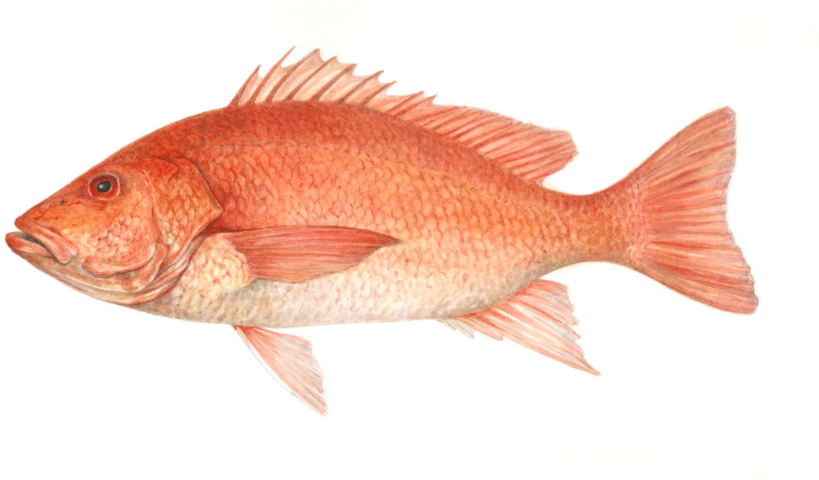
Monterey Bay Aquarium
Seafood Watch

Environmental sustainability assessment of wild-caught Red snapper (*Lutjanus campechanus*) and Yellowtail snapper (*Ocyurus chrysurus*) from Mexico (Gulf of Mexico) caught using deep-set longline, handlines, and hand-operated pole and line.



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Species:	Red snapper (*Lutjanus campechanus*), Yellowtail snapper (*Ocyurus chrysurus*)
Location:	Mexico: Gulf of Mexico
Gear:	Handlines and hand-operated pole and lines, Longline (deep-set)
Type:	Wild Caught
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Assessed using Seafood Watch Fisheries Standard v3

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About the Monterey Bay Aquarium Seafood Watch Program

The mission of the Monterey Bay Aquarium is to inspire conservation of the ocean and enable a future where the ocean flourishes and people thrive in a just and equitable world. To do this, the Aquarium is focused on creating extraordinary experiences that inspire awe and wonder, championing science-based solutions, and connecting people across the planet to protect and restore the ocean. We know that healthy ocean ecosystems are critical to enabling life on Earth to exist, and that our very survival depends on them. As such, our conservation objectives are to mobilize climate action, improve the sustainability of global fisheries and aquaculture, reduce sources of plastic pollution, and restore and protect ocean wildlife and ecosystems.

The aquarium is focused on improving the sustainability of fisheries and aquaculture given the role seafood plays in providing essential nutrition for 3 billion people globally, and in supporting hundreds of millions of livelihoods. Approximately 180 million metric tons of wild and farmed seafood is harvested each year (excluding seaweeds). Unfortunately, not all current harvest practices are sustainable and poorly managed fisheries and aquaculture pose the greatest immediate threat to the health of the ocean and the economic survival and food security of billions of people.

The Seafood Watch program was started 25 years ago as a small exhibit in the Monterey Bay Aquarium highlighting better fishing practices and grew into one of the leading sources of information on seafood sustainability, harnessing the power of consumer choice to mobilize change. The program's comprehensive open-source information and public outreach raises awareness about global sustainability issues, identifies areas for improvement, recognizes and rewards best practices and empowers individuals and businesses to make informed decisions when purchasing seafood.

We define sustainable seafood as seafood from sources, whether fished or farmed, that can maintain or increase production without jeopardizing the structure and function of affected ecosystems, minimize harmful environmental impacts, assure good and fair working conditions, and support livelihoods and economic benefits throughout the entire supply chain. As one aspect of this vision, Seafood Watch has developed trusted, rigorous standards for assessing the environmental impacts of fishing and aquaculture practices worldwide. Built on a solid foundation of science and collaboration, our standards reflect our guiding principles for defining environmental sustainability in seafood.

Seafood Watch Ratings

The Seafood Watch Standard for Fisheries is used to produce assessments for wild-capture fisheries resulting in a Seafood Watch rating of green, yellow, or red. Seafood Watch uses the assessment criteria to determine a final numerical score as well as numerical subscores and colors for each criterion. These scores are translated to a final Seafood Watch color rating according to the methodology described in the table below. The table also describes how Seafood Watch defines each of these categories. The narrative descriptions of each Seafood Watch rating, and the guiding principles listed below, compose the framework on which the criteria are based.

Green	Final Score >3.2, and either criterion 1 or criterion 3 (or both) is green, and no red criteria, and no critical scores	Wild-caught and farm-raised seafood rated green are environmentally sustainable, well managed and caught or farmed in ways that cause little or no harm to habitats or other wildlife. These operations align with all of our guiding principles.
Yellow	Final score >2.2, and no more than one red criterion, and no critical scores, and does not meet the criteria for green (above)	Wild-caught and farm-raised seafood rated yellow cannot be considered fully environmentally sustainable at this time. They align with most of our guiding principles, but there is either one conservation concern needing substantial improvement, or there is significant uncertainty associated with the impacts of the fishery or aquaculture operations.
Red	Final Score ≤2.2, or two or more red criteria, or one or more critical scores.	Wild-caught and farm-raised seafood rated red are caught or farmed in ways that have a high risk of causing significant harm to the environment. They do not align with our guiding principles and are considered environmentally unsustainable due to either a critical conservation concern, or multiple areas where improvement is needed.

Disclaimer: All Seafood Watch fishery assessments are reviewed for accuracy by external experts in ecology, fisheries science, and aquaculture. Scientific review does not constitute an endorsement of the Seafood Watch program or its ratings on the part of the reviewing scientists. Seafood Watch is solely responsible for the conclusions reached in this assessment.

Recommended Citation: Seafood Watch (2025) Environmental sustainability assessment of wild-caught Red snapper (Lutjanus campechanus) and Yellowtail snapper (Ocyurus chrysurus) from Mexico (Gulf of Mexico) caught using deep-set longline, handlines, and hand-operated pole and line. Monterey Bay Aquarium

Guiding Principles

Monterey Bay Aquarium defines sustainable seafood as seafood from sources, whether fished or farmed, that can maintain or increase production without jeopardizing the structure and function of affected ecosystems, minimize harmful environmental impacts, assure good and fair working conditions, and support livelihoods and economic benefits throughout the entire supply chain.

As one aspect of this vision, Seafood Watch has developed trusted, rigorous standards for assessing the environmental impacts of fishing and aquaculture practices worldwide. Environmentally sustainable wild capture fisheries:

1. **Follow the principles of ecosystem-based fisheries management**

   The fishery is managed to ensure the integrity of the entire ecosystem, rather than solely focusing on maintenance of single species stock productivity. To the extent allowed by the current state of the science, ecological interactions affected by the fishery are understood and protected, and the structure and function of the ecosystem is maintained.

2. **Ensure all affected stocks[1] are healthy and abundant**

   Abundance, size, sex, age and genetic structure of the main species affected by the fishery (not limited to target species) is maintained at levels that do not impair recruitment or long-term productivity of the stocks or fulfillment of their role in the ecosystem and food web.

   Abundance of the main species affected by the fishery should be at, above, or fluctuating around levels that allow for the long-term production of maximum sustainable yield. Higher abundances are necessary in the case of forage species, in order to allow the species to fulfill its ecological role.

3. **Fish all affected stocks at sustainable levels**

   Fishing mortality for the main species affected by the fishery should be appropriate given current abundance and inherent resilience to fishing while accounting for scientific uncertainty, management uncertainty, and non-fishery impacts such as habitat degradation.

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[1]"Affected" stocks include all stocks affected by the fishery, no matter whether target or bycatch, or whether they are ultimately retained or discarded.

The cumulative fishing mortality experienced by affected species must be at or below the level that produces maximum sustainable yield for single-species fisheries on typical species that are at target levels.

Fishing mortality may need to be lower than the level that produces maximum sustainable yield in certain cases such as forage species, multispecies fisheries, highly vulnerable species, or fisheries with high uncertainty.

For species that are depleted below target levels, fishing mortality must be at or below a level that allows the species to recover to its target abundance.

4. **Minimize bycatch**

   Seafood Watch defines bycatch as all fisheries-related mortality or injury other than the retained catch. Examples include discards, endangered or threatened species catch, pre-catch mortality and ghost fishing. All discards, including those released alive, are considered bycatch unless there is valid scientific evidence of high post-release survival and there is no documented evidence of negative impacts at the population level.

   The fishery optimizes the utilization of marine and freshwater resources by minimizing post-harvest loss and by efficiently using marine and freshwater resources as bait.

5. **Have no more than a negligible impact on any threatened, endangered or protected species**

   The fishery avoids catch of any threatened, endangered or protected (ETP) species. If any ETP species are inadvertently caught, the fishery ensures and can demonstrate that it has no more than a negligible impact on these populations.

6. **Are managed to sustain the long-term productivity of all affected species**

   Management should be appropriate for the inherent resilience of affected marine and freshwater life and should incorporate data sufficient to assess the affected species and manage fishing mortality to ensure little risk of depletion. Measures should be implemented and enforced to ensure that fishery mortality does not threaten the long term productivity or ecological role of any species in the future.

   The management strategy has a high chance of preventing declines in stock productivity by taking into account the level of uncertainty, other impacts on the stock, and the potential for increased pressure in the future.

   The management strategy effectively prevents negative population impacts on bycatch species, particularly species of concern.

7. **Avoid negative impacts on the structure, function or associated biota of aquatic habitats where fishing occurs**

The fishery does not adversely affect the physical structure of the seafloor or associated biological communities.

If high-impact gears (e.g. trawls, dredges) are used, vulnerable seafloor habitats (e.g. corals, seamounts) are not fished, and potential damage to the seafloor is mitigated through substantial spatial protection, gear modifications and/or other highly effective methods.

8. **Maintain the trophic role of all aquatic life**

   All stocks are maintained at levels that allow them to fulfill their ecological role and to maintain a functioning ecosystem and food web, as informed by the best available science.

9. **Do not result in harmful ecological changes such as reduction of dependent predator populations, trophic cascades, or phase shifts**

   Fishing activities must not result in harmful changes such as depletion of dependent predators, trophic cascades, or phase shifts.

   This may require fishing certain species (e.g., forage species) well below maximum sustainable yield and maintaining populations of these species well above the biomass that produces maximum sustainable yield.

10. **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**

    Any enhancement activities are conducted at levels that do not negatively affect wild stocks by reducing diversity, abundance or genetic integrity.

    Management of fisheries targeting enhanced stocks ensures that there are no negative impacts on the wild stocks, in line with the guiding principles described above, as a result of the fisheries.

    Enhancement activities do not negatively affect the ecosystem through density dependent competition or any other means, as informed by the best available science.

Final Ratings

Ratings Details	C 1 Target Species	C 2 Other Species	C 3 Management	C 4 Habitat	Rating
Red snapper Mexico - Gulf of Mexico - Handlines and hand-operated pole-and-lines - 1,181 mt	2.644	2.644	1.000	2.828	Red (2.109)
Red snapper Gulf of Mexico Stock - Mexico - Gulf of Mexico - Longline (deep-set) - 1,181 mt	2.644	1.000	1.000	2.449	Red (1.595)
Yellowtail snapper Mexico - Gulf of Mexico - Handlines and hand-operated pole-and-lines - 2,068 mt	1.526	2.644	1.000	2.828	Red (1.838)

Summary

This report analyzes the fisheries that target red snapper (*Lutjanus campechanus*) and yellowtail snapper (*Ocyurus chrysurus*) in the Gulf of Mexico. Historically, the red snapper fishery is one of the most important in the economy of the Gulf of Mexico (DOF 2023). A portion of the catch is exported to the United States; thus, the fishery provides significant economic value by generating jobs and foreign currency income for Mexico.

The Campeche Bank has the greatest abundance of red snapper (Ramos-Miranda et al. 2021), followed by the region along the states of Tabasco and Campeche (ibid). Grouper species have historically been the primary target species in the area, along with red snapper (DOF 2023). But yellowtail snapper has recently gained importance as landings have increased significantly in recent years from 25% of the landings in 2022 to > 44% in 2024 (CONAPESCA datos abiertos 2022; CONAPESCA datos abiertos 2024). For the rest of the Gulf of Mexico states, yellowtail snapper is incidentally caught in quite low quantities in Campeche, Tabasco, and Veracruz, where red snapper is the main targeted species (Díaz-Álvarez and Lara-Mendoza 2018) (Caballero-Chávez and Morales-Martínez 2022).

The red snapper stock was most recently assessed by managers in 2023 (DOF 2023), and the assessment concluded that red snapper biomass was below B_{MSY}. In addition, two data-limited and independent evaluations of the species were completed, in which Garcia-Caudillo et al. (2024) and Garcia-Rodriguez et al. (2024) reported that red snapper biomass was around MSY levels, which contradicted the official assessment (Garcia-Caudillo et al. 2024) (Garcia-Rodriguez et al. 2024). We used a productivity-susceptibility analysis (PSA) to finalize the abundance score as a "moderate concern." Because the fishing mortality of red snapper from all sources was uncertain, it was scored a "moderate concern."

Similarly, because of the high level of uncertainty, yellowtail snapper was scored using a combination of a recent evaluation by (Garcia-Caudillo et al. 2024) and a PSA. As a result, abundance was scored a "moderate concern"; however, overfishing has been occurring (Garcia-Caudillo et al. 2024), so fishing mortality was scored a "high concern."

Regarding the impacts on other species, the snapper fishery is considered a multispecies fishery, with several species not considered bycatch but secondary target species or "associated species" within the Mexican legislation. For Criterion 2, the most recent catch composition reports were used to select species that compose at least 5% of the total catch or are recognized as endangered, threatened, or protected (ETP) species. Based on Flores-Guzman et al. (2021), Flores-Guzman (2022), Flores-Guzman (2023), and Rocha-Tejeda & Flores-Guzman (2024), the C2 species assessed for the vertical line fishery were: vermilion snapper (*Rhomboplites aurorubens*), lane snapper (*Lutjanus synagris*), Atlantic sharpnose shark (*Rhizoprionodon terranovae*), and gafftopsail catfish (*Bagre marinus*). For the bottom longlines, the C2 species were: gafftopsail catfish (*Bagre marinus*), vermilion snapper (*Rhomboplites aurorubens*), bonnethead shark (*Sphyrno tiburo*), Atlantic sharpnose shark (*Rhizoprionodon terraenovae*), and coney (*Cephalopholis fulva*). In addition, Atlantic bonito (*Sarda sarda*), which was used as bait, was included for both gears because of its volume

against the total catch. Sea turtles, marine mammals, seabirds, and benthic invertebrates and coral habitats were included, using the Unknown Bycatch Matrix (UBM), because of their susceptibility to the longline gears in the Gulf of Mexico. Overall, the species that drove the scoring for Criterion 2 were sea turtles for the bottom longline fishery, while lane snapper and Atlantic bonito drove the score for the hand-operated lines and handline fisheries.

Concerning management, some specific measures are currently in place to control the impact on the main species (red snapper) and some elasmobranchs. But, considering the status of the target species, management strategy and implementation was deemed "ineffective." Concerning the bycatch strategy, some measures are in place that aim to mitigate the impacts on other species, but the effectiveness of these measures remains uncertain. For this reason, the bycatch strategy is considered "moderately effective." The rest of the factors in Criterion 3 were not assessed as a result of the "ineffective" rating.

Finally, regarding the impact on the habitat and the ecosystem, there is limited contact between the gears and the sandy and muddy bottoms. But snappers play an active role in the energy flow dynamics, and there is no management plan for snappers that considers their balance in the ecosystem and the potential for negative food web impacts; hence, ecosystem-based fisheries management scored a "high concern." The overall SFW rating for red and yellowtail snappers in the Gulf of Mexico is red, because of the status of the target and associated species and the lack of strong and effective management schemes.

Introduction

Scope of the analysis and ensuing rating

This report focuses on two species of snapper: red snapper (*Lutjanus campechanus*) caught along the Gulf of Mexico by hand-operated lines as well as deep-set longlines (Flores-Guzman 2022; DOF 2023) and yellowtail snapper (*Ocyurus chrysurus*) targeted by the artisanal fleet in the state of Yucatán with hand-operated lines (Brule et al. 2008; DOF 2023).

