearshore areas where it is primarily young-of-the-year sharks (and the same is assumed for the drift gillnet fisheries under assessment, based on similar mesh sizes). But this fishery specifically prohibits using gillnets in nearshore areas, suggesting that it is likely not a substantial enough contributor to fishing mortality of young sharks to adversely affect the population {NOAA 2018}. Fishing mortality was calculated in the most recent stock assessment in 2018 and has decreased significantly in relation to that during the peak of the shark drift gillnet fishery in the 1980s. Fishing intensity on the stock was also found to be substantially low. Therefore, this warrants a score of low concern.

Giant sea bass (Stereolepis gigas)

Factor 2.3 - Discard Rate/Landings

Eastern Central Pacific | United States | California | Drift gillnets

< 100%

The discard to landings ratio for drift gillnets targeting white seabass and California yellowtail have not been estimated (Valero and Waterhouse 2016). The global discard to landings in gillnets is 0.5% (Kelleher 2005). Observer data for California and Oregon drift gillnet fisheries from 2010 to 2021 suggest a discard rate between 25% and 50%, although this is not specific to the California white seabass fishery. The California drift gillnet fishery for swordfish has a discard rate of 66% (Kelleher 2005), but the mesh size is greater than 35.56 cm, whereas the white seabass and California yellowtail fishery has a mesh size of 8.89 to 35.56 cm (CDFW 2020b)(CDFW 2022c). Therefore with no other data, an estimate of the discards to landings ratio is 20% to 40%.

Eastern Central Pacific | United States | California | Set gillnets

< 100%

The discards to landings ratio for gillnet fisheries worldwide is estimated to be an average rate of 10% or a weighted rate of 0.5% (Kelleher 2005). A study of bycatch in small-scale (vessels less than 15 m) set gillnet fisheries in Baja California, Mexico calculated a discards to landings ratio of 34.3% by weight (Shester and Micheli 2011).

NOAA observer data from six years between 2007 and 2017 in California set gillnet fisheries suggest a ratio between 60% and 70%, based on total discards (both returned alive and dead) of all species (including finfish, mammals, birds, and invertebrates) caught in relation to total landings of all species. This likely is not the exact ratio specific to the white seabass set gillnet fishery, because fishery-specific data are limited (Valero and Waterhouse 2016). But observer data specific to this fishery suggest around a 55% discard rate for the most common finfish species. Considering this, it can be estimated that the ratio of bait and discards is likely less than 100% of total landings.

Gray whale (Eschrichtius robustus)

Factor 2.1 - Abundance

Eastern Central Pacific | United States | California | Drift gillnets
Eastern Central Pacific | United States | California | Set gillnets

Low Concern

The Eastern North Pacific gray whale population has been estimated to be about 26,960 individuals, based on a 2015–16 survey. This species does not have a formal status under the Marine Mammal Protection Act (MMPA), is not classified as a strategic stock, and is considered “Least Concern” by

the IUCN. In recent years, the gray whale population has increased in abundance, which suggests favorable feeding conditions and high calf production. Therefore, abundance is a low concern.

Factor 2.2 - Fishing Mortality

Eastern Central Pacific | United States | California | Drift gillnets
Eastern Central Pacific | United States | California | Set gillnets

Low Concern
Observer data found two documented instances—in 2014 and 2018—of California large mesh drift gillnet gear causing the mortality of gray whales, although this is larger mesh than the drift gillnet fishery being assessed here. From 2014 to 2018, mortality and serious injuries due to commercial fisheries was estimated to be 1.1 whales per year, and although it is lower than the calculated PBR of 3.5, it is assumed to be an underestimate because many cases go undetected {NOAA 2020}. But, this value is not attributed solely to the fisheries in this assessment, so a score of low concern is given.

Humpback whale (Megaptera novaeangliae)

Factor 2.1 - Abundance

Eastern Central Pacific | United States | California | Drift gillnets
Eastern Central Pacific | United States | California | Set gillnets

High Concern
The Central America/Southern Mexico-CA-OR-WA stock of humpback whale is a Demographically Independent Population (DIP) delineated from the Central America DPS, is listed as “Endangered” under the ESA, and is considered depleted and strategic under the MMPA. The stock is estimated to have grown around 1.6% annually since 2004, although there is high uncertainty in this estimate. According to the most recent stock assessment, the best estimate for population size for the Central America/Southern Mexico-CA-OR-WA stock is 1,496 whales (CV = 0.171) {Curtis et al. 2022}.

The Mainland Mexico-CA-OR-WA stock of humpback whale is a Demographically Independent Population (DIP) delineated from the Mexico DPS, listed as “Threatened” under the ESA, and is considered depleted and strategic under the MMPA. There is currently no direct estimate of the population trend for this stock. The best estimate for population size for the Mexico-CA-OR-WA stock is 3,477 whales (CV = 0.101) {Curtis et al. 2022}.

Both stocks of humpback whale in the region of this fishery are of concern and have been determined to be endangered or threatened; therefore, abundance of humpback whale is considered a high concern.

Justification:
Humpback whale has been listed as “Endangered” under the ESA since 1970 (Federal Register). In 2016, NOAA fisheries revised the ESA listing to identify 14 Distinct Population Segments (DPS); the whales in California waters are part of the Mexico DPS and the Central America DPS. At this time, four DPS were determined to be “Endangered” (Cape Verde/Northwest Africa, Western North Pacific,

Central America, and Arabian Sea). The Mexico DPS was determined as “Threatened,” while the remaining nine DPSs were determined as “not at risk” (Federal Register). The most recent humpback whale stock assessment report, published in 2023, transitioned the stock delineation to be based on Demographically Independent Populations (DIPs) {NMFS 2023}.

The evaluations of the four North Pacific DPSs resulted in three DIPs and four “units” that may contain multiple DIPs as well as five stocks from these delineations. The Central America-CA-OR-WA DIP, also considered the Central America/Southern Mexico-CA-OR-WA stock, is listed as “Endangered” under the ESA. The Mainland Mexico-CA-OR-WA DIP, or the Mainland Mexico-CA-OR-WA stock, is listed as “Threatened” under the ESA. Genetics and movement data resulted in the delineation of these two DIPs/stocks. The Mexico-North Pacific unit/stock may also contain other DIPs based on movement data, but data are limited so it is considered a separate stock.

Factor 2.2 - Fishing Mortality

Eastern Central Pacific | United States | California | Drift gillnets
Eastern Central Pacific | United States | California | Set gillnets

High Concern

There were six cases of humpback whale mortality and serious injury documented in California, Oregon, and Washington commercial fisheries from 2016 to 2020 due to gillnet fishery gear, although this is not attributed directly to this fishery (Caretta et al. 2023). There were also 58 cases attributed to unidentified fishery interactions with whales identified as humpback, and an additional 7 cases of unidentified fishery interactions with unidentified whales prorated to humpback. This sums to 71 cases of mortality and serious injury from 2016 to 2020 potentially caused by this fishery, or an average of 14.2 whales per year.

Although this risk of 14.2 whales per year does not exceed the calculated annual PBR (43) of the Mainland Mexico-CA-OR-WA stock, it greatly exceeds the Central America/Southern Mexico-CA-OR-WA stock’s annual PBR (3.5). There is some uncertainty regarding which stock each case identified above is associated with; however, the 2022 U.S. Pacific Marine Mammal Stock Assessment prorated the impact of fisheries across the different DPIs based on point estimates of summer and winter movements. As a result, the annual estimated mortality and serious injury rate (2016–20) from fisheries to the Central America/Southern Mexico-CA-OR-WA DPI is 8.1 per year, still exceeding the PBR for this stock (Caretta et al. 2023).

Mortalities from 2016 to 2020 increased compared to the previous 5-year period (2012–16), suggesting that total fishery impacts on humpback whale are increasing (Carretta et al. 2019) Carretta et al. 2023}. Because this fishery’s contribution is unknown and PBR is being exceeded for one of the stocks present in this fishery’s range, fishing mortality is considered a high concern in the set and drift gillnet fisheries.

Justification:

None of the human-related humpback whale interactions that occurred from 2016 to 2020 were associated directly with this gillnet fishery. Many of the fishery-related interactions could not be traced to a specific fishery and were categorized as unidentified {Carretta et al. 2023}. The most conservative approach to assessing fishery impacts would consider that all unidentified interactions resulted from

this gillnet fishery.

Observer coverage for the fisheries identified in the stock assessment ranges from 6% to 71% (Carretta et al. 2022). But numerous fisheries, including the pot/trap fisheries that account for the greatest number of documented mortalities and interactions, have no observer coverage and rely on strandings or sightings for data (Carretta et al. 2022). Threats to humpback whale are entanglement in fishing gear (mainly trap/pot gear, with a smaller amount of gillnet gear), ship strikes, harassment, habitat impacts, and harvest. Humpback whale is considered a high conservation concern.

Shortfin mako shark (Isurus oxyrinchus)

Factor 2.1 - Abundance

Eastern Central Pacific | United States | California | Drift gillnets
Eastern Central Pacific | United States | California | Set gillnets

Low Concern

Shortfin mako shark is listed as “Endangered” by the IUCN and is noted as having a decreasing population trend in 2019 {IUCN 2019}. In 2022, it was determined to not be listed under the ESA. This stock was recently assessed in 2018 and was determined to not be overfished or undergoing overfishing. According to the stock assessment, the estimated biomass of 860,200 mature females is greater than the calculated B_{MSY} of 633,700 mature females. Observer data show that shortfin mako shark is regularly part of the catch in the set gillnet fishery in California (and the same is assumed for the drift gillnet fisheries under assessment, based on similar mesh sizes), therefore warranting a score of low concern.