Species Overview

The snapper fishery in the Gulf of Mexico occurs year-round, with the Campeche Bank as the most important zone for this fishery (Monroy et al. 2002). The main fishing grounds are in the west and northwest regions of the bank (Monroy 2010). Red snapper is the most abundant snapper species in the Campeche Bank, with distribution along the coast of the Atlantic Ocean from New England in the United States to the Yucatán Peninsula in Mexico, at depths of 8 to 200 m (Allen, G. 1985). This species is thought to mature between 2 and 5 years of age and can live up to 50 years (Patterson et al. 2001). The International Union for the Conservation of Nature (IUCN) considers red snapper "Vulnerable" (Anderson et al. 2016). In Mexico, managers formerly recognized the fishery (driven by the status of red snapper) as deteriorated in 2012 (DOF 2012). But during the most recent update of the National Fisheries Chart profile, managers reported that biomass of red snapper was within the range of B_{MSY}, but near the limit where it can be considered deteriorated (DOF 2023). The red snapper population in the Gulf and Atlantic comprises three stocks: the U.S. Atlantic, the U.S. Gulf of Mexico, and the Mexican Gulf of Mexico {Anderson, et al. 2016}. This is corroborated by the results of a biophysical model of the Gulf, which showed that red snapper larvae released in the Campeche Bank are primarily retained in the bank (Patterson 2007), and by an otolith chemical study, which suggested little mixing between the populations in U.S. and Mexican waters (ibid).

Yellowtail snapper ranges from the coast of Massachusetts in the United States to Brazil in South America, including Bermuda, the Gulf of Mexico, and the Caribbean {Hill, K. 2005}. Juveniles are commonly found in inshore areas, while adults are found in nearshore and offshore waters {Hill, K. 2005). Yellowtail snapper is typically found at depths between 20 and 70 m (FMNH 2005), but it has been reported at 0 to 165 m (Lindeman et al. 2016). Yellowtail snappers can reach up to 34 inches in total length (TL) (IGFA 2001) and live up to 14 years (Allen, G. 1985). Based on the species' distribution, the status case of yellowtail snapper could be more precise if the U.S. and Mexican fleets target the same populations. But a genetic study suggests that a single, self-recruiting population of yellowtail snapper exists in southern Florida (Cummings 2004).

In Mexico, the Secretariat of Agriculture and Rural Development (SADER, formerly known as SAGARPA) is the government body that promotes policies to improve production practices for the agricultural, livestock, and fisheries sectors. The National Aquaculture and Fishing Commission (CONAPESCA) is the SADER branch in charge of developing and executing management regulations. The technical branch that supports CONAPESCA, known as the

Mexican Institute of Research on Fisheries and Aquaculture (IMIPAS, formerly INAPESCA), provides technical support and management recommendations based on scientific evidence. These government bodies together create, implement, and enforce management strategies for fishing resources in the country.

Production Statistics

Snapper fisheries are among the most important in terms of value and volume in Mexico {Monroy, et al. 2014}. The Mexican Pacific snapper landings (including the Gulf of California) ranged between 4,317 metric tons (MT) and 11,617 MT annually {Monroy, et al. 2014}. In the Gulf of Mexico (GOM), landings averaged 4,125 MT from 2008 to 2012 (DOF 2012). Despite the higher production in the Pacific compared to the GOM, the Gulf production is what reaches the U.S. market (DOF 2012), while the Pacific production remains for domestic consumption because of the high demand for these species in the national market (Monroy et al. 2014).

In the GOM, the states of Yucatán, Veracruz, and Campeche are the most important for the fishery and produced 34.5%, 31%, and 16.5%, respectively, of the total landings of the snapper fishery in the GOM in 2022 (CONAPESCA datos abiertos 2022). Landings of snapper in the GOM are generated directly from logbooks and self-reports delivered to local IMIPAS offices (DOF 2012). Fishers used common names to report their landings, and common names vary even between communities (Ramirez-Rodriguez 2013). During our data analysis, several common species names were found to be inaccurate; for example, species names exclusively distributed in the Pacific Ocean were assigned to landings from the GOM and vice versa (as observed when analyzing the databases). In addition, databases did not specify catch by fleet or gear type, making it challenging to distinguish production by fleet (particularly in Yucatán). Therefore, it was not possible to accurately specify the landing volumes for each species by a particular fishing gear. Nonetheless, based on expert opinions, we used managers' data. We grouped landings into three main categories: huachinango (mostly red snapper), pargo (or snapper) comprised mainly of "other snapper species," and rubia and villajaiba (mostly lane and yellowtail snapper). Thus, it was possible to estimate the landings of these species.

Of the fourteen GOM *Lutjanus* species (Brule et al. 2008), red snapper (*Lutjanus campechanus*) is the most important for commercial fisheries. Snapper production in the GOM averaged above 9,000 MT between 2020 and 2021 (CONAPESCA datos abiertos 2022). In 2024, snapper landings reached more than 6,300 MT, with Campeche, Veracruz, and Yucatán states as the most important (Figure 1).

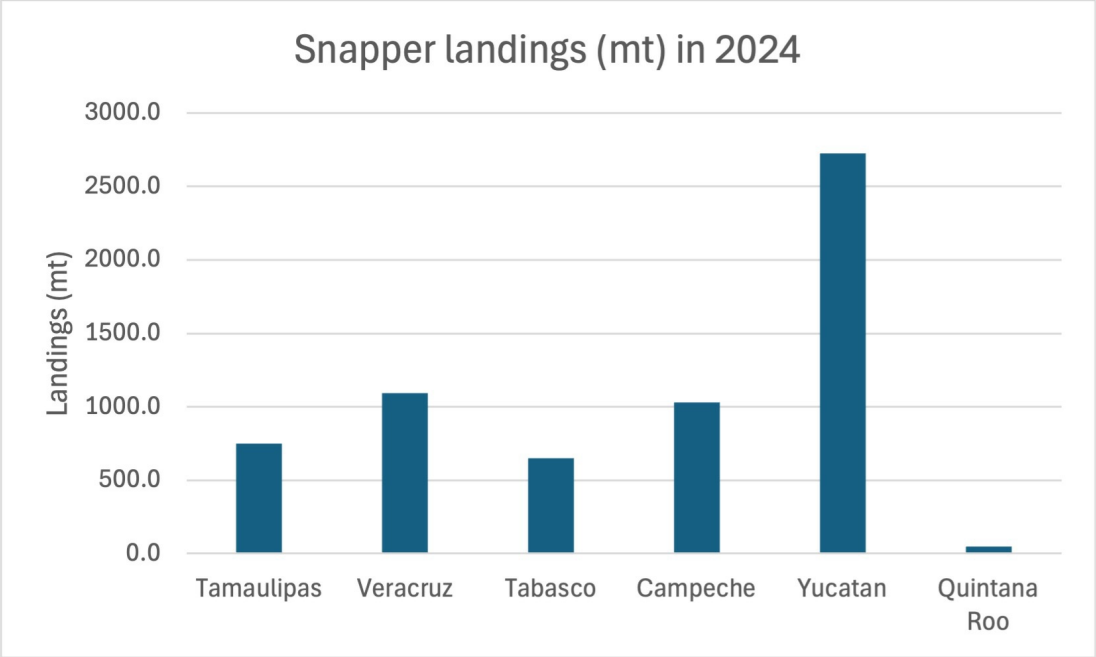


Figure 1: Landings of snapper in the Gulf of Mexico by state in 2024 (CONAPESCA datos abiertos 2024).

Based on landings information, in 2024, red snapper accounted for ≈25% (1,181 MT) of the total snapper landings in the GOM (Figure 2). Of these, ≈554 MT were landed in Yucatán (Figure 3) (CONAPESCA datos abiertos 2024). Meanwhile, yellowtail (villajaiba) accounted for ≈43% of total snapper production in the GOM (≈2,068 MT) (see Figure 2), with almost the entire production (≈1,730 MT) landed in Yucatán (see Figure 3) (CONAPESCA datos abiertos 2024).

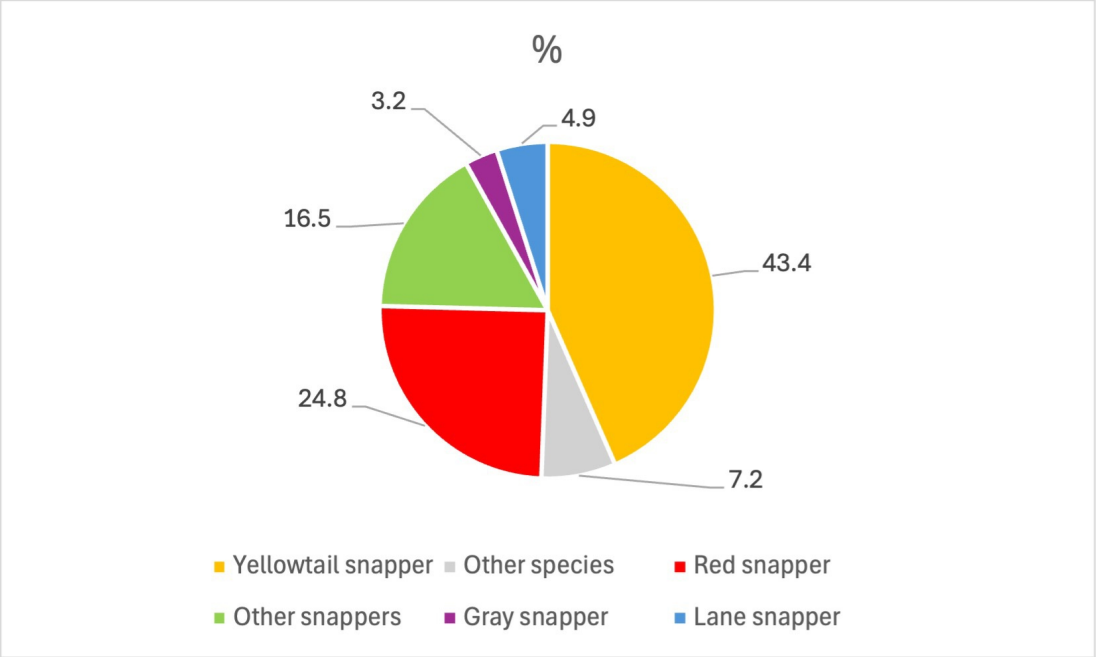


Figure 2: Landing proportions (%) per snapper species in the Gulf of Mexico in 2022 (CONAPESCA datos abiertos 2024).

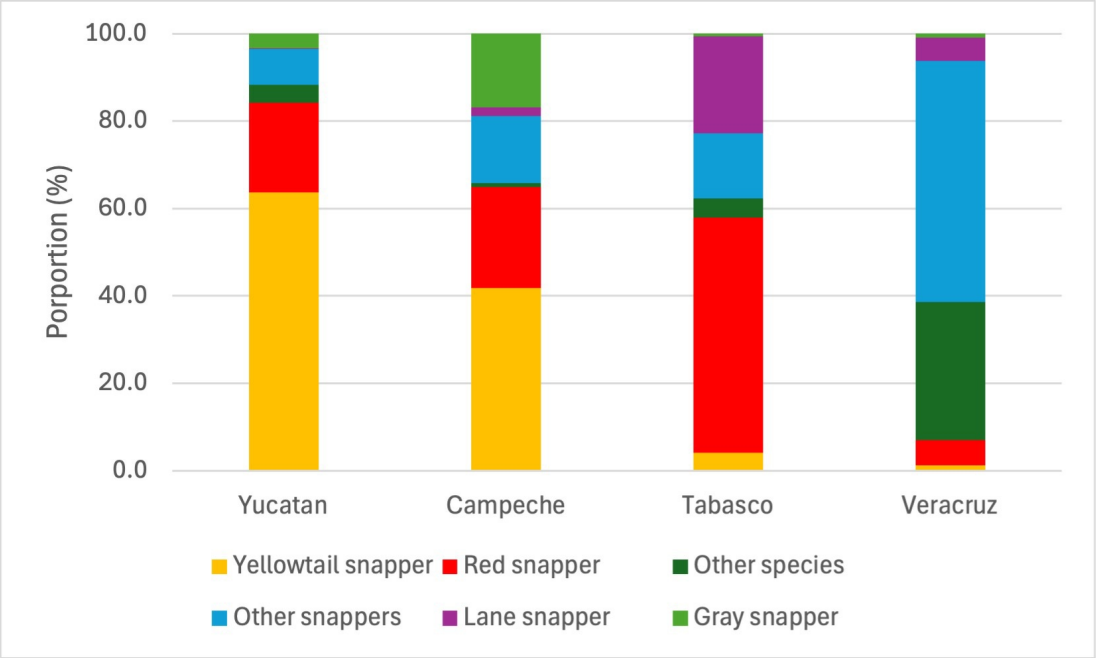


Figure 3: Landing proportions (%) per snapper species within each state in the Gulf of Mexico in 2024 (CONAPESCA datos abiertos 2024)

Importance to the US/North American market

The United States is one of the largest importers of snapper in the world. In 2024, the U.S.

imported more than 20,000 MT of snapper (NOAA 2024). Mexico and Brazil were the leading snapper exporters to the United States, providing 45% of snapper imported into the U.S. in 2024 (Figure 4) (NOAA 2024). The volume by species imported into the United States from Mexico is unclear. According to an exporter in Yucatán, red and yellowtail snappers are the most exported species from the region (Rudy 2018 pers. comm.)

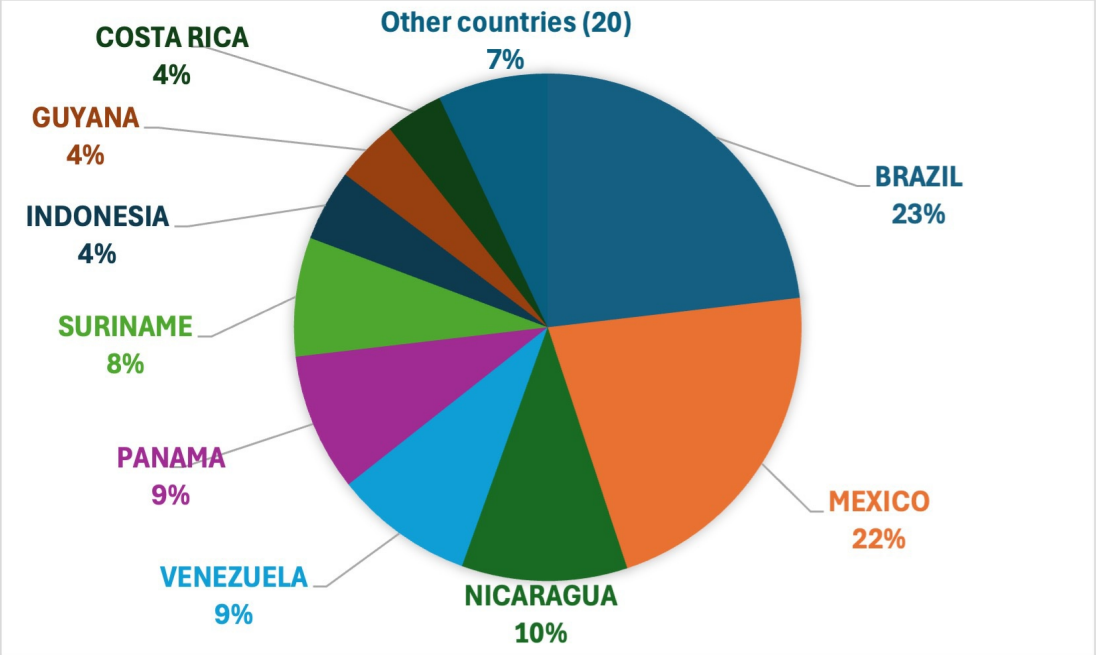


Figure 4: The most important countries exporting snapper to the United States (NOAA 2024).

Common and market names

In the United States, *L. campechanus* is known as snapper or red snapper (FDA 2017) and *O. chrysurus* is known regularly as snapper or yellowtail snapper (ibid). In Mexico, the species are known as huachinango and pargo canane (DOF 2023).

Primary product forms

In 2024, snapper from Mexico was shipped to the United States as either fresh whole fish (≈4,000 MT; 90%) or frozen fillets (≈400 MT; 10%) (NOAA 2024)

Production volume notes

Landings presented were taken from CONAPESCA's open-source data sets (Datos Abiertos).