Factor 2.2 - Fishing Mortality

Eastern Central Pacific | United States | California | Drift gillnets
Eastern Central Pacific | United States | California | Set gillnets

Low Concern

Observer data show that shortfin mako shark is regularly part of the catch in the set gillnet fishery in California, although in relatively small numbers (and the same is assumed for the drift gillnet fisheries under assessment, based on similar mesh sizes). Many of those caught were kept and landed. The most recent stock assessment in 2018 estimated the fishing mortality to be 0.16, which is less than the F_{MSY} of 0.26. It is likely that this fishery is not a substantial contributor to shortfin mako shark mortality, therefore warranting a score of low concern.

Spiny dogfish (Squalus acanthias)

Factor 2.1 - Abundance

Eastern Central Pacific | United States | California | Set gillnets

Moderate Concern

Spiny dogfish is listed as “Vulnerable” by the IUCN and is noted as having a decreasing population trend in 2020 {IUCN 2020}. This stock was recently assessed in 2021 and was determined to not be overfished or undergoing overfishing. According to the stock assessment, the biomass is estimated at 13,613 thousand pups, compared to a calculated B_{MSY} of 13,029 thousand pups; however, there is uncertainty in using a measure of juveniles rather than reproductive output. Observer data show that spiny dogfish is regularly part of the catch in the set gillnet fishery in California, although in relatively small numbers. Because of the uncertainty surrounding stock estimates, abundance is scored a moderate concern.

Factor 2.2 - Fishing Mortality

Eastern Central Pacific | United States | California | Set gillnets

Low Concern

NOAA observer data from 2007 to 2017 for the set gillnet fisheries in California documented regular catch of spiny dogfish. Although in generally small amounts, a number of those caught were returned dead. The most recent stock assessment in 2021 estimated the fishing mortality to be 0.216, which is less than the F_{MSY} of 0.5. It is likely that this fishery is not a substantial contributor to spiny dogfish mortality, therefore warranting a score of low concern.

White seabass (Atractoscion nobilis)

Factor 2.3 - Discard Rate/Landings

Eastern Central Pacific | United States | California | Drift gillnets

< 100%

The discard to landings ratio for drift gillnets targeting white seabass and California yellowtail have not been estimated (Valero and Waterhouse 2016). The global discard to landings in gillnets is 0.5% (Kelleher 2005). Observer data for California and Oregon drift gillnet fisheries from 2010 to 2021 suggest a discard rate between 25% and 50%, although this is not specific to the California white seabass fishery. The California drift gillnet fishery for swordfish has a discard rate of 66% (Kelleher 2005), but the mesh size is greater than 35.56 cm, whereas the white seabass and California yellowtail fishery has a mesh size of 8.89 to 35.56 cm (CDFW 2020b)(CDFW 2022c). Therefore with no other data, an estimate of the discards to landings ratio is 20% to 40%.

Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines

< 100%

Handlines and hand-operated pole-and-lines fishing is highly selective for the target species. Fishes landed beside the target species generally occur in low numbers (<5% of catch) (Bellman et al. 2012). Bycatch from the white seabass hook and line fishery is assumed to be low, and incidentally caught species are released alive with high post-release survival.

Eastern Central Pacific | United States | California | Set gillnets

< 100%

The discards to landings ratio for gillnet fisheries worldwide is estimated to be an average rate of 10% or a weighted rate of 0.5% (Kelleher 2005). A study of bycatch in small-scale (vessels less than 15 m) set gillnet fisheries in Baja California, Mexico calculated a discards to landings ratio of 34.3% by weight (Shester and Micheli 2011).

NOAA observer data from six years between 2007 and 2017 in California set gillnet fisheries suggest a ratio between 60% and 70%, based on total discards (both returned alive and dead) of all species (including finfish, mammals, birds, and invertebrates) caught in relation to total landings of all species. This likely is not the exact ratio specific to the white seabass set gillnet fishery, because fishery-specific data are limited (Valero and Waterhouse 2016). But observer data specific to this fishery suggest around a 55% discard rate for the most common finfish species. Considering this, it can be estimated that the ratio of bait and discards is likely less than 100% of total landings.

White shark (Carcharodon carcharias)

Factor 2.1 - Abundance

Eastern Central Pacific | United States | California | Drift gillnets
Eastern Central Pacific | United States | California | Set gillnets

High Concern

There is no stock assessment for white shark; therefore, there are no reference points to use to assess the stock status. According to the IUCN, white sharks is listed as “Vulnerable” with a decreasing population trend (IUCN 2023). White shark bycatch is of concern in both gillnet fisheries, but large individuals are rarely caught and there is evidence that the local population is expanding. Because of the lack of recent stock data and the “Vulnerable” IUCN rating, stock status is a high concern.