Summary

The multispecies fishery in the Gulf of Mexico, which primarily harvests with hand-operated lines and deep-set longlines, targets the most important species: red and yellowtail snappers. The hand-operated and deep-set longline fisheries receive a red rating, driven mainly by concerns about the levels of fishing mortality on yellowtail snapper and the lack of adequate

management strategy and implementation, because minimal regulations (e.g., official minimum size or off-season) are in place. Overall, the snapper fisheries are likely to negatively affect the target and retained species and receive a red rating.

Eco-Certification information

A small portion of the snapper fishery is engaged in a Fishery Improvement Project (FIP). Engagement in an FIP does not affect the Seafood Watch score per se, because we base our assessments on the current situation. But data and information generated by the FIP can be used in our assessments.

Assessments

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

Red snapper			
Region / Method	**Abundance**	**Fishing Mortality**	**Score**
Mexico - Gulf of Mexico - Handlines and hand-operated pole-and-lines - 1,181 mt	2.330 Moderate Concern	3.000 Moderate Concern	**Yellow (2.644)**
Gulf of Mexico Stock - Mexico - Gulf of Mexico - Longline (deep-set) - 1,181 mt	2.330 Moderate Concern	3.000 Moderate Concern	**Yellow (2.644)**

Yellowtail snapper			
Region / Method	**Abundance**	**Fishing Mortality**	**Score**
Mexico - Gulf of Mexico - Handlines and hand-operated pole-and-lines - 2,068 mt	2.330 Moderate Concern	1.000 High Concern	**Red (1.526)**

The snapper fishery off the Campeche Bank is a multispecies fishery that targets 13 species of snapper: red snapper (*Lutjanus campechanus*), silk snapper (*L. vivanus*), blackfin snapper (*L. buccanella*), queen snapper (*Etelis oculatus*), yellowtail snapper (*Ocyurus chrysurus*), mutton snapper (*Lutjanus analis*), grey snapper (*L. griseus*), lane snapper (*L. synagris*), vermilion snapper (*Rhomboplites aurorubens*), schoolmaster snapper (*Lutjanus apodus),* southern red snapper (*L. purpureus*), cubera snapper (*L. cyanopterus*), and dog snapper (*L. jocu*) (DOF 2012).

Red snapper (*Lutjanus campechanus*) is the most important species in terms of volume (CONAPESCA datos abiertos 2022). It is targeted and captured using different gears, mostly bicycle gear or vertical and deep-set longlines, which are evaluated for this report. The artisanal fleet mostly targets and harvests yellowtail snapper using hand-operated lines (ibid).

Criterion 1 Assessment

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.*

Red snapper *(Lutjanus campechanus)*

1.1 Abundance

Gulf of Mexico - Handlines and hand-operated pole-and-lines

Gulf of Mexico Stock | Gulf of Mexico - Longline (deep-set)

Moderate Concern

Managers assessed the red snapper stock, and the results were released in the fisheries profile update in the National Fisheries Chart (NFC) of 2023 (DOF 2023). In these updates, managers concluded that:

> "... the biomass of red snapper was very close to the biomass that would generate the Maximum Sustainable Yield and within the levels of a relatively healthy fishery. However, the trend in biomass indicated that it could decrease in the coming years. Due to the above, it is considered that this fishery is exploited to the maximum sustainable extent with a tendency to deteriorate in the future (DOF 2023)."

In 2015, the biomass estimates were close to 0.5 B/B_{MSY} (Figure 5). These results only cover biomass estimates up to 2016, and the methodology used was not discussed in the update (see Figure 5).

Garcia-Caudillo et al. (2024) released a more recent red snapper assessment. The authors used historical landing records (MT/year) and the Catch-MSY method to estimate MSY and B_{MSY} for red snapper in the Gulf of Mexico (GOM) (Garcia-Caudillo et al. 2024). As a result, the authors reported that B_{MSY} for red snapper was 4,964 MT, and the biomass associated with MSY (or the biomass target reference point, B_{TRP}) was 17,554 MT (ibid). Based on their results, the stock biomass has oscillated above the B_{TRP}, although it has a declining trend from 2015 until the most recent year (2019) (Figure 6) (ibid). Using a Kobe plot (Figure 7), the authors concluded that the red snapper stock remained at healthy levels (green quadrant), with a 94.3% probability that the current status (2019) was above the B_{TRP}, with a small probability (4.1%) that the stock was below the B_{TRP} but not overfished (yellow quadrant) (ibid).

Finally, Garcia-Rodriguez et al. (2024) assessed the status of 10 finfish stocks along both coasts of Mexico, including the northern red snapper (*Lutjanus campechanus*), using official landing statistics reported by managers (CONAPESCA) and the CMSY model, to produce estimates of the reference points for stock size (B/B_{MSY}). As a result, the authors reported that the B/B_{MSY} for red snapper was 1.07 in 2019, recovering from low levels in previous years (Figures 8–9) (ibid).

Both Garcia-Caudillo et al. (2024) and Garcia-Rodriguez et al. (2024) developed Kobe

plots and reported that red snapper biomass fluctuates around B/BMSY. But Garcia-Caudillo et al. added that unrecorded fishing data in Mexico are on the order of 40%, which can affect the stock biomass estimates; based on this level of uncertainty, it was essential to focus more on biomass trajectories than specific point estimates. On the other hand, Garcia-Rodriguez et al. also mentioned that one of the significant sources of uncertainty is the data used and the need to incorporate more details regarding the catch structure (in terms of length). Considering that these results provide conclusions that conflict with those provided by managers (DOF 2023), we ran a productivity-susceptibility analysis (PSA) to assess the species' vulnerability, which scored as low (Tables 1–2). Therefore, abundance is considered a "moderate concern" (per line 2b in Table 1.1.1 of the Seafood Watch Standard).

Supplementary Information

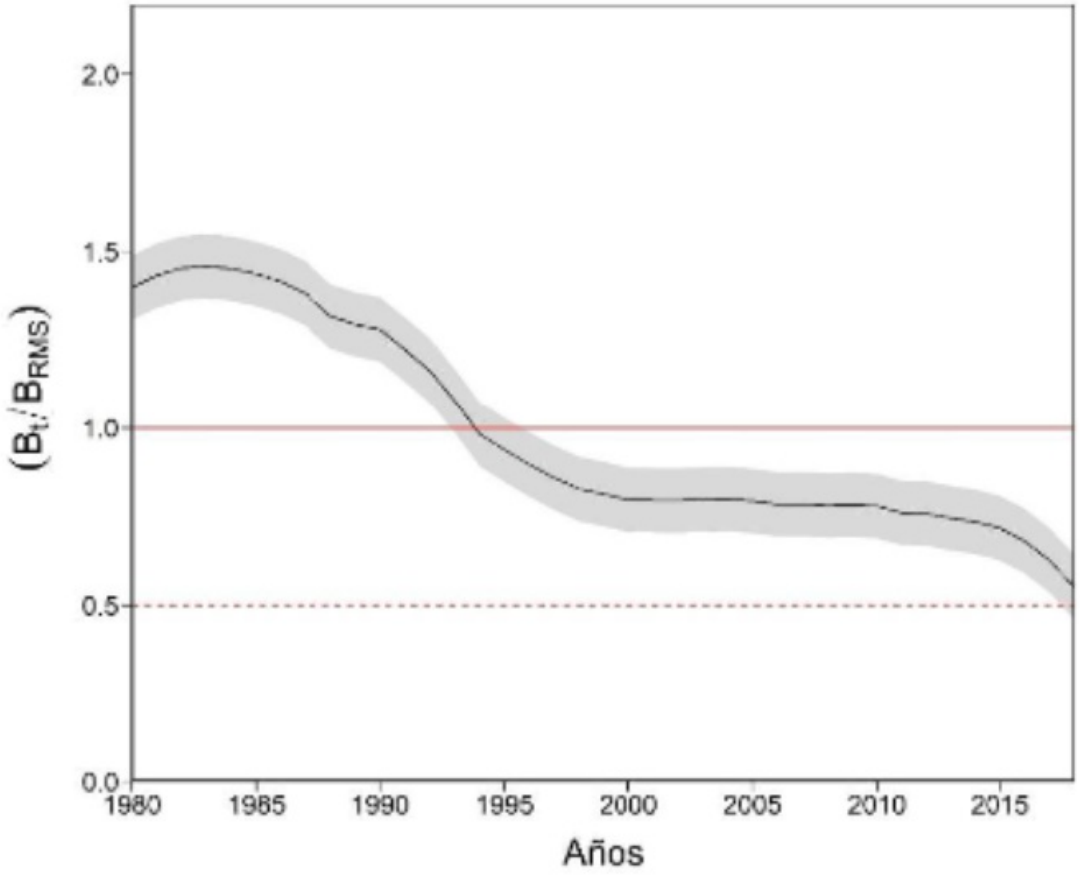


Figure 5: Red snapper biomass estimates between 1980 and 2017 released within the NFC (DOF 2023).

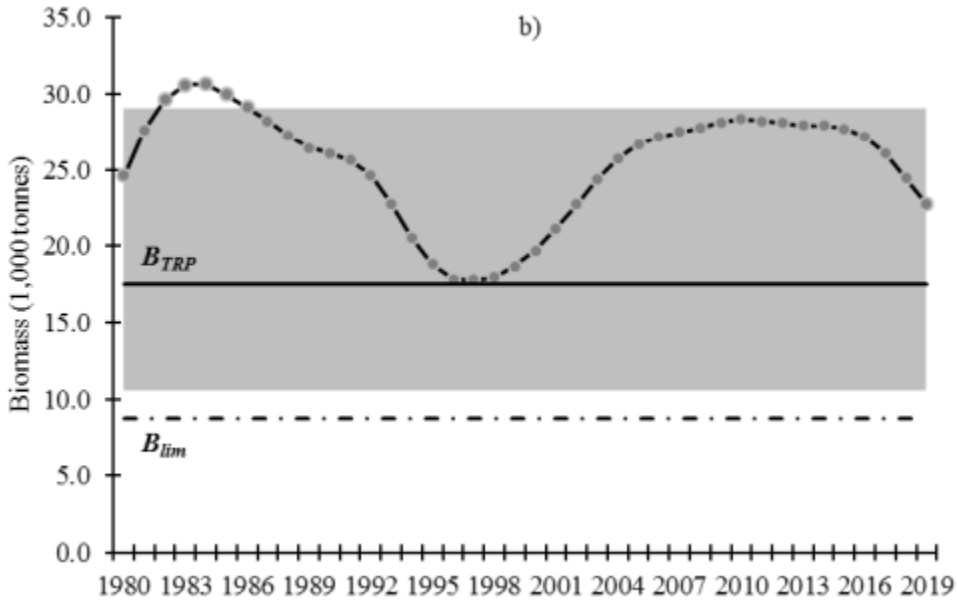


Figure 6: Red snapper biomass trajectory (Garcia-Caudillo et al. 2024).

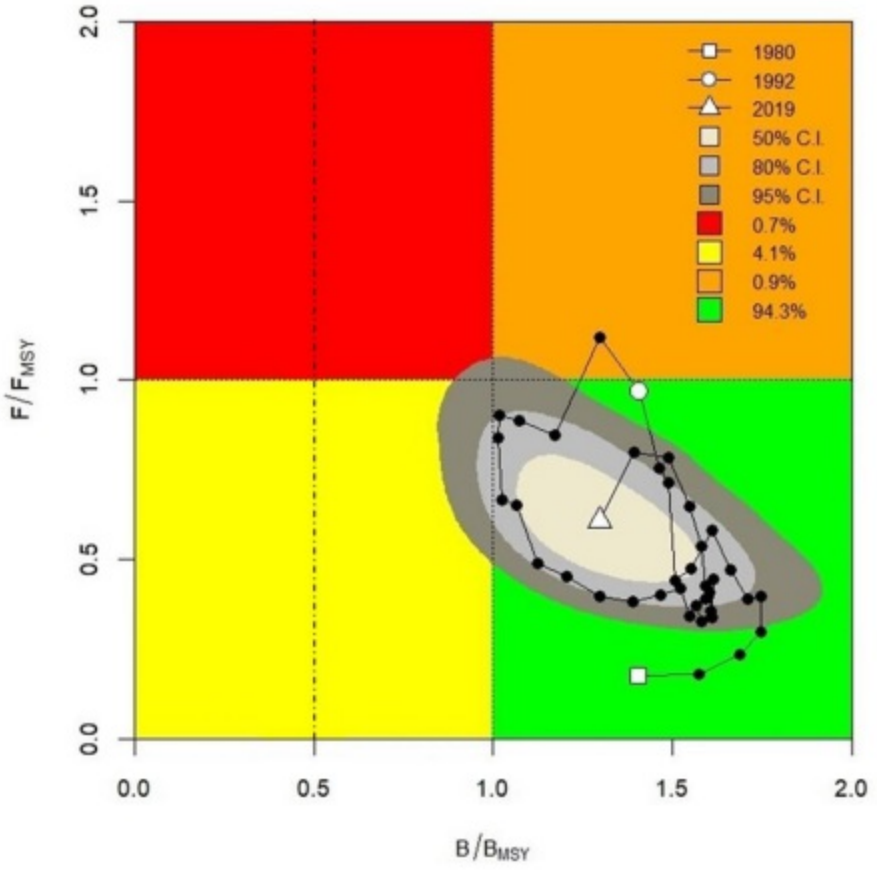


Figure 7: Red snapper Kobe plot (Garcia-Caudillo et al. 2024).

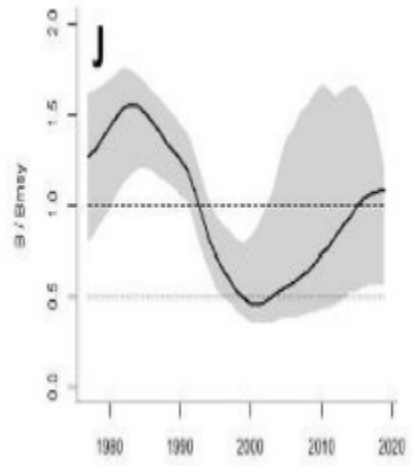


Figure 8: Red snapper biomass trajectory estimated by (Garcia-Rodriguez et al. 2024).

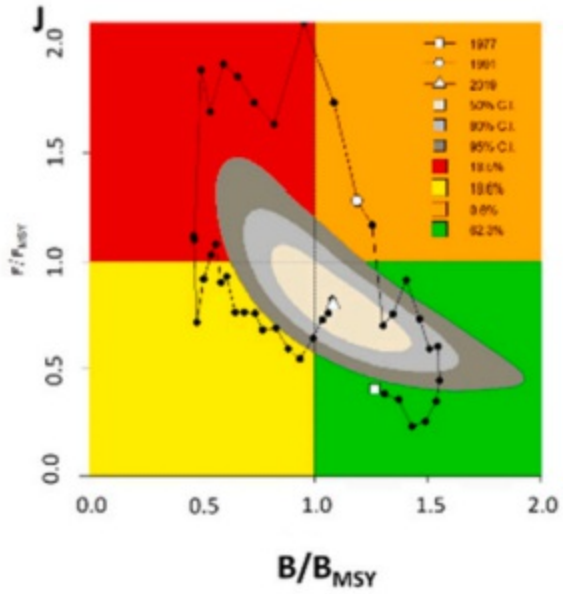


Figure 9: Red snapper Kobe plot estimated by (Garcia-Rodriguez et al. 2024).

Productivity-Susceptibility Analysis for red snapper (*Lutjanus campechanus*):

Table 1

Productivity attribute	High productivity (score = 1)	Medium productivity (score = 2)	Low productivity (score = 3)	Score	Notes/References
Average age at maturity (years)	< 5 years	5–15 years	> 15 years	1	In Alabama, the species reaches its maturity between 2 and 4.5 years of age (Kulaw et al. 2017).
Average maximum age (years)	< 10 years	10–25 years	> 25 years	3	The species can reach up to 57 years old (Allman et al. 2002).
Fecundity	> 20,000	100 to 20,000	< 100	1	Fecundity of females has been reported to range from 9.3 to 59 million eggs (Allen 1985).
Average maximum size	< 100	100–300	> 300	2	The maximum length reported is 104 cm (Wilson and Nieland 2001).
Average size at maturity	< 40	40–200	> 200	1	According to IMIPAS, average size at maturity has been estimated at 34.5 cm of length.
Reproductive strategy	Broadcast spawner	Demersal egg layer or brooder	Live bearer	1	(Fishbase c 2024) (Brulé et al. 2010)
Trophic level	< 2.75	2.75–3.25	> 3.25	3	Trophic level of 3.9 (Fishbase c 2024).
Density dependence	Compensatory dynamics at low population size demonstrated or likely	No depensatory or compensatory dynamics demonstrated or likely	Depensatory dynamics at low population sizes (Allee effects) demonstrated or likely	N/A	

Quality of habitat	Habitat is robust, with no known degradation from nonfishery impacts	Habitat has been moderately altered by nonfishery impacts	Habitat has been substantially compromised from nonfishery impacts		
Productivity score (mean of attribute scores)				**1.71**	

Table 2

Susceptibility attribute (default scores in bold)	**Low (score = 1)**	**Medium (score = 2)**	**High (score = 3)**	**Score**	**Notes/Reference**
Areal overlap (all fisheries)	Vast majority (> 90%) of species concentration (main geographic range) is unfished (considering all fisheries).	Most (70–90%) of species concentration is unfished by any fishery (must have evidence).	> 30% of the species concentration is fished, considering all fisheries.	3	The species distributes throughout the Gulf of Mexico, with fisheries targeting it along all its distribution. The species is fished in > 30% of its concentration.

Vertical overlap (all fisheries)	Low overlap between fishing depths and depth range of species; i.e., most of the species depth range (≥ 66%) is unfished (considering all fisheries). (Must have evidence; unlikely for any "main species.")	Medium overlap between fishing depths of depth range of species, considering all fisheries; i.e., species has considerable portion (≥ 33%) of depth range that is unfished (must have evidence).	High degree of overlap between fishing depths and depth range of species. Default score for target species, as well as any air-breathing animal, or when unknown.	2	The species' depth ranges from 10 to 190 m (Allen 1985). The fishery takes place along the continental shelf of the Gulf of Mexico (DOF 2023), and the gears used might have a medium degree of overlap with the species' depth range.
Seasonal availability	Fisheries overlap with species < 3 months/year (Griffiths et al. 2017) OR Seasonal migrations decrease overlap with the fishery (Patrick et al. 2009).	Fisheries overlap with species 3–6 months/year (Griffiths et al. 2017) OR Seasonal migrations do not substantially affect overlap with the fishery (Patrick et al. 2009).	Fisheries overlap with species > 6 months/year (Griffiths et al. 2017) Default score if unknown OR Seasonal migrations increase overlap with the fishery (Patrick et al. 2009)	3	The snapper fishery occurs all year long. So, it is expected for the fishery to have regular overlap overall with the shark species. For this reason, a score of high is selected.
			Species is targeted or is incidentally encountered AND attributes of the fishery, combined with the species'		

Selectivity of fishery (specific to fishery under assessment)	Species is not targeted AND is not likely to be captured by gear; e.g., average body size at maturity is smaller than mesh size (net fisheries), or species is not attracted to the bait used (line fisheries), or is too large to enter trap (pot/trap fisheries). (If known, < 33% of individuals of this species encountering gear are captured.) Must have evidence.	Species is targeted, or is incidentally encountered AND is not likely to escape the gear, BUT conditions under "high risk" do not apply. Default score when conditions under "high risk" do not apply.	biology or behavior—e.g., migratory bottlenecks, spawning aggregation, site fidelity, unusual attraction to gear, sequential hermaphrodite, semelparity, or segregation by sex—increase its susceptibility to the gear; e.g., net mesh size allows retention of individuals below size at maturation, or fishery targets spawning aggregations or BOFFFFs (Hixon et al. 2014). If effective management measures are in place to mitigate the effect of the behavior or requirement, the behavior and/or	2	The species is targeted by this fishery and it is incidentally captured by other fisheries (e.g., shrimp) BUT conditions under "high risk" do not apply because there are some measures in place that aim to mitigate the impacts (DOF 2022).

			requirement need not be		
Post-capture mortality (specific to fishery under assessment)	Evidence of majority of captured individuals (> 66%) released and survive post-capture.	Evidence of some (33–66%) individuals released and survive post-capture.	Retained species, or majority dead when released, or unknown. Default score for retained species or unknown.	3	Default score is used, considering that this species is retained.
Susceptibility score [(S1 × S2 × S3 × S4 – 1) ÷ 40 + 1]				**1.88**	
Productivity-Susceptibility Score [$V = \sqrt{(P^2 + S^2)}$]				2.54	
Vulnerability Rating: < 2.64 = Low vulnerability; ≥ 2.64 and ≤ 3.18 = Medium vulnerability; > 3.18 = High vulnerability				Low vulnerability	

1.2 Fishing Mortality

Gulf of Mexico - Handlines and hand-operated pole-and-lines

Gulf of Mexico Stock | Gulf of Mexico - Longline (deep-set)

Moderate Concern

Fishing mortality for the snapper fishery has been historically driven by red snapper (DOF 2012) (DOF 2023). Landings peaked in 1993, reaching more than 7,000 MT (DOF 2023) and then started to decline, following a negative trend and stabilizing at around 4,000 MT annually between 2000 and 2015 (Figure 10). The species is targeted by industrial longline, artisanal longline, and handline fishers (DOF 2012). Access to the fishery is controlled through permits and gear restrictions (DOF 2023). Managers recommended reducing fishing efforts, not granting new permits, reducing fleet size, and limiting landings in the Gulf of Mexico to 4,295 MT included in the 2012 fishery profile (DOF 2012). But the most recent versions of the fishery profile do not provide evidence that effort has been reduced, and there is no quota and no off-fishing season has been established for the species.

In 2022, Garcia-Caudillo et al. (2024) calculated the values of fishing mortality for the red snapper fishery between 1980 and 2019. The authors reported that annual fishing mortality throughout most of the time series was below the fishing mortality limit (F_{lim}) value (0.28), reaching a maximum value of 0.31 in 1993 and a value of 0.17 in 2019 (Figure

11) (Garcia-Caudillo et al. 2024). During 2019, landings reached ≈4,600 MT {CONAPESCA 2020} (see Figure 10), above the limit set by managers in 2012 but below the limit of 4,964 MT calculated by Garcia-Caudillo et al. (2024).

In Tabasco, Díaz-Álvarez and Lara-Mendoza (2018) used size-based methods and estimated values for total (Z) and fishing mortality (F). The authors reported that F = 0.83 with an exploitation rate (E) of 0.62 (ibid). The results (applicable to the Tabasco fleet) differ from those estimated by Garcia-Caudillo et al. (2024), who estimated fishing mortality rates using methods based solely on catch data, which will always tend to estimate reference points differently from those based on size. In addition, juvenile red snapper is susceptible to shrimp trawling in the Gulf of Mexico, significantly reducing recruitment (Anderson et al. 2016). It is believed that these interactions might have been reduced thanks to a reduction in the size of the industrial fleet, which switched from 737 vessels to just 256 vessels (from 2004 to 2023) (CONAPESCA 2023), and the mandatory use of bycatch excluding devices (DOF 2013).

Finally, red snapper is a bycatch species in the grouper fishery that could account for up to 8% of the catch (Brule et al. 2008). In 2019, grouper landings reached around 7,000 MT {CONAPESCA 2020}, which could mean that red snapper fishing mortality from the grouper fishery could reach ≈500 MT and surpass the recommended limit suggested by managers in 2012 (4,295 MT) (DOF 2012) and the 2019 limit (4,964 MT) estimated by Garcia-Caudillo et al. (2024).

Based on the available information, fishing mortality from all sources (including commercial, recreational, and subsistence) is uncertain, as is the reference point; for these reasons, fishing mortality is scored a “moderate concern” (per line 2 in table 1.2.1 of the Seafood Watch Standard).

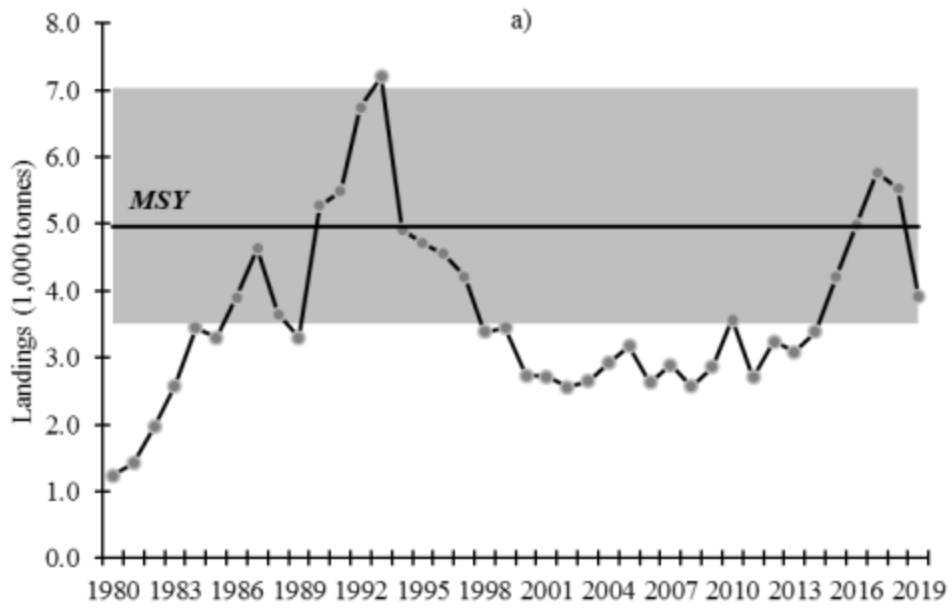


Figure 10: Red snapper landings from 1980 to 2019 (Garcia-Caudillo et al. 2024).

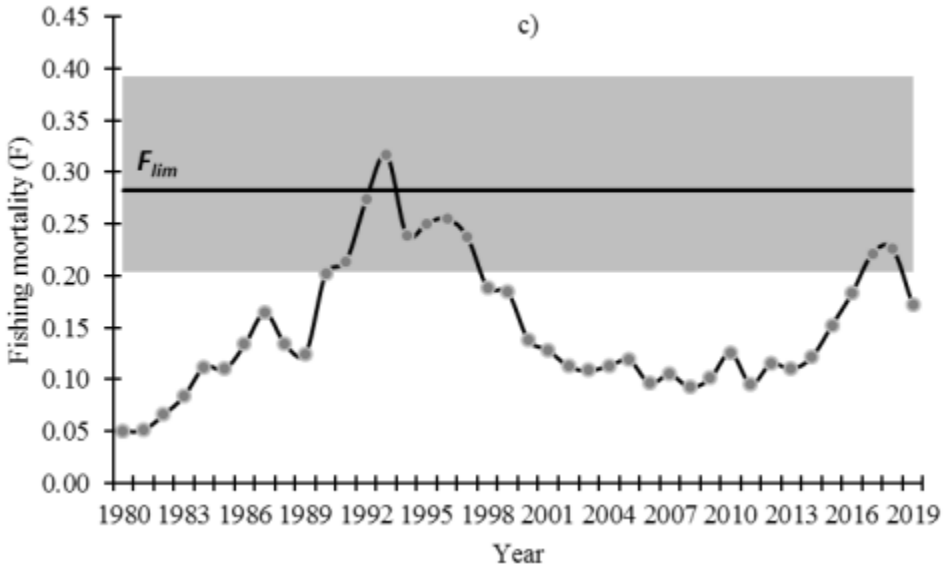


Figure 11: Red snapper fishing mortality, $F_{lim} = F_{MSY}$ (Garcia-Caudillo et al. 2024).

Yellowtail snapper *(Ocyurus chrysurus)*

1.1 Abundance

Gulf of Mexico - Handlines and hand-operated pole-and-lines

Moderate Concern

The assessment developed by Garcia-Caudillo et al. (2024) is the most recent evaluation for yellowtail snapper. The authors used historical landing records (MT/year) in the Catch-MSY model to estimate MSY, B_{MSY}, and F_{MSY} for yellowtail snapper in the Gulf of Mexico (GOM). As a result, the authors estimated yellowtail snapper B_{MSY} at 1,953 MT, and the biomass associated with MSY (or the biomass target reference point, B_{TRP}) at 6,907 MT. Based on their results, the stock biomass has oscillated above B_{MSY} (Figure 12). The authors concluded that the yellowtail snapper stock remained healthy, with 75.5% probability that the current status (2019) was above B_{TRP} (Garcia-Caudillo et al. 2024). But the authors recommended some level of caution in the assessment, considering that the data-poor assessment methodology comes with a significant level of inherent uncertainty (Garcia-Caudillo et al. 2024).

Because the assessment is uncertain, we conducted a PSA as part of the scoring for this species. The PSA results generated a score of 2.54, indicating that the species has a low level of vulnerability (Tables 3–4). Therefore, abundance is considered a "moderate concern" (per line 2b in Table 1.1.1 of the Seafood Watch Standard).

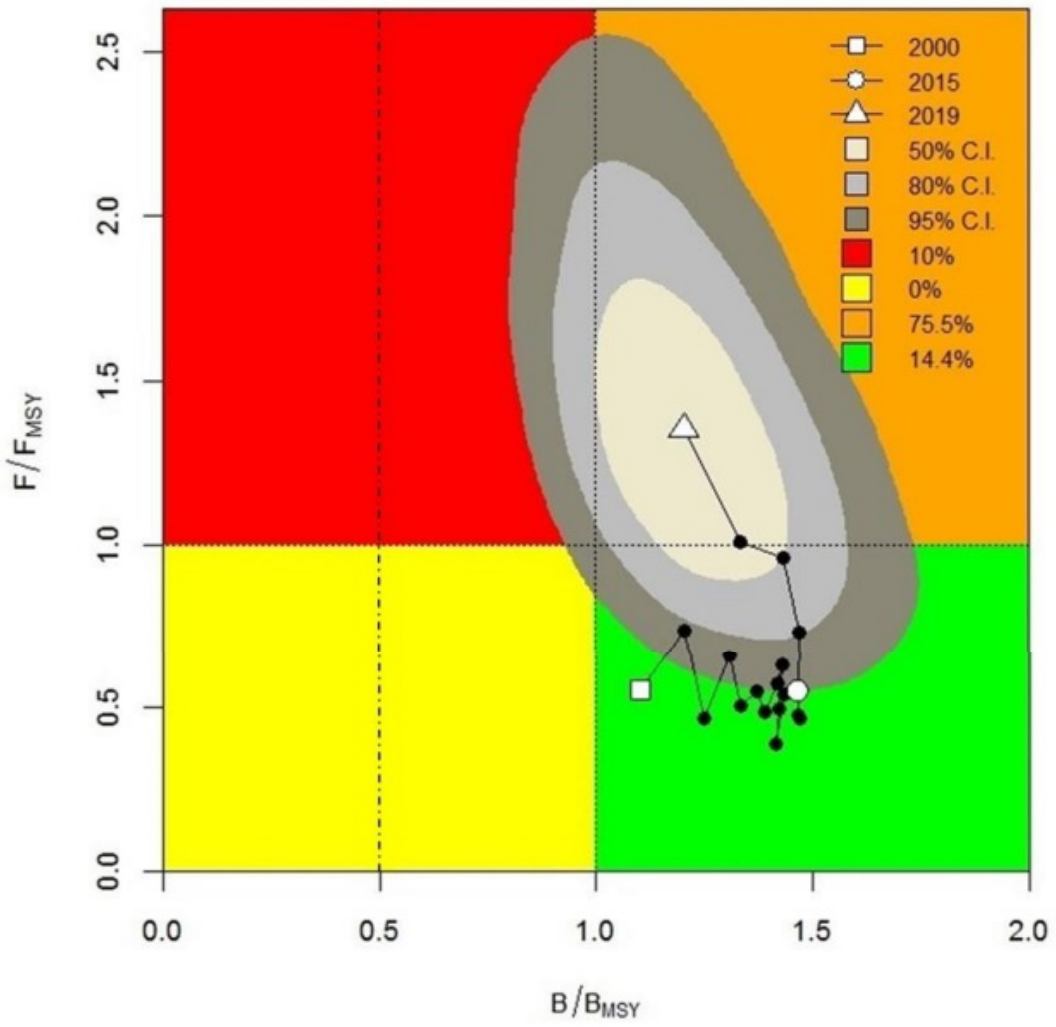


Figure 12: Yellowtail snapper Kobe plot (Garcia-Caudillo et al. 2024).