Justification:

In 2013, the California Fish and Game Commission accepted a petition to list the Northeastern Pacific Ocean population of white shark under the California Endangered Species Act (CESA). In 2014, the Commission found that listing white shark as threatened or endangered under the CESA was not warranted. White shark is listed as “Vulnerable” with a decreasing population trend by the IUCN Red List of threatened species, and has earned a recovery score of moderately depleted and 56% through a new measure developed by the IUCN, a green status assessment (IUCN 2023). White shark was proposed for listing as threatened or endangered under the U.S. Endangered Species Act (ESA), but the status review determined that the population was most likely at a low to very low risk of extinction, so white shark was not listed (NMFS 2013b).

CDFW abundance estimates have been based on two location-dependent studies, the sum of which estimates 339 subadult and adult white shark (Sosa-Nishizaki et al. 2012)(Chapelle et al. 2011); however, one of the studies cautions using this estimate for absolute abundance (Sosa-Nishizaki et al. 2012), and the CDFW determined that this underestimates the population because it does not take

into account individuals that congregate at other areas (CDFW 2014). Burgess et al. (2014) uses a dataset from sampling at the same locations as Chapelle et al. (2011) and is critical of the methodology used. A major criticism was that Chapelle et al. (2011) only sampled subadults and adults {Burgess et al. 2014}. By extrapolating with age-based and size-based frequency data, the total population with all life stages accounted for was estimated at 2,148 to 2,819 white sharks {Burgess et al. 2014}. The first estimate of population trends for white shark in central California indicates that the population is slightly increasing. This estimate is based on subadult and adult estimates of abundance {Kanive et al. 2021}. There are no historic estimates of abundance or population trends as a basis for comparison.

Since 2005, there has been an increase in reported white shark catch in California fisheries, particularly young of the year (YOY), but there has not been an increase in fishing pressure. This suggests that more white sharks are present and that the population is increasing, which could be partly the result of the nearshore gillnet bans in 1994 and the white shark bans (Lowe et al. 2012).

Factor 2.2 - Fishing Mortality

Eastern Central Pacific | United States | California | Drift gillnets
Eastern Central Pacific | United States | California | Set gillnets

Moderate Concern

Fishing mortality is unknown with respect to reference points because none are available for white shark. The Biological Review Team determined that shark bycatch across fisheries in California and Mexico posed a moderate risk to the white shark population (NMFS 2013b). But this fishery's individual contribution is unknown. Therefore, fishing mortality is a moderate concern.

Justification:

It is illegal to retain white shark in federal waters, although this does not preclude it from incidental catch. Under the California Fish and Game Code Section 599, "(a) It is unlawful to take any white shark (*Carcharodon carcharias*) for commercial purposes, except under permits issued pursuant to Section 1002 for scientific or educational purposes or pursuant to subdivision (b) for scientific or live display purposes; (b) Notwithstanding subdivision (a), white sharks may be taken incidentally by commercial fishing operations using set gill nets, drift gill nets, or roundhaul nets. White shark taken pursuant to this subdivision shall not have the pelvic fin severed from the carcass until after the white shark is brought ashore. White shark taken pursuant to this subdivision, if landed alive, may be sold for scientific or live display purposes; (c) Any white shark killed or injured by any person in self-defense may not be landed" (CFGC 1994).

There is some indication that YOY and juvenile white sharks exhibit fairly high post-release survival from gillnet gear, when they are found alive in the gear (about one-third to one-half of the time) (Lowe et al. 2012). The shorter the soak time, the greater the survival rate (Lyons et al. 2013). The majority of white sharks caught in drift and set gillnet gear are YOY and juveniles (Lowe et al. 2012). From 2006 to 2009, there were 56 documented white shark captures in southern California drift and set gillnets, including drift gillnets for swordfish (*Xiphias gladius*) and thresher sharks (*Alopias* spp.) (Lyons et al. 2013). The recent status review of the local white shark population estimated the average annual bycatch from 2001 to 2011 as 28 individuals, with 16 mortalities per year (NMFS 2013b). Although the above studies suggest low fishing mortality due to a relative low catch rate of white shark and good

post-release survival from incidental catch, recent tagging data indicate that the main source of mortality in white shark in the northeast Pacific is bycatch (Benson et al. 2018). Also, there is little information on bycatch of white shark in Mexico waters, though managers consider the ecological impact of fisheries to white shark within a high-risk category {Castillo-Genes and Tovar-Avila 2016}. The amount of mortality that the population can withstand is unknown.

Factor 2.3 - Discard Rate/Landings

Eastern Central Pacific | United States | California | Drift gillnets

< 100%

The discard to landings ratio for drift gillnets targeting white seabass and California yellowtail have not been estimated (Valero and Waterhouse 2016). The global discard to landings in gillnets is 0.5% (Kelleher 2005). Observer data for California and Oregon drift gillnet fisheries from 2010 to 2021 suggest a discard rate between 25% and 50%, although this is not specific to the California white seabass fishery. The California drift gillnet fishery for swordfish has a discard rate of 66% (Kelleher 2005), but the mesh size is greater than 35.56 cm, whereas the white seabass and California yellowtail fishery has a mesh size of 8.89 to 35.56 cm (CDFW 2020b)(CDFW 2022c). Therefore with no other data, an estimate of the discards to landings ratio is 20% to 40%.

Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines

< 100%

Handlines and hand-operated pole-and-lines fishing is highly selective for the target species. Fishes landed beside the target species generally occur in low numbers (<5% of catch) (Bellman et al. 2012). Bycatch from the white seabass hook and line fishery is assumed to be low, and incidentally caught species are released alive with high post-release survival.

Eastern Central Pacific | United States | California | Set gillnets

< 100%

The discards to landings ratio for gillnet fisheries worldwide is estimated to be an average rate of 10% or a weighted rate of 0.5% (Kelleher 2005). A study of bycatch in small-scale (vessels less than 15 m) set gillnet fisheries in Baja California, Mexico calculated a discards to landings ratio of 34.3% by weight (Shester and Micheli 2011).

NOAA observer data from six years between 2007 and 2017 in California set gillnet fisheries suggest a ratio between 60% and 70%, based on total discards (both returned alive and dead) of all species (including finfish, mammals, birds, and invertebrates) caught in relation to total landings of all species. This likely is not the exact ratio specific to the white seabass set gillnet fishery, because fishery-specific data are limited (Valero and Waterhouse 2016). But observer data specific to this fishery suggest around a 55% discard rate for the most common finfish species. Considering this, it can be estimated that the ratio of bait and discards is likely less than 100% of total landings.

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 LowConcern) — Meets the standards of 'highly effective' for all five factors considered.*
- *4 (LowConcern) — 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
Eastern Central Pacific | United States | California | Drift gillnets	Moderately Effective	Moderately Effective	Ineffective	Moderately Effective	Moderately Effective	**Red (2.000)**
Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines	Moderately Effective	Highly effective	Moderately Effective	Highly effective	Moderately Effective	**Yellow (3.000)**

Eastern Central Pacific | United States | California | Set gillnets	Moderately Effective	Moderately Effective	Ineffective	Moderately Effective	Moderately Effective	**Red (2.000)**

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

Eastern Central Pacific | United States | California | Drift gillnets
Eastern Central Pacific | United States | California | Set gillnets

Moderately Effective

White seabass (*Atractoscion nobilis*) is caught using set and drift gillnet gear in U.S. state and federal waters. As noted in this report, California yellowtail and giant sea bass (incidental) are also retained as part of this multispecies fishery. This fishery is mostly concentrated in southern California between Point Conception and the United States–Mexico border, but also has a component in the Monterey Bay. Other species that are not targeted, but sometimes retained, include common thresher shark, California flounder, and shortfin mako shark.

There is a Fishery Management Plan and recent stock assessment for white seabass, although there is neither for California yellowtail or giant sea bass. Shortfin mako shark and thresher shark are managed under the NOAA Fisheries Fishery Management Plan for U.S. West Coast Fisheries for Highly Migratory Species. California flounder is a state-managed finfish species, and fishery-specific laws and regulations have included minimum size limits, bag limits, gear restrictions, seasonal closures, area closures, and permit requirements {CDFW 2024c}. There are spatial and temporal restrictions for both set and drift gillnet gear in this fishery, as well as catch limits for all the retained species. More than 70% of the fishery's main targeted and retained species have management and implementation measures in place that are expected to be effective, with no evidence of systematic noncompliance, so the management strategy of both the drift and set gillnet fisheries is considered moderately effective.

Justification:

Gillnets are prohibited in waters less than 110 m (60 fm) and within state waters from Point Arguello to the Mexican border (3 nautical miles off the mainland and 1 nautical mile off islands) (California Code of Regulations 2022)(FGC §8610.2). Minimum mesh size restrictions are 15.24 cm (6 in) to fish white seabass and 8.89 cm (3.5 in) to fish California yellowtail (FGC §8623). White seabass can be taken in gillnets with mesh size 3.5–6 in from June 16 to March 14 if the number of white seabass does not compose more than 20% of the load (FGC §8623){CDFW 2021}. The white seabass fishery is closed from March 15 through June 15 south of Point Conception to protect spawning schools {CDFW 2021}. The yellowtail fishery is closed from May 1 to August 31, and no more than 0.227 MT (500 lb) of California yellowtail may be landed per person, to a maximum of 1.134 mt (2,500 lb) for any vessels with five or more persons {CDFW 2021}.

A minimum size limit of 71.12 cm (28 in) is in place for both species. Giant sea bass is caught incidentally in gillnet fisheries. The 1994 gillnet closure in Southern California significantly reduced bycatch of giant sea bass by moving fleets away from the majority of its habitat (CDFG 2010b). One giant sea bass per vessel may be taken as incidental catch. This restriction does not apply to giant sea bass landed in Mexican waters. Up to 1,000 lb of giant sea bass per trip and 3,000 lb per vessel per calendar year may be retained if it is landed from Mexican waters {CDFW 2021}.

Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines

Moderately Effective

The white seabass fishery management plan is reviewed annually, but no management changes have been implemented since it was approved in 2002. A stock assessment was completed in 2016 (CDFW 2021a). There is no stock assessment for California yellowtail. The white seabass fishery is closed from March 15 through June 15 to protect spawning schools (CDFW 2021b). The yellowtail fishery is closed from May 1 to August 31, and no more than 0.227 mt (500 lb) of California yellowtail may be landed per person, to a maximum of 1.134 mt (2,500 lb) for any vessels with five or more persons (CDFW 2021b). A minimum size limit of 71.12 cm (28 in) is in place for both species. There are management measures that are expected to be effective, instruments for implementation are in place, and best management practices for species of concern are believed to be effective for the hook and line fishery. Therefore, the management strategy of the hook and line fishery is considered moderately effective.

Factor 3.2 - Bycatch Strategy

Eastern Central Pacific | United States | California | Drift gillnets
Eastern Central Pacific | United States | California | Set gillnets

Moderately Effective

The set and drift gillnet fisheries have measures in place to reduce bycatch of species of concern as discussed in the Justification; however, at this time, not enough information on bycatch is available to know the effectiveness of some of these measures. There are also concerns regarding the potential for ghost fishing with this gear type and the lack of an incidental take permit for endangered or threatened species. Therefore, the bycatch management strategy of white seabass and California yellowtail set gillnets is considered moderately effective.

Justification:

Gillnets are prohibited in waters less than 110 m (60 fm), which includes state waters (0 to 3 nm) and effectively reduces bycatch of shallower-living animals, including sea otter and seabird (California Code of Regulations 2022)(CalCOFI 2013). Minimum mesh size restrictions can range from 3-½ inches (8.89 cm) to 6 inches (15.24 cm) to fish white seabass and California yellowtail, depending on the time of the year {CDFW 2021}. California flounder bycatch has a minimum size of 55.9 cm (22 in) (CalCOFI 2012), and the most recent stock assessment says that the stock is depleted to 14% of the unfished biomass but is not experiencing overfishing {CDFG 2011b}. There is a concern for white shark bycatch in gillnets, particularly in the set gillnet fishery; the nets in the white seabass and California yellowtail fisheries are size-selective, so large individuals are rarely caught, and young of the year and juvenile sharks have been shown to have a high post-release survival rate, especially if released alive after a short soak time (Lyons et al. 2013)(Lowe et al. 2012). The gillnet depth restrictions eliminated bycatch of sea otter, while humpback whale bycatch is also of concern, particularly with gear entanglement and the potential for ghost fishing to occur.

There is no applicable take reduction plan in the fishery (NOAA 2017). Until recently, the impacts of gillnet fisheries in the region to humpback whale were considered to be below the PBR; however, the July 2023 delineation of the Central America/Southern Mexico-CA-OR-WA DIP identifies that there is a risk that PBR is being exceeded. Actions to adjust to the new categorization of California gillnet fisheries and fully investigate and mitigate the impacts on the marine mammals may take several years. Because of the relative recency of the determination of PBR of humpback whale being exceeded by unidentified fisheries in California, we have not expected management measures to be implemented at this time; however, future assessments will consider whether mitigation measures have been developed and implemented.

Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines

Highly effective

Handlines and hand-operated pole-and-lines fishing are highly selective for the target species. Fishes landed beside the target generally occur in low numbers (<5% of catch) (Bellman et al. 2012). Bycatch from the white seabass hook and line fishery is assumed to be low, and incidentally caught species are released alive with high post-release survival. California flounder is targeted by commercial hook and line fishers in Monterey Bay, but is not considered bycatch because it has its own fishery. Refer to the California flounder Seafood Watch Report for more information. Because this fishery has very low bycatch (<5%) with live release of nontarget species, and with no bycatch of species of concern, the bycatch strategy for hook and lines is considered highly effective.

Factor 3.3 - Scientific Data Collection and Analysis

Eastern Central Pacific | United States | California | Drift gillnets
Eastern Central Pacific | United States | California | Set gillnets

Ineffective

The first stock assessment for white seabass was completed in 2016 (Valero and Waterhouse 2016). There is no stock assessment or fishery management plan for California yellowtail or giant sea bass, and bycatch and ghost fishing monitoring is insufficient, given the potential impacts of this fishery. Although there has been periodic observer coverage over the past two decades, observer coverage rates are significantly lower than the suggested rates to sufficiently monitor bycatch (Carretta et al. 2019)(Curtis and Carretta 2020). CDFW does use logbook data to analyze trends for these species and to monitor interactions with other species, but the data are limited (CDFG 2001). Therefore, scientific research and monitoring for the bottom and drift gillnet fisheries is considered ineffective.