Productivity-Susceptibility Analysis for yellowtail snapper (*Ocyurus chrysurus*)

Table 3

Productivity attribute	High productivity (score = 1)	Medium productivity (score = 2)	Low productivity (score = 3)	Score	Notes/References
Average age at maturity (years)	< 5 years	5–15 years	> 15 years	1	The species reaches its maturity at 2 years of age (García-Cagide et al. 1994).
Average maximum age (years)	< 10 years	10–25 years	> 25 years	2	The species can reach up to 14 years old around South Florida (Manooch 1987).
Fecundity	> 20,000	100 to 20,000	< 100	1	Ranging from 14,000 to 164,000 (Trejo-Martínez et al. 2011).
Average maximum size	< 100	100–300	> 300	2	The maximum length reported around South Florida was 44.3 cm (Manooch 1987).

Average size at maturity	< 40	40–200	> 200	2	The species reaches maturity between 25 and 27.5 cm length (Allen 1985).
Reproductive strategy	Broadcast spawner	Demersal egg layer or brooder	Live bearer	1	Broadcast spawner
Trophic level	< 2.75	2.75–3.25	> 3.25	3	Trophic level of 4.0 (Fishbase d 2024).
Density dependence	Compensatory dynamics at low population size demonstrated or likely	No depensatory or compensatory dynamics demonstrated or likely	Depensatory dynamics at low population sizes (Allee effects) demonstrated or likely	N/A	
Quality of habitat	Habitat is robust, with no known degradation from nonfishery impacts	Habitat has been moderately altered by nonfishery impacts	Habitat has been substantially compromised from nonfishery impacts		
Productivity score (mean of attribute scores)				**1.71**	

Table 4

Susceptibility Attribute (default scores in bold)	**Low (score = 1)**	**Medium (score = 2)**	**High (score = 3)**	**Score**	**Notes/Reference**

Areal overlap (all fisheries)	Vast majority (> 90%) of species concentration (main geographic range) is unfished (considering all fisheries).	Most (70–90%) of species concentration is unfished by any fishery (must have evidence).	> 30% of the species concentration is fished, considering all fisheries.	3	The species distributes throughout the Gulf of Mexico, with fisheries targeting it along all its distribution. The species is fished in > 30% of its concentration.
Vertical overlap (all fisheries)	Low overlap between fishing depths and depth range of species; i.e., most of the species depth range (≥ 66%) is unfished (considering all fisheries). (Must have evidence; unlikely for any "main species.")	Medium overlap between fishing depths of depth range of species, considering all fisheries; i.e., species has considerable portion (≥ 33%) of depth range that is unfished (must have evidence).	High degree of overlap between fishing depths and depth range of species. Default score for target species, as well as any air-breathing animal, or when unknown.	2	The species' depth ranges from 0 to 180 m (Allen 1985). The fishery takes place along the continental shelf of the Gulf of Mexico (DOF 2023), and the gears used might have a medium degree of overlap with the species' depth range.
Seasonal availability	Fisheries overlap with species < 3 months/year (Griffiths et al. 2017) OR Seasonal migrations decrease overlap with the fishery (Patrick et al. 2009).	Fisheries overlap with species 3–6 months/year (Griffiths et al. 2017) OR Seasonal migrations do not substantially affect overlap with the fishery (Patrick et al. 2009).	Fisheries overlap with species > 6 months/year (Griffiths et al. 2017). Default score if unknown OR Seasonal migrations increase overlap with the fishery (Patrick et al. 2009).	3	The snapper fishery occurs all year long. So, it is expected for the fishery to have regular overlap overall with the shark species. For this reason, a score of high is selected.

Selectivity of fishery (specific to fishery under assessment)	Species is not targeted AND is not likely to be captured by gear (e.g., average body size at maturity is smaller than mesh size (net fisheries), or species is not attracted to the bait used (line fisheries), or is too large to enter trap (pot/trap fisheries). (If known, < 33% of individuals of this species encountering gear are captured.) Must have evidence.	Species is targeted, or is incidentally encountered AND is not likely to escape the gear, BUT conditions under "high risk" do not apply. Default score when conditions under "high risk" do not apply.	Species is targeted or is incidentally encountered AND attributes of the fishery, combined with the species' biology or behavior—e.g., migratory bottlenecks, spawning aggregation, site fidelity, unusual attraction to gear, sequential hermaphrodite, semelparity, or segregation by sex—increase its susceptibility to the gear; e.g., net mesh size allows retention of individuals below size at maturation, or fishery targets spawning aggregations or BOFFFFs (Hixon et al. 2014). If effective management measures are in place to mitigate the effect of the behavior or	2	The species is targeted by this fishery, BUT conditions under "high risk" do not apply because there are some measures in place that aim to mitigate the impacts (DOF 2022).

			requirement, the behavior and/or requirement need not be considered		
Post-capture mortality (specific to fishery under assessment)	Evidence of majority of captured individuals (> 66%) released and survive post-capture.	Evidence of some (33–66%) individuals released and survive post-capture.	Retained species, or majority dead when released, or unknown. Default score for retained species or unknown.	3	Default score is used, considering this species is retained.
Susceptibility score [(S1 × S2 × S3 × S4 – 1) ÷ 40 + 1]				**1.88**	
Productivity-Susceptibility Score [$V = \sqrt{(P^2 + S^2)}$]				2.54	
Vulnerability Rating: < 2.64 = Low vulnerability; ≥ 2.64 and ≤ 3.18 = Medium vulnerability; > 3.18 = High vulnerability				Low vulnerability	

1.2 Fishing Mortality

Gulf of Mexico - Handlines and hand-operated pole-and-lines

High Concern

Fishing mortality for the snapper fishery has been historically driven by red snapper (DOF 2012; DOF 2023), so specific values for yellowtail F were not available in the past. But Garcia-Caudillo et al. (2024) calculated the values of fishing mortality for yellowtail snapper between 1980 and 2019 (Garcia-Caudillo et al. 2024). The authors reported that annual fishing mortality throughout most of the time series was below the fishing mortality limit (F_{lim}); however, starting in 2015, landings (and F values) began increasing and surpassing the F_{lim} in the most recent years, with a value of F_{2019} of 0.39 (Figures 13 and 14; see also the levels of F in the Kobe plot in Figure 12) (Garcia-Caudillo et al. 2024). Based on the available information, fishing mortality is above the level that would allow a population to maintain abundance. Thus, abundance is scored a “high concern” (per line 1 of table 1.2.1 of the Seafood Watch Standard).

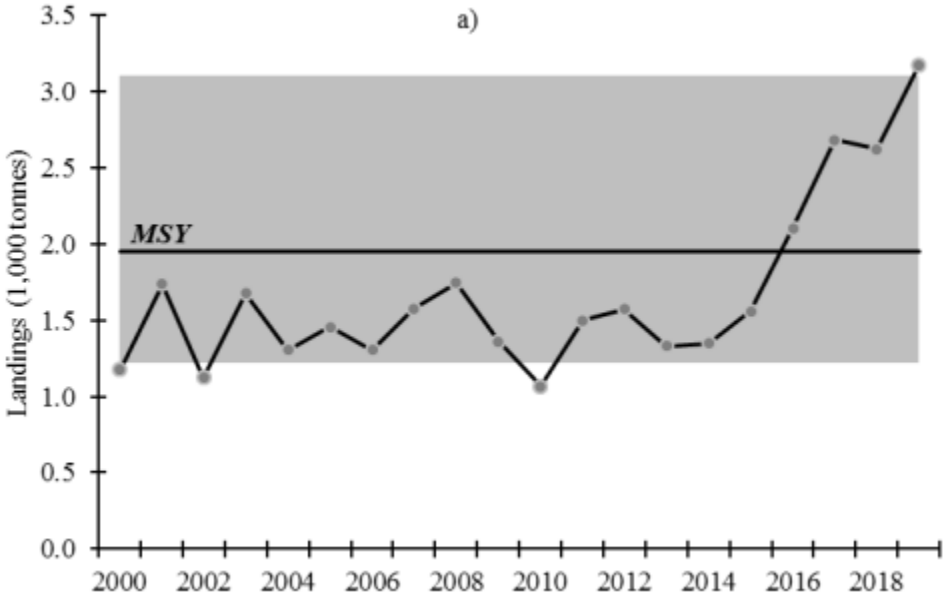


Figure 13: Yellowtail snapper landings (Garcia-Caudillo et al. 2024).

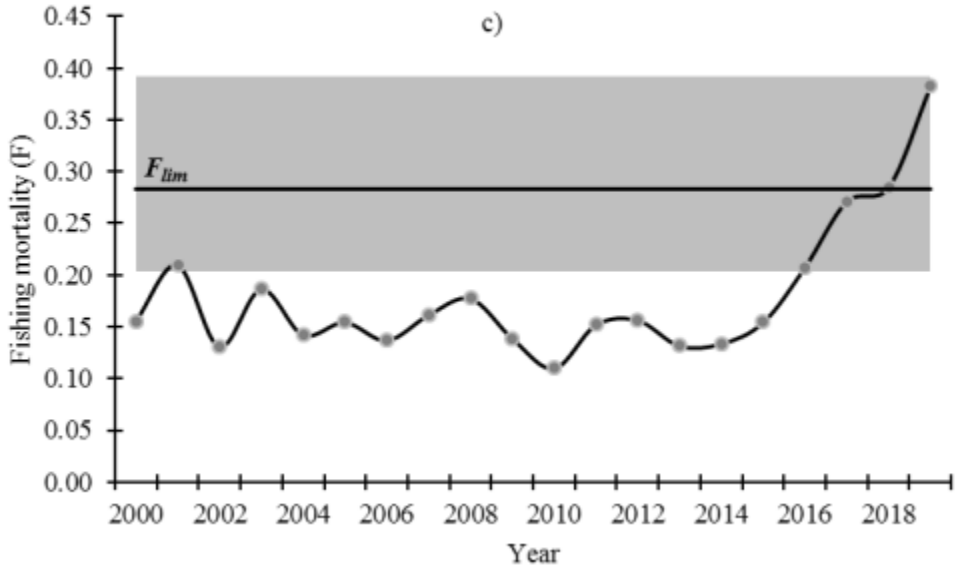


Figure 14: Fishing mortality values for yellowtail snapper (Garcia-Caudillo et al. 2024).

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.

Red snapper			
Region / Method	**Sub Score**	**Discard Rate/Landings**	**Score**
Mexico - Gulf of Mexico - Handlines and hand-operated pole-and-lines - 1,181 mt	2.644	1.000: < 100%	Yellow (2.644)
Gulf of Mexico Stock - Mexico - Gulf of Mexico - Longline (deep-set) - 1,181 mt	1.000	1.000: < 100%	Red (1.000)

Yellowtail snapper			
Region / Method	**Sub Score**	**Discard Rate/Landings**	**Score**
Mexico - Gulf of Mexico - Handlines and hand-operated pole-and-lines - 2,068 mt	2.644	1.000: < 100%	Yellow (2.644)

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.

Gulf of Mexico - Handlines and hand-operated pole-and-lines			
Sub Score: 2.644	**Discard Rate: 1.000**		**Score: 2.644**
Species	**Abundance**	**Fishing Mortality**	**Score**
Yellowtail snapper	2.330: Moderate Concern	1.000: High Concern	Red (1.526)
Atlantic bonito	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Lane snapper	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Vermilion snapper	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)

Gulf of Mexico - Handlines and hand-operated pole-and-lines			
Sub Score: 2.644	**Discard Rate: 1.000**		**Score: 2.644**
Species	**Abundance**	**Fishing Mortality**	**Score**
Atlantic bonito	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Lane snapper	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Red snapper	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Vermilion snapper	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)
Gulf of Mexico - Longline (deep-set)			
Sub Score: 1.000	**Discard Rate: 1.000**		**Score: 1.000**
Species	**Abundance**	**Fishing Mortality**	**Score**
Sea turtles	1.000: High Concern	1.000: High Concern	Red (1.000)
Bonnethead	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Corals and other biogenic habitats	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Marine mammals	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Seabirds	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Atlantic bonito	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Atlantic sharpnose shark	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Coney	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Red snapper	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Vermilion snapper	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)
Benthic invertebrates	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)

In Mexico, the snapper fishery off the Campeche Bank is considered a multispecies fishery. During the most recent update of the fishery's profile, managers identified three snapper species as the target species: red snapper (*Lutjanus campechanus*), silk snapper (*L. vivanus*), and blackfin snapper (*L. buccanella*) (DOF 2023). According to the 2023 National Fisheries Chart (NFC), managers included 36 species as "associated" species in the fishery profile, including some species of sharks and rays (see Appendix B for the complete list). Managers considered associated species that were also captured and retained by the fishery (DOF 2023).

Studies on the snapper fishery catch composition are not abundant; Brule et al. (2009) and Monroy et al. (2010) studied the composition of the small-scale fleet. In recent years, as part of the Fishery Improvement Project, landing reports were generated that include data from September 2019 to January 2024 (Flores-Guzman et al. 2021; Flores-Guzman 2022; Flores-Guzman 2023) {Rocha-Tejeda & Flores-Guzman 2024}. The reports analyzed the catch

composition of the Campeche fleets that target red and yellowtail snappers using hand-operated lines (or vertical lines) and deep-set bottom lines. Data showed variations in catch composition for both gears among the different reports.

Using these reports, the SFW standard that considers Criterion 2 main species, those species that are a common component of the catch (> 5% of the catch), those that are considered overfished, endangered, threatened, and undergoing overfishing, and bait species when they are > 5% of the catch, along with considering the most recent information, the species included for Criterion 2 are as follows:

Hand-operated vertical line: vermilion snapper (*Rhomboplites aurorubens*), lane snapper (*Lutjanus synagris*), and gafftopsail catfish (*Bagre marinus*) because of their proportion of the catch, as well as Atlantic bonito (*Sarda sarda*), which is used as bait and represented ≈20% of the total catch of the hand-operated lines (Flores-Guzman et al. 2021; Flores-Guzman 2022; Flores-Guzman 2023; Rocha & Flores 2024}.

Deep-set longline: Atlantic sharpnose shark (*Rhizoprionodon terraenovae*), coney (*Cephalopholis fulva*), gaffstopsail catfish (*Bagre marinus*), vermilion snapper (*Rhomboplites aurorubens*), and bonnethead shark (*Sphyrno tiburo*) because of their proportion of the catch; similarly, Atlantic bonito, which is used as bait and represented 24% of volume against the total catch.

In the years that the data collection program has been in place, there have not been reported catches or interactions with sea turtles or marine mammals in the fishery {Flores-Guzman, A., pers comm 2024}. But Cuevas et al. (2018) reported some interactions between sea turtles and longlines in the Gulf of Mexico (Cuevas et al. 2018). Because there are no data available for the longline fishery interactions in the Gulf of Mexico, these species groups have been selected using the Unknown Bycatch Matrix (UBM) (Appendix 2 of the Seafood Watch Standard). The UBM is a tool that identifies which taxonomic groups are susceptible to fishing activities across the world's oceans, compiled from the available scientific literature. In assessing longline gears in the Gulf of Mexico, the main species identified include sea turtles, marine mammals, sharks, benthic invertebrates, finfish, and forage fish. For these reasons, the impacts of the fishery on sea turtles and marine mammals and potential adverse interactions with benthic invertebrates, corals, and other biogenic habitats were assessed.

Overall, the impact of the deep-set longline on sea turtles is the primary driver limiting the Criterion 2 score, because of concerns about the species' abundance. For hand lines (vertical lines), the impacts on lane snapper (reflected in the available information on abundance and fishing mortality) and Atlantic bonito (used as bait) are the main drivers of the gear's Criterion 2 score.

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

Atlantic bonito *(Sarda sarda)*

2.1 Abundance

Gulf of Mexico - Handlines and hand-operated pole-and-lines

Gulf of Mexico - Longline (deep-set)

Moderate Concern

The region has no recent stock evaluations, and the International Union for the Conservation of Nature (IUCN) classified the species as "Least Concern" in 2023 (Collette et al. 2023). Hence, abundance is considered a "moderate concern" (per line 3a in table 1.1.1 of the Seafood Watch Standard).

2.2 Fishing Mortality

Gulf of Mexico - Handlines and hand-operated pole-and-lines

Gulf of Mexico - Longline (deep-set)

Moderate Concern

Current levels of fishing mortality are unknown. The IUCN reported that "...Turkey and Mexico landed the highest tonnage of this species: 17,900 t and 2,314 t, respectively (FAO 2008)" (Collette and Abad-Uribarren 2015). In 2022, reported landings were ≈1,600 MT (CONAPESCA datos abiertos 2022), similar to those reported by Collette and Abad-Uribarren (2015). Because fishing mortality is unknown, it is considered a "moderate concern" (per line 2 of table 1.2.1 of the Seafood Watch Standard).

Atlantic sharpnose shark *(Rhizoprionodon terraenovae)*

2.1 Abundance

Gulf of Mexico - Longline (deep-set)

Moderate Concern

Atlantic sharpnose shark (*Rhizoprionodon terraenovae*) is one of the target species within the "shark fishery" in the Gulf of Mexico. In 2013, SEDAR completed a stock assessment that concluded that the species was not overfished (SEDAR 2013). In 2022, Mexican managers updated the fishery profile and included an estimate of the changes in biomass for the species between 1937 and 2017 (Figure 15). Based on the results, managers concluded that biomass was below MSY ($B < B_{MSY}$) but stated, *"*...the levels are not below what it would be considered a deteriorated fishery" (DOF 2022). Managers did not include the methodology or data used in their analysis. The IUCN classified the species

as “Least Concern” (Carlson et al. 2021); hence, abundance is considered a “moderate concern” (per line 3a in table 1.1.1 of the Seafood Watch Standard).

Supplementary Information

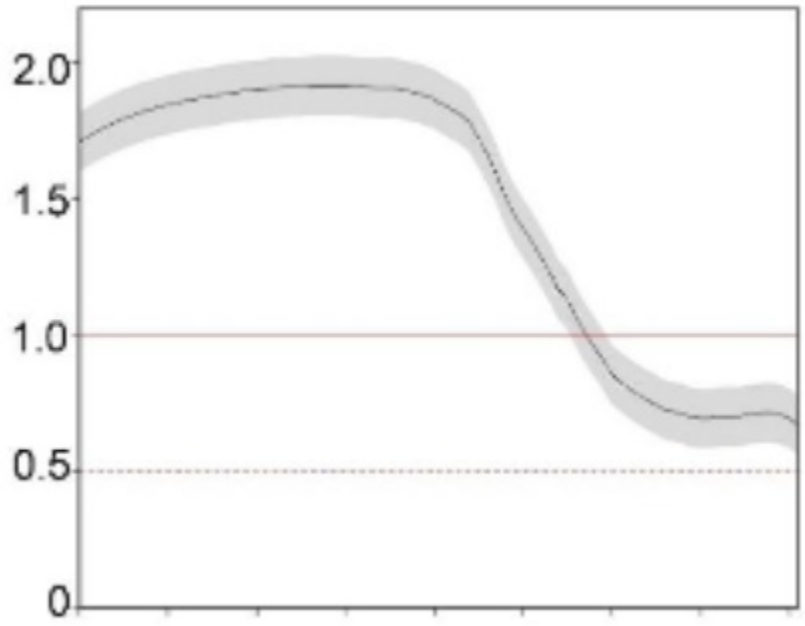


Figure 15: Atlantic sharpnose shark biomass trajectory calculated by Mexican managers (DOF 2022).

2.2 Fishing Mortality

Gulf of Mexico - Longline (deep-set)

Moderate Concern

The current levels of fishing mortality are unknown; the species is extensively harvested in Mexico, with landings reaching their peak between 1977 and 1997 and decreasing to their lowest by 2007, with a positive trend until 2017 (Figure 16) (DOF 2022). Considering that F is unknown, this factor is scored a “moderate concern” (per line 2 of table 1.2.1 of the Seafood Watch Standard).

Supplementary Information

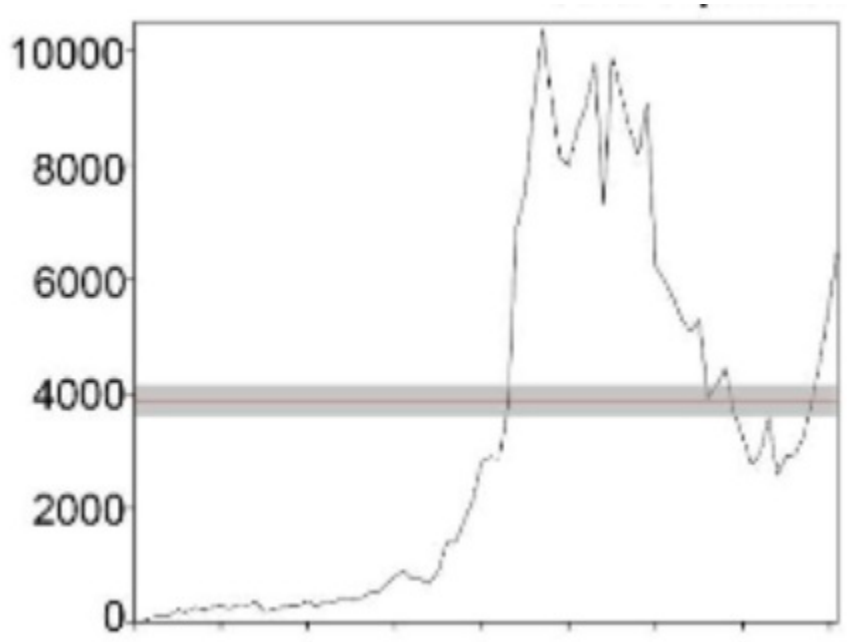


Figure 16: Atlantic sharpnose shark landings in Mexico from 1937 to 2017 (DOF 2022).

Benthic invertebrates *(Benthic invertebrate spp.)*

2.1 Abundance

Gulf of Mexico - Longline (deep-set)

Moderate Concern

According to the Seafood Watch Fisheries standard, unknown benthic invertebrates score a “moderate concern” for abundance (per paragraph 2 on page 60 of the Seafood Watch Standard).

2.2 Fishing Mortality

Gulf of Mexico - Longline (deep-set)

Low Concern

Based on the Seafood Watch UBM, the susceptibility of unknown benthic invertebrates to set longlines in the Gulf of Mexico is scored as 4.5, or “low concern” (per the table on page 68 of the Seafood Watch Standard).

Bonnethead *(Sphyrna tiburo)*

2.1 Abundance

Gulf of Mexico - Longline (deep-set)

High Concern

Bonnethead shark comprises at least three spatial units (two in the Western Atlantic and one in the Eastern Pacific). The Northwest and Western Central Atlantic spatial unit covers the United States, the Bahamas, and Mexico (Castro 2011). Like Atlantic sharpnose shark, bonnethead is a main species within the Mexican snapper fishery (DOF 2022). In the 2022 update of the fishery profile within the National Fisheries Chart, managers reported the biomass change for the species between 1937 and 2017 (Figure 17). Although there is no information on how biomass was calculated or what data were used, managers concluded that biomass is below the B/BMSY relationship but "...above the reference point where it would be considered deteriorated" (DOF 2022). The results presented by managers show that B < BMSY, but with uncertain methodology, and because the species was classified as "Endangered" and largely depleted by the IUCN Red List (Pollom et al. 2019; Perez-Jimenez et al. 2021), the results of the two assessments are contradictory. Hence, we used a PSA to determine the stock vulnerability, which was found to be high (PSA score = 3.26). For these reasons, abundance is considered a "high concern" (per line 3b in table 1.1.1 of the Seafood Watch Standard).

Supplementary Information

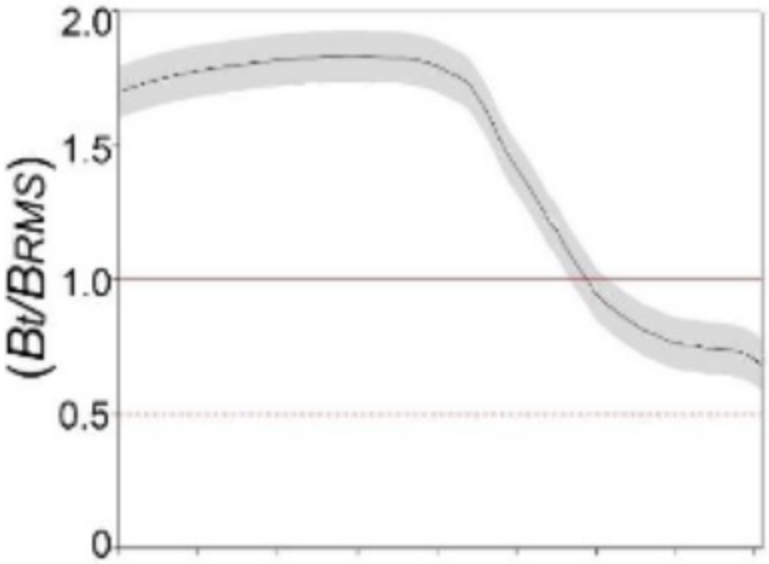


Figure 17: Bonnethead shark biomass in the Gulf of Mexico from 1937 to 2017 (DOF 2022).

Table 5

Productivity attribute	High productivity (score = 1)	Medium productivity (score = 2)	Low productivity (score = 3)	Score	Notes/References
Average age at maturity (years)	< 5 years	5–15 years	> 15 years	1	Reports of the species maturity are around 2 and 2.7 years old (Parsons 1993).
Average maximum age (years)	< 10 years	10–25 years	> 25 years	2	The species can reach up to 12 years age {Carlson and Parsons 1997}.
Fecundity	> 20,000	100 to 20,000	< 100	3	Average number of eggs = 11. Pupping season occurs during late August and early September (Parsons 1993).
Average maximum size	< 100	100–300	> 300	2	The maximum length reported in Florida was 124 cm {Carlson and Parsons 1997}.
Average size at maturity	< 40	40–200	> 200	2	The species reaches maturity around 85 cm length (Parsons 1993).
Reproductive strategy	Broadcast spawner	Demersal egg layer or brooder	Live bearer	3	Live bearer
Trophic level	< 2.75	2.75–3.25	> 3.25	3	Trophic level of 3.9 reported (Fishbase e 2024).
Density dependence	Compensatory dynamics at low population size demonstrated or likely	No depensatory or compensatory dynamics demonstrated or likely	Depensatory dynamics at low population sizes (Allee effects) demonstrated or likely	N/A	

Quality of habitat	Habitat is robust, with no known degradation from nonfishery impacts	Habitat has been moderately altered by nonfishery impacts	Habitat has been substantially compromised from nonfishery impacts		
Productivity score (mean of attribute scores)				**2.29**	

Table 6

Susceptibility Attribute (default scores in bold)	**Low (score = 1)**	**Medium (score = 2)**	**High (score = 3)**	**Score**	**Notes/Reference**
Areal overlap (all fisheries)	Vast majority (> 90%) of species concentration (main geographic range) is unfished (considering all fisheries)	Most (70–90%) of species concentration is unfished by any fishery (must have evidence)	> 30% of the species concentration is fished, considering all fisheries.	3	The species distributes from North Carolina to southern Brazil, including Cuba, the Bahamas, the Caribbean, and Gulf of Mexico. The species is fished in > 30% of its concentration.

Vertical overlap (all fisheries)	Low overlap between fishing depths and depth range of species; i.e., most of the species depth range (≥ 66%) is unfished (considering all fisheries). (Must have evidence; unlikely for any "main species.")	Medium overlap between fishing depths of depth range of species, considering all fisheries; i.e., species has considerable portion (≥ 33%) of depth range that is unfished (must have evidence).	High degree of overlap between fishing depths and depth range of species. Default score for target species, as well as any air-breathing animal, or when unknown.	3	The species depth ranges from 10 to 180 m (Compagno 1984). The fishery takes place along the continental shelf of the Gulf of Mexico (DOF 2023). The gears used might have a high degree of overlap with the species depth range.
Seasonal availability	Fisheries overlap with species < 3 months/year (Griffiths et al. 2017) OR Seasonal migrations decrease overlap with the fishery (Patrick et al. 2009).	Fisheries overlap with species 3–6 months/year (Griffiths et al. 2017) OR Seasonal migrations do not substantially affect overlap with the fishery (Patrick et al. 2009).	Fisheries overlap with species > 6 months/year (Griffiths et al. 2017). Default score if unknown. OR Seasonal migrations increase overlap with the fishery (Patrick et al. 2009).	3	The snapper fishery occurs all year long. So, it is expected for the fishery to have regular overall with the shark species. For this reason, a score of high is selected.
			Species is targeted or is incidentally encountered AND attributes of the fishery, combined		

Selectivity of fishery (specific to fishery under assessment)	Species is not targeted AND is not likely to be captured by gear; e.g., average body size at maturity is smaller than mesh size (net fisheries), or species is not attracted to the bait used (line fisheries), or is too large to enter trap (pot/trap fisheries). (If known, < 33% of individuals of this species encountering gear are captured.) Must have evidence.	Species is targeted, or is incidentally encountered AND is not likely to escape the gear, BUT conditions under "high risk" do not apply. Default score when conditions under "high risk" do not apply.	with the species' biology or behavior—e.g., migratory bottlenecks, spawning aggregation, site fidelity, unusual attraction to gear, sequential hermaphrodite, semelparity, or segregation by sex—increase its susceptibility to the gear; e.g., net mesh size allows retention of individuals below size at maturation, or fishery targets spawning aggregations or BOFFFFs (Hixon et al. 2014). If effective management measures are in place to mitigate the effect of the behavior or requirement,	2	The species is incidentally encountered AND is not likely to escape the gear, BUT conditions under "high risk" do not apply.	

			the behavior and/or requirement need not be		
Post-capture mortality (specific to fishery under assessment)	Evidence of majority of captured individuals (> 66%) released and survive post-capture	Evidence of some (33–66%) individuals released and survive post-capture	Retained species, or majority dead when released, or unknown. Default score for retained species or unknown.	3	Default score is used, considering that this species is retained.
Susceptibility score [(S1 × S2 × S3 × S4 – 1) ÷ 40 + 1]				**2.33**	
Productivity-Susceptibility Score [$V = \sqrt{(P^2 + S^2)}$]				3.26	
Vulnerability Rating: < 2.64 = Low vulnerability; ≥ 2.64 and ≤ 3.18 = Medium vulnerability; > 3.18 = High vulnerability				High vulnerability	

2.2 Fishing Mortality

Gulf of Mexico - Longline (deep-set)

Moderate Concern

According to what is reported by Pollom et al. (2019), the species has one of the highest population growth rates for sharks, making it much less sensitive to fishing mortality than most other species of sharks. But the species is targeted and reported as bycatch in several coastal fisheries (e.g., gillnet and longline) and as bycatch in shrimp fisheries (Pollom et al. 2019; DOF 2022). The IUCN report of 2019 concluded that, despite the species' high productivity, drastic declines had been reported throughout its range (Pollom et al. 2019). In Mexico, the most recent species profile showed a sharp decrease in landings that started around 1997 and continued until 2007, then increased again around 2017 to ≈800 MT (Figure 18). But current fishing mortality levels are unknown; thus, this factor is considered a "moderate concern" (per line 2 on table 1.2.1 of the Seafood Watch Standard).

Supplementary Information

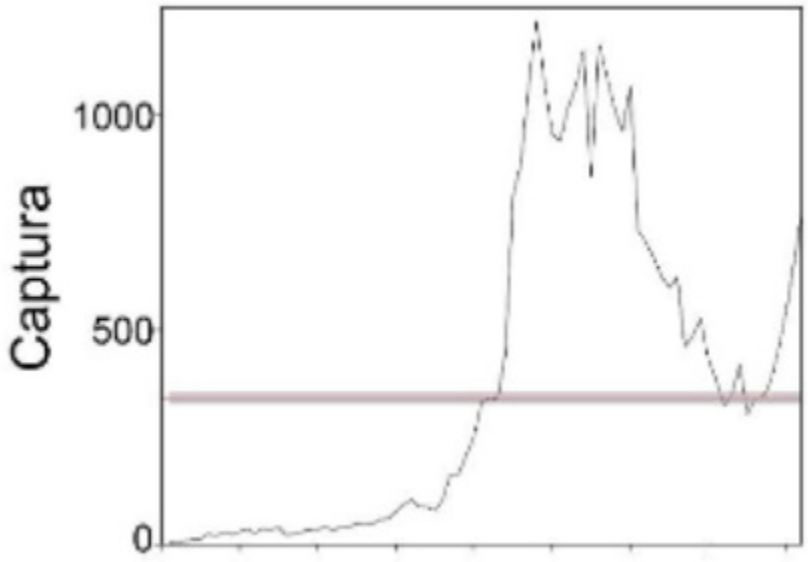


Figure 18: Bonnethead landings in the Mexican shark fishery from 1937 to 2017 (DOF 2022).