Justification:

The first stock assessment for white seabass was published in 2016. The stock assessment utilizes data through 2013, so it is not considered up-to-date for this assessment (Valero and Waterhouse 2016).

The CPFV logbook data have been used in the past to determine that the yellowtail stock size had

declined from historic levels and that the age structure of the stock has shifted to younger fish (Crooke 1983)(CDFG 2001). In 2010, 12.5% of set gillnets from both the California flounder and the white seabass fishery were observed, with 8.0% observed in 2011 and 5.5% observed in 2012. There was also observer coverage in 2013 and 2017. For the small net mesh fishery targeting white seabass and California yellowtail, observations from 2010 to 2012 were 0.7%, 3.3%, and 4.6%, respectively {Caretta et al. 2019}. These observer coverage rates are not considered adequate to detect and estimate all rare event bycatch, particularly species of concern, although the suggested coverage rate to do so is unknown due to differences in species, gear interactions, and observer effects on behavior (Curtis and Carretta 2020).

Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines

Moderately Effective

The first stock assessment for white seabass was published in 2016; however, the stock assessment uses data through 2013, so it is not considered up-to-date based on the Seafood Watch standard (Valero and Waterhouse 2016). There is no stock assessment or fishery management plan for California yellowtail and there is no federal observer coverage currently (NMFS 2011), although bycatch and ghost fishing concerns in this fishery are minimal and management generally relies on techniques that require minimal monitoring, such as protected or restricted areas. CDFW does use logbook data to analyze trends for these species and to monitor interactions with other species, but the data are limited (CDFG 2001). Therefore, scientific research and monitoring in the handlines and hand-operated pole-and-lines fishery is considered moderately effective.

Factor 3.4 - Enforcement of and Compliance with Management Regulations

Eastern Central Pacific | United States | California | Drift gillnets
Eastern Central Pacific | United States | California | Set gillnets

Moderately Effective

CDFW officers patrol and enforce fishing regulations, including in areas where gillnets are prohibited. Also, dockside sampling does occur and logbooks are required in gillnet fisheries (see Factor 3.3). There have been documented instances of noncompliance with this gear type using a mesh size beyond what is allowed (e.g., halibut gillnet fishery), although these are not attributed to this fishery and are considered to be rare and potentially due to reporting errors (CFGC 2022). There is periodic federal observer coverage in the set gillnet fishery to document the incidental capture of federally protected marine mammals and sea turtles. Although enforcement measures are in place to support management goals, there is uncertainty surrounding the effectiveness and coverage of the spatial management measures. Therefore, enforcement for the gillnet fisheries is considered moderately effective.

Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines

Highly effective

CDFW officers patrol and enforce regulations. Dockside fishery-dependent monitoring is conducted by CDFW staff within the State Managed Marine Finfish Program (CDFW 2022). Enforcement receives a highly effective rating.

Factor 3.5 - Stakeholder Inclusion

Eastern Central Pacific | United States | California | Drift gillnets
Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines
Eastern Central Pacific | United States | California | Set gillnets

Moderately Effective

CDFW develops notices of preparation (NOP) for environmental documents they are preparing, to inform interested individuals and organizations if they would like to submit comments to the documents (CDFG 2002). Also, CDFW conducted three public meetings with a panel of scientists chosen to advise CDFW on the white seabass fishery management plan preparation (CDFG 2002). The White Seabass Scientific and Constituent Advisory Panel (WSSCAP) also meets annually to review the FMP annual reports (CDFW 2015). CDFW and the California Fish and Game Commission invite stakeholders to participate in these meetings; however, these annual meetings are limited to a subset of six points of concern that may be addressed. Therefore, it is unclear if all user conflicts are addressed effectively and if there are ample opportunities for all user groups to participate in this process. No recent environmental documents have been prepared for California yellowtail, and these annual meetings have resulted in few changes in recent years. Thus, the level of stakeholder inclusion in the management of this fishery is considered moderately 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
Eastern Central Pacific | United States | California | Drift gillnets	Score: 5	Score: 0	Moderate Concern		**Green (3.873)**
Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines	Score: 4	Score: 0	Moderate Concern		**Green (3.464)**
Eastern Central Pacific | United States | California | Set gillnets	Score: 3	+.5	Moderate Concern		**Green (3.240)**

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

Eastern Central Pacific | United States | California | Drift gillnets

Score: 5

Drift gillnets do not contact the bottom during fishing; therefore, they have no impact on the seafloor (Chuenpagdee et al. 2003).

Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines

Score: 4

Handlines and hand-operated pole-and-lines present a vertical line in the water that has minimal impact on the seafloor (Chuenpagdee et al. 2003). This results in a very low conservation concern, which is rated 4 on the Seafood Watch Standard.