Coney *(Cephalopholis fulva)*

2.1 Abundance

Gulf of Mexico - Longline (deep-set)

Moderate Concern

There are no recent stock evaluations for coney in the region, and the IUCN classified the species as “Least Concern” in 2018 (Bertoncini et al. 2018). For this reason, abundance is considered a “moderate concern” (per line 3a in table 1.1.1 of the Seafood Watch Standard).

2.2 Fishing Mortality

Gulf of Mexico - Longline (deep-set)

Moderate Concern

Current levels of fishing mortality on coney are unknown; in Mexico, landings of the species are reported within the “grouper” category {DOF 2020}. Because fishing mortality is unknown, this factor is considered a “moderate concern” (per line 2 in table 1.2.1 of the Seafood Watch Standard).

Corals and other biogenic habitats *(Unknown coral spp.)*

2.1 Abundance

Gulf of Mexico - Longline (deep-set)

High Concern

According to the Seafood Watch Fisheries standard, unknown corals and biogenic habitats are scored a “high concern” for abundance (per paragraph 2 on page 60 of the Seafood Watch Standard).

2.2 Fishing Mortality

Gulf of Mexico - Longline (deep-set)

Moderate Concern

Based on the UBM of the Seafood Watch Fisheries standard, the susceptibility of corals and other biogenic habitats to set longlines in the Gulf of Mexico is scored a 3, or “moderate concern” (per the table on page 68 of the Seafood Watch Standard).

Lane snapper *(Lutjanus synagris)*

2.1 Abundance

Gulf of Mexico Stock | Gulf of Mexico - Handlines and hand-operated pole-and-lines

Gulf of Mexico - Handlines and hand-operated pole-and-lines

Moderate Concern

Garcia-Caudillo et al. (2024), who used landing records (Figure 19) to estimate biomass and reference points, recently assessed lane snapper caught in Mexico (Garcia-Caudillo et al. 2024). The authors estimated MSY for the stock to be 269 MT (ibid), and mentioned that landings fluctuated above and below the MSY confidence intervals during the first third of the series until 2005, after which the landings showed a decreasing trend and reached their lowest value (95 MT) below the MSY range (see Figure 19). The authors concluded that the lane snapper stock was overfished (B value below the $B_{TRP} = B_{MSY}$) (Figure 20).

But the authors have mentioned high levels of uncertainty, based on the nature of the data-poor methodology (Garcia-Caudillo et al. 2024); for this reason, a PSA was used to complete the scoring on this factor. The species was found to have a medium vulnerability (PSA score = 2.73). For all these reasons, abundance is considered a “moderate concern” (per line 2 in table 1.1.1 of the Seafood Watch Standard).

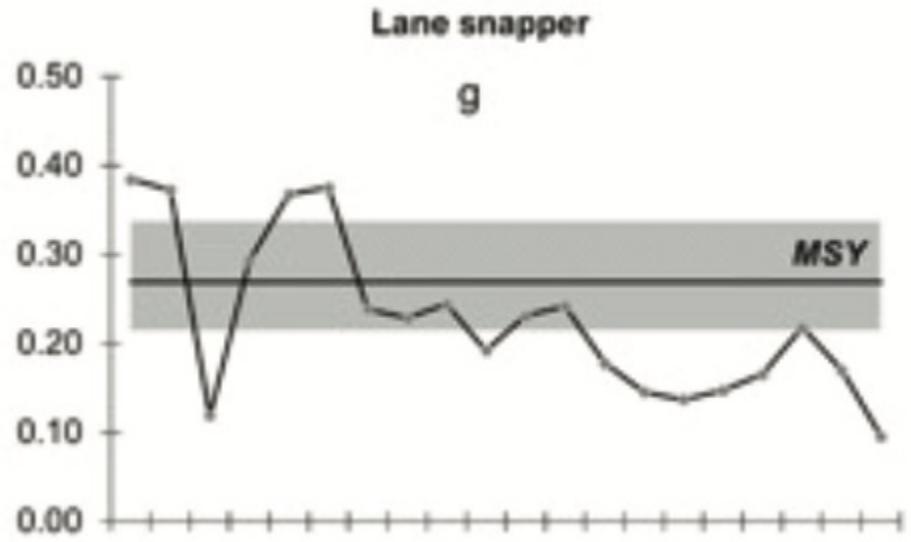


Figure 19: Lane snapper landings in the snapper fishery (Garcia-Caudillo et al. 2024).

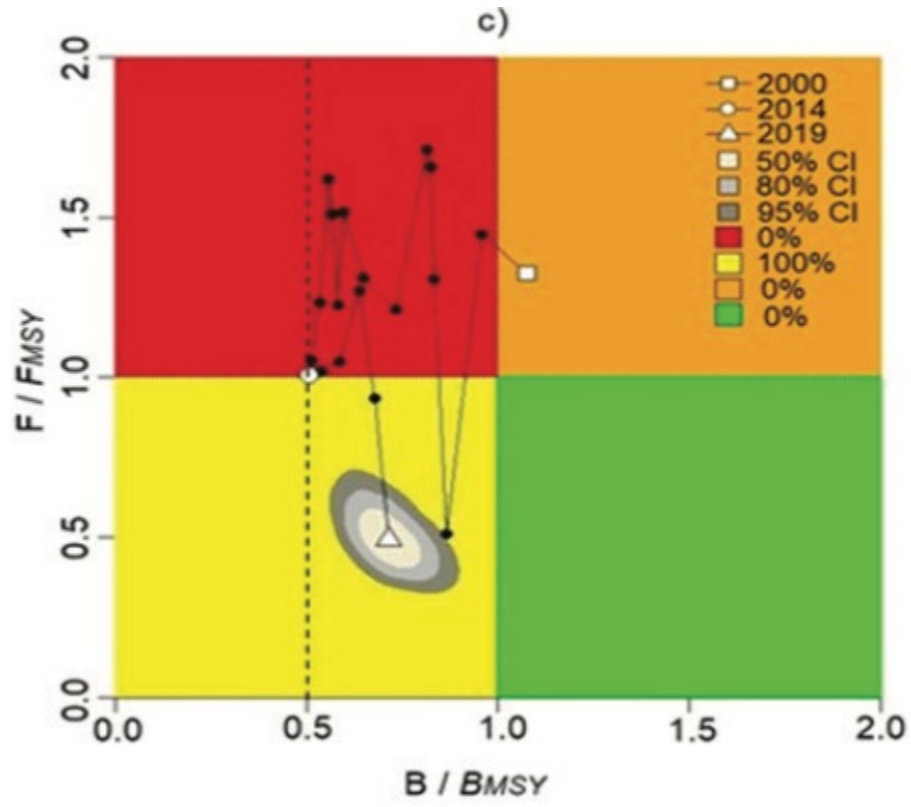


Figure 20: Kobe plot of biomass for lane snapper (Garcia-Caudillo et al. 2024).

Table 7

Productivity attribute	High productivity (score = 1)	Medium productivity (score = 2)	Low productivity (score = 3)	Score	Notes/References
Average age at maturity (years)	< 5 years	5–15 years	> 15 years	1	Reports of the species maturity are around 2 years age (García-Cagide et al. 1994).
Average maximum age (years)	< 10 years	10–25 years	> 25 years	2	The species can reach up to 10 years age (Manooch 1987).
Fecundity	> 20,000	100 to 20,000	< 100	1	Fecundity is reported to be between 28,000 and 595,000 (Manickchand-Dass 1987).
Average maximum size	< 100	100–300	> 300	1	The maximum length reported in Florida was 60 cm (IGFA 2001).
Average size at maturity	< 40	40–200	> 200	1	The species reaches maturity around 22.0 cm length (Aiken 2001).
Reproductive strategy	Broadcast spawner	Demersal egg layer or brooder	Live bearer	1	Broadcast spawner
Trophic level	< 2.75	2.75–3.25	> 3.25	3	Trophic level of 3.8 reported (Fishbase f 2024)
Density dependence	Compensatory dynamics at low population size demonstrated or likely	No depensatory or compensatory dynamics demonstrated or likely	Depensatory dynamics at low population sizes (Allee effects) demonstrated or likely	N/A	

Quality of habitat	Habitat is robust, with no known degradation from nonfishery impacts	Habitat has been moderately altered by nonfishery impacts	Habitat has been substantially compromised from nonfishery impacts		
Productivity score (mean of attribute scores)				**1.43**	

Table 8

Susceptibility attribute (default scores in bold)	**Low (score = 1)**	**Medium (score = 2)**	**High (score = 3)**	**Score**	**Notes/Reference**
Areal overlap (all fisheries)	Vast majority (> 90%) of species concentration (main geographic range) is unfished (considering all fisheries).	Most (70–90%) of species concentration is unfished by any fishery (must have evidence).	> 30% of the species concentration is fished, considering all fisheries.	3	North Carolina, U.S., to Bermuda (Anderson, pers. comm.) to southeastern Brazil, including Gulf of Mexico and Caribbean Sea. The species is fished in > 30% of its concentration.

Vertical overlap (all fisheries)	Low overlap between fishing depths and depth range of species; i.e., most of the species depth range (≥ 66%) is unfished (considering all fisheries). (Must have evidence; unlikely for any "main species.")	Medium overlap between fishing depths of depth range of species, considering all fisheries; i.e., species has considerable portion (≥ 33%) of depth range that is unfished (must have evidence).	High degree of overlap between fishing depths and depth range of species. Default score for target species, as well as any air-breathing animal, or when unknown.	3	The species depth ranges from 10 to 400 m (Cervigón 1993). The fishery takes place along the continental shelf of the Gulf of Mexico (DOF 2023). The gears used might have a high degree of overlap with the species depth range.
Seasonal availability	Fisheries overlap with species < 3 months/year (Griffiths et al. 2017) OR Seasonal migrations decrease overlap with the fishery (Patrick et al. 2009).	Fisheries overlap with species 3–6 months/year (Griffiths et al. 2017) OR Seasonal migrations do not substantially affect overlap with the fishery (Patrick et al. 2009).	Fisheries overlap with species > 6 months/year (Griffiths et al. 2017). Default score if unknown. OR Seasonal migrations increase overlap with the fishery (Patrick et al. 2009).	3	The snapper fishery occurs all year long. So, it is expected for the fishery to have regular overall with the shark species. For this reason, a score of high is selected.
			Species is targeted or is incidentally encountered AND		

Selectivity of fishery (specific to fishery under assessment)	Species is not targeted AND is not likely to be captured by gear; e.g., average body size at maturity is smaller than mesh size (net fisheries), or species is not attracted to the bait used (line fisheries), or is too large to enter trap (pot/trap fisheries). (If known, < 33% of individuals of this species encountering gear are captured.) Must have evidence.	Species is targeted, or is incidentally encountered AND is not likely to escape the gear, BUT conditions under "high risk" do not apply. Default score when conditions under "high risk" do not apply.	attributes of the fishery, combined with the species' biology or behavior—e.g., migratory bottlenecks, spawning aggregation, site fidelity, unusual attraction to gear, sequential hermaphrodite, semelparity, or segregation by sex—increase its susceptibility to the gear; e.g., net mesh size allows retention of individuals below size at maturation, or fishery targets spawning aggregations or BOFFFFs (Hixon et al. 2014). If effective management measures are in place to	2	The species is incidentally encountered AND is not likely to escape the gear, BUT conditions under "high risk" do not apply.

			mitigate the effect of the behavior or requirement, the behavior and/or requirement need not be		
Post-capture mortality (specific to fishery under assessment)	Evidence of majority of captured individuals (> 66%) released and survive post-capture	Evidence of some (33–66%) individuals released and survive post-capture	Retained species, or majority dead when released, or unknown. Default score for retained species or unknown	3	Default score is used, considering this species is retained.
Susceptibility score [(S1 × S2 × S3 × S4 – 1) ÷ 40 + 1]				**2.33**	
Productivity-Susceptibility Score [$V = \sqrt{(P^2 + S^2)}$]				2.73	
Vulnerability Rating: < 2.64 = Low vulnerability; ≥ 2.64 and ≤ 3.18 = Medium vulnerability; > 3.18 = High vulnerability				Medium vulnerability	

2.2 Fishing Mortality

Gulf of Mexico Stock | Gulf of Mexico - Handlines and hand-operated pole-and-lines

Gulf of Mexico - Handlines and hand-operated pole-and-lines

Moderate Concern

Fishing mortality was recently estimated by Garcia-Caudillo et al. (2024). The authors found that fishing mortality fluctuated around the F_{MSY} range for several years, surpassing those limits (e.g., in 2005, 2008, and 2011) (Figure 21) (Garcia-Caudillo et al. 2024). The report concludes that F has been around or below F_{MSY} (Garcia-Caudillo et al. 2024), and the stock has not experienced overfishing in recent years. But because of the high level of uncertainty in the methodology (ibid), there is uncertainty about the fishing mortality estimates and the reference levels; hence, this factor is considered a “moderate concern” (per line 2 in table 1.2.1 of the Seafood Watch Standard).

Supplementary Information

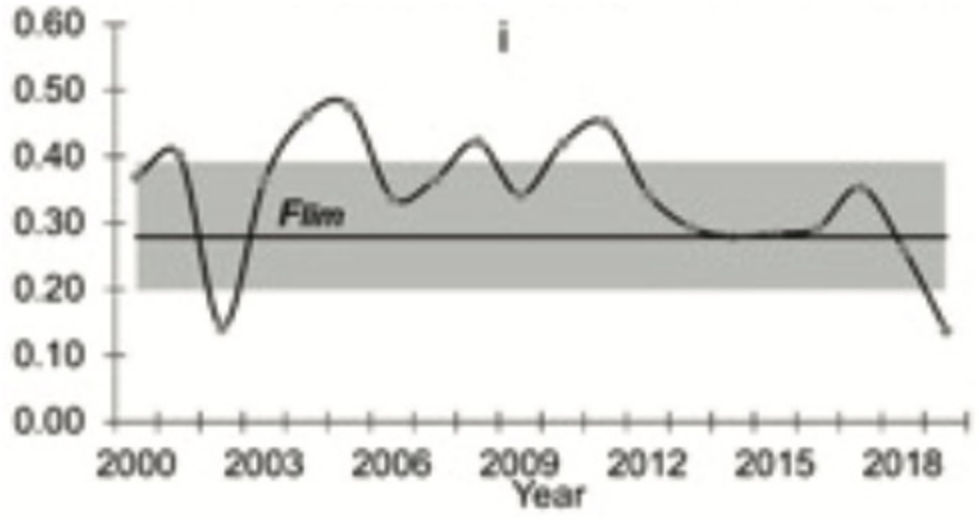


Figure 21: Fishing mortality value estimates for lane snapper in the Gulf of Mexico (Garcia-Caudillo et al. 2024).

Marine mammals *(Mammalia)*

2.1 Abundance

Gulf of Mexico - Longline (deep-set)

High Concern

The region hosts several species of marine mammals, including whales; e.g., North Atlantic right whale (*Eubalaena glacialis*) and blue whale (*Balaenoptera musculus*), dolphins; e.g., Fraser's dolphin (*Lagenodelphis hose*), and West Indian manatee (*Trichechus manatus*) (Oceana 2024). All these species are listed within the NOM-059, which lists all species at risk under Mexican legislation (DOF 2010). Similarly, the IUCN lists these species as either "Critically Endangered" (North Atlantic right whale) (Cooke 2020), "Endangered" (blue whale) (Cooke 2018), or "Vulnerable" (West Indian manatee) (Deutsch and Morales-Vela 2024). Finally, the UBM considers that unknown marine mammal species have a high inherent vulnerability, so they receive a "high concern" score for abundance (per paragraph 2 on page 60 of the Seafood Watch Standard).

2.2 Fishing Mortality

Gulf of Mexico - Longline (deep-set)

Moderate Concern

Based on the UBM of the Seafood Watch Fisheries standard, marine mammal bycatch susceptibility to set longlines in the Gulf of Mexico is scored a 3, or "moderate concern"

(per the table on page 63 of the Seafood Watch Standard).

Sea turtles *(Dermochelyidae, Cheloniidae)*

2.1 Abundance

Gulf of Mexico - Longline (deep-set)

High Concern

In the Gulf of Mexico, five sea turtle species can be found: green (*Chelonia mydas*), loggerhead (*Caretta caretta*), hawksbill (*Eretmochelys imbricata*), leatherback (*Dermochelys coriacea*), and Kemp's ridley (*Lepidochelys kempii*) {SEMARNAT 2010}. Under Mexican legislation, all sea turtles are included within the Mexican Official Norm-059, which is the environmental protection list of species at risk (DOF 2010); and according to the most recent report from the National Program for turtle conservation (CONANP 2022), the species remain considered "in danger of extinction" (ibid). Similarly, all five species are listed by the IUCN as either "Vulnerable" (leatherback, loggerhead, and olive ridley) (Wallace et al. 2013; Casale & Tucker 2017; Abreu-Grobois & Plotkin 2008), "Endangered" (green) (Seminoff 2023), or "Critically Endangered" (Kemp's ridley) {Wibbels & Bevan 2019}.

Finally, the UBM of the Seafood Watch Fisheries standard considers unknown sea turtle species to have a high inherent vulnerability. For these reasons, abundance is considered a "high concern" (per paragraph 2 on page 60 of the Seafood Watch Standard).

2.2 Fishing Mortality

Gulf of Mexico - Longline (deep-set)

High Concern

Cuevas et al. (2018) conducted interviews to identify the overlap between fishing activities and sea turtle interactions of the small-scale fleets operating in the Campeche Bank using gillnets and longlines (Cuevas et al. 2018). The study did not differentiate fisheries in particular; instead, it focused only on gears and interactions. The authors identified three bycatch hotspots (northeast, northwest, and southwest peninsula coasts) (Figure 22). They reported that hawksbill turtle was the most frequently caught bycatch species, followed by loggerhead turtle and green turtle (Cuevas et al. 2018). Gillnets were the most dangerous for sea turtles, with the highest incidence of dead turtles caught (ibid). But specific values of fishing mortality were not estimated for longlines, or specifically the snapper fishery.

Finally, the UBM in the Seafood Watch Fisheries standard scores sea turtle bycatch susceptibility for bottom longlines in the Gulf of Mexico as a 1 (high concern). Considering

the available information in Cuevas et al. (2018) and the UBM scoring, this factor is score a "high concern" (per the table on page 62 of the Seafood Watch Standard).

Supplementary Information

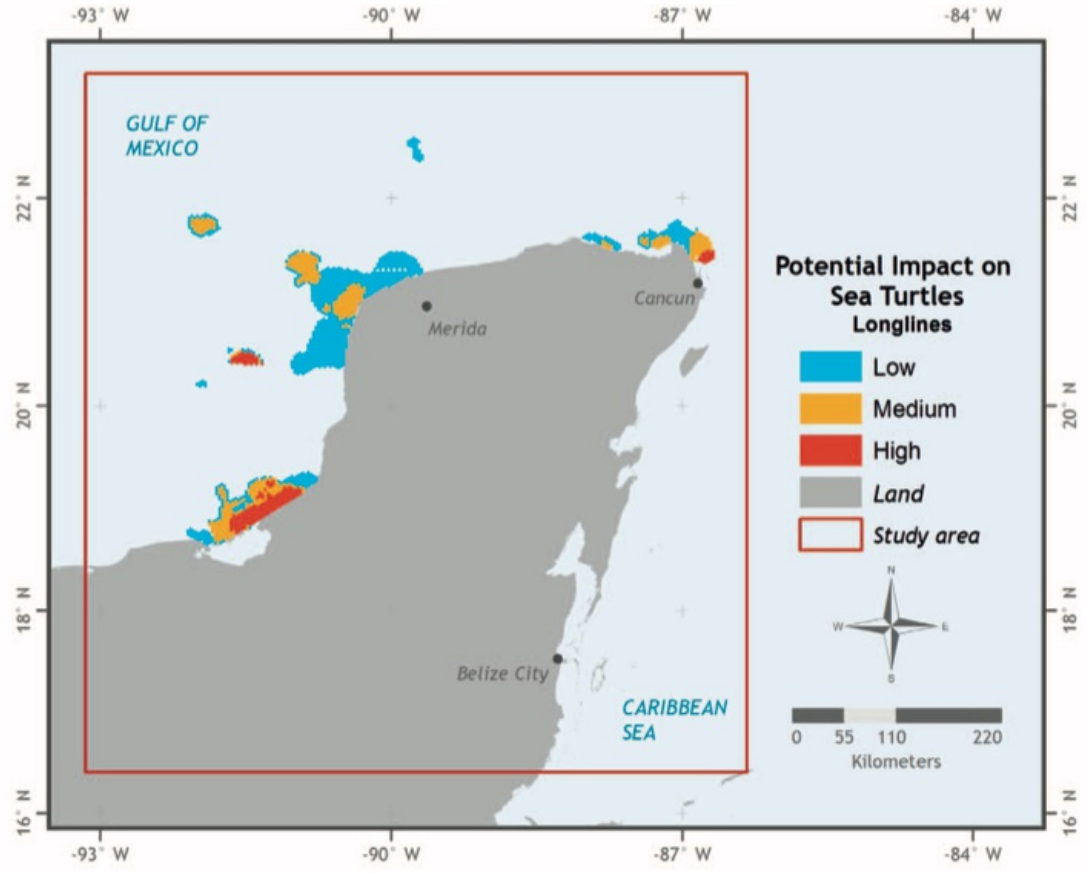


Figure 22: Maps of intensity of potential impact on sea turtles by longlines, determined by interviewing local fishers (Cuevas et al. 2018).

Seabirds *(Aves)*

2.1 Abundance

Gulf of Mexico - Longline (deep-set)

High Concern

Based on the UBM, potential seabird bycatch or interactions can occur with the gear. Because of seabirds' high inherent vulnerability, this factor is scored a "high concern" (per paragraph 2 on page 60 of the Seafood Watch Standard).

2.2 Fishing Mortality

Gulf of Mexico - Longline (deep-set)

Moderate Concern

Based on the UBM in the Seafood Watch Fisheries standard, seabird bycatch susceptibility to longlines in the Gulf of Mexico is scored a 3, or "moderate concern" (per table on page 64 of the Seafood Watch Standard).

Vermilion snapper *(Rhomboplites aurorubens)*

2.1 Abundance

Gulf of Mexico Stock | Gulf of Mexico - Handlines and hand-operated pole-and-lines

Gulf of Mexico Stock | Gulf of Mexico - Longline (deep-set)

Low Concern

The U.S. and Mexican commercial fleets target the vermilion snapper stock. In the Western Atlantic, the species is distributed from North Carolina, U.S., and Bermuda to São Paulo, Brazil, including the West Indies, the Gulf of Mexico, and the Caribbean Sea (Fishbase c 2024). There has yet to be a recent evaluation of the stock in Mexico. In the U.S., NOAA reported five stocks of vermilion snapper: South Atlantic, Gulf of Mexico, and three stocks contained in the Puerto Rico Snapper 1 Complex, the St. Croix Snapper 1 Complex, and the St. Thomas/St. John Snapper 1 Complex {NOAA fisheries 2024}. The authors reported that neither the South Atlantic (2018) stock nor the Gulf of Mexico stock was overfished (2020) (NOAA SMART 2018; NOAA SMART 2023).

It is still being determined if the Mexican fishery targets a different population of vermilion snapper. Genetic studies have been conducted and have been inconclusive. According to a study that assessed the population genetic structure of the species in the U.S., the authors reported very weak differentiation among the different localities. They concluded that genetic distance estimates between localities were unrelated to geographic distances (Bagley et al. 1999). Finally, the authors concluded that their findings suggested that vermilion snapper in the South Atlantic and Gulf of Mexico likely consist of one genetic stock, but recommended further examination (Bagley et al. 1999).

For this evaluation, the information available regarding the U.S. Gulf of Mexico and South Atlantic stock statuses was used to score this factor. Those evaluations considered the populations not showing signs of being overfished (Figures 23–24). For the 2023 Gulf of Mexico assessment, the 2017 biomass (expressed in the number of eggs) was calculated as 353×10^{12}, which was greater than the B_{MSY} of 201.7×10^{12} (NOAA SMART 2023). Similarly, the 2018 SE Atlantic coast reported B_{2016} at 20.67×10^{12}, which was greater than the B_{MSY} of 18.3×10^{12} (NOAA SMART 2018). For these reasons, abundance is considered a "low concern" (per line 1b of table 1.1.1 of the Seafood Watch Standard).

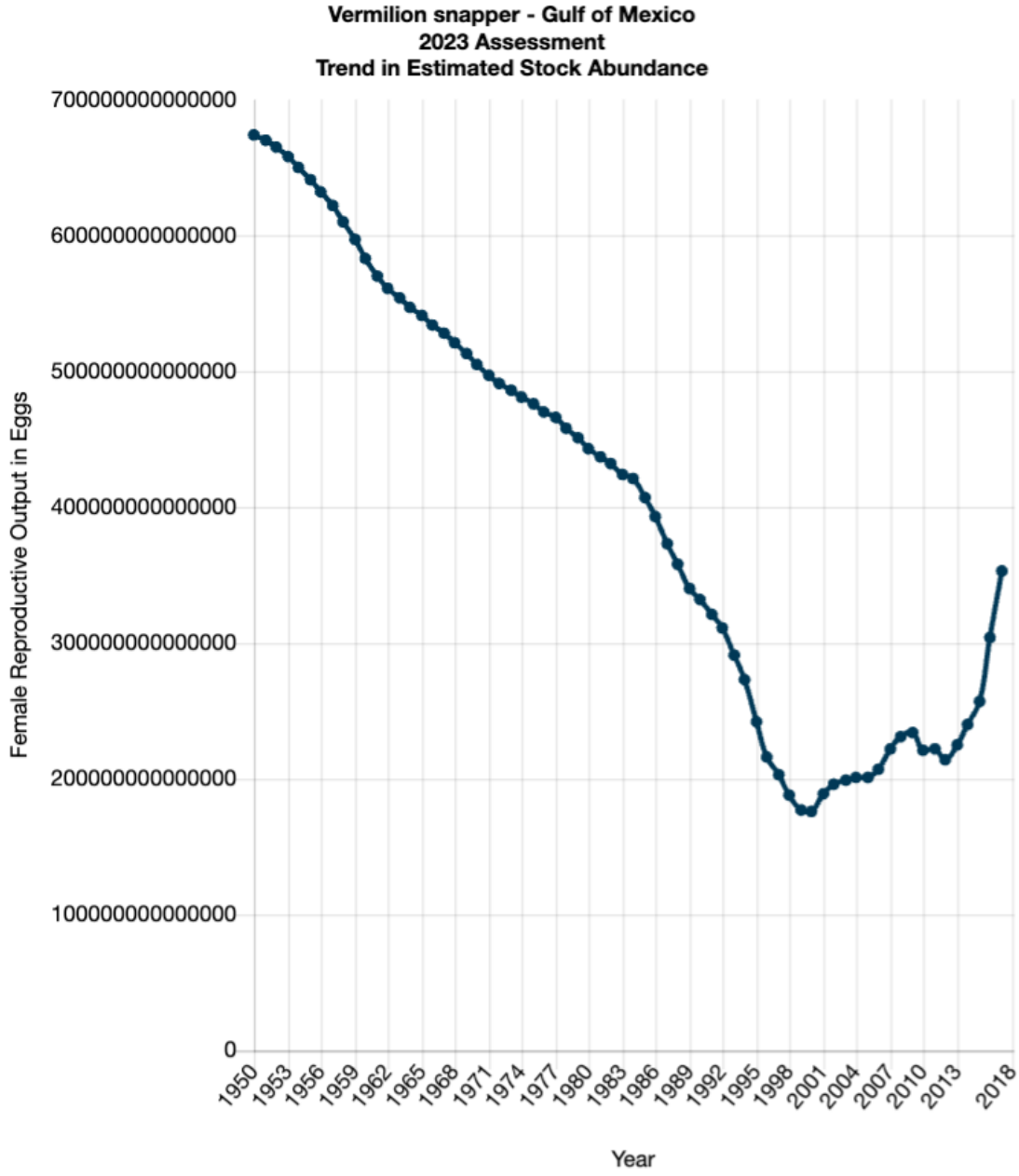


Figure 23: Vermilion snapper stock abundance trend in the U.S. Gulf of Mexico (NOAA SMART 2018).

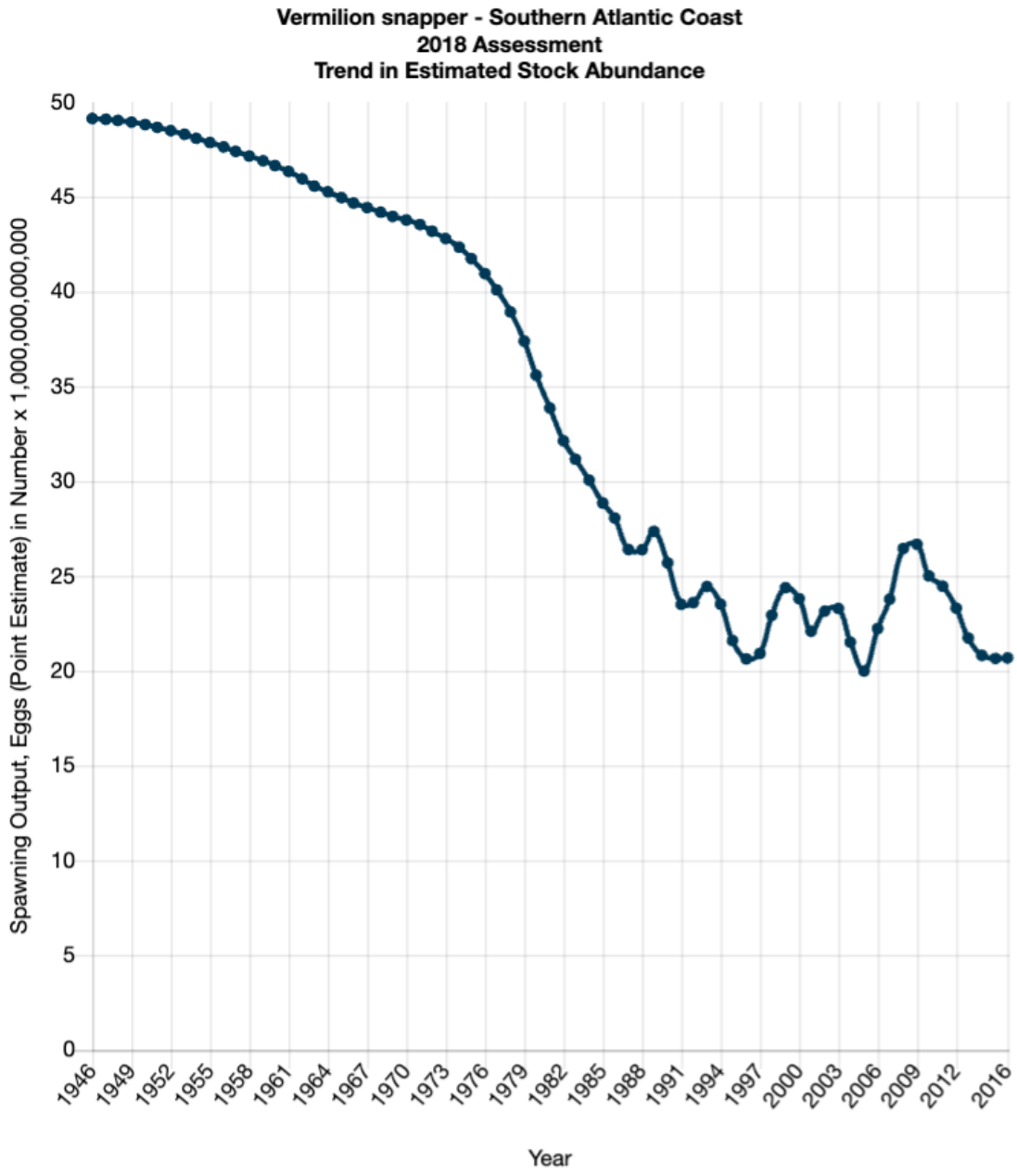


Figure 24: Vermilion