Eastern Central Pacific | United States | California | Set gillnets

Score: 3

Set gillnets for white seabass are operated solely south of Point Conception (CalCOFI 2013), and likely over soft sediment with minimal boulder or reef (Love 1996). The set gillnet fishery receives a score of 3.

Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts

Eastern Central Pacific | United States | California | Drift gillnets

Score: 0

This is not applicable because the gear is benign and the fishery received a score of 5 for Factor 4.1.

Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines

Score: 0

Commercial handlines and hand-operated pole-and-lines fishing for white seabass can be conducted by any fisher with a commercial fishing license. There are no specific area restrictions for hook-and-line gear except those areas where no fishing is allowed (e.g., state marine reserves). As a result, there is no effective mitigation of hook and line impacts.

Eastern Central Pacific | United States | California | Set gillnets

+.5

All gillnets were prohibited within 3 nm of mainland south of Point Arguello and 1 nm around the

Channel Island in 1994 (Larese 2009). Gillnets were also banned in waters less than 110 m (60 fm) from Point Reyes south to Point Arguello to protect seabird and sea otter populations in 2002, which effectively ended gillnet fishing north of Point Conception (CalCOFI 2013). Also, the set gillnet fishery has been a limited-entry fishery since 1986; new permits may not be issued and restrictions exist for transferring existing permits (Huppert and Odemar 1986). A network of marine protected areas also covers over 350 square miles south of Point Conception, protecting over 13% of eelgrass and kelp habitats, which juvenile white seabass associate with. Mitigation of gear impacts receives a modifying factor of +0.5, because a substantial proportion of representative habitats are protected from bottom contact and vulnerable habitats are strongly protected.

Factor 4.3 - Ecosystem-based Fisheries Management

Eastern Central Pacific | United States | California | Drift gillnets
Eastern Central Pacific | United States | California | Handlines and hand-operated pole-and-lines
Eastern Central Pacific | United States | California | Set gillnets

Moderate Concern

In the white seabass FMP, CDFW acknowledges the need to better understand the species' ecosystem role and the impact from fishing. CDFW also has stated that the goal is to move away from single-species management and toward multispecies ecosystem-based management. Following the release of the white seabass FMP, the first white seabass stock assessment was conducted by the Center for Advancement of Population Assessment Methodology (CAPAM) and funded by the Pfleger Institute of Environmental Research (PIER). But the assessment acknowledged that it is unknown how varying levels of exploitation would affect the food web (Valero and Waterhouse 2016).

CDFW regularly collects essential fishery information, including length and sex data, to better estimate spawning biomass. Although these efforts are contributing to the goal of an ecosystem-based approach to management, it is unknown if this fishery's spatial management is sufficient to protect ecosystem functioning and account for the ecological role of white seabass. The food web impacts of California yellowtail and giant sea bass are also unknown. Considering the uncertainty of these species' ecosystem roles, food web impacts may be possible. Therefore, ecosystem-based fisheries management is considered a moderate concern.

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Appendix A: 2023 Reassessment

The White Seabass and California Yellowtail report was reassessed in 2023. Stock data, landings, and management information were updated throughout the report, resulting in some scoring changes and overall rating downgrades from Yellow to Red for yellowtail and white seabass caught with set and drift gillnets. Giant sea bass caught with set and drift gillnets remains Red, and yellowtail and white seabass caught using handlines remain Yellow.

Criterion 1

Fishing mortality for giant sea bass has been changed from a high concern to moderate concern, because fishing mortality is unknown. No scoring changes have been made in Criterion 1 for yellowtail or white seabass.

Criterion 2

The following species have been added to Criterion 2 (abundance score/fishing mortality score): spiny dogfish (moderate concern/low concern), common thresher shark (low concern/low concern), gray whale (low concern/low concern), and shortfin mako shark (low concern/low concern). The abundance score for California flounder has been changed from a moderate concern to high concern, because of the lack of recent stock data and its high vulnerability, although fishing mortality remains a moderate concern. The scores for white shark have not changed (high concern/moderate concern). The abundance score for humpback whale remains a high concern, although the fishing mortality score has been changed from a moderate concern to high concern, because the potential biological removal (PBR) is being exceeded for one of the stocks present in this fishery's range, and this fishery's contribution is unknown.

Criterion 3

For set and drift gillnets, the score for research and monitoring has decreased from moderately effective to ineffective, because of limited observer coverage, a lack of bycatch and ghost fishing monitoring, and the lack of recent stock data for the main species in this fishery. Enforcement and Stakeholder Inclusion have both been reduced from highly effective to moderately effective, because of uncertainty surrounding the effectiveness of management measures and their enforcement, and limited opportunities for user groups to meaningfully participate in the process, respectively.

For handlines, stakeholder inclusion has been increased from moderately effective to highly effective, although this does not result in any scoring or rating change for Criterion 3.

Criterion 4

No scoring changes have been made in Criterion 4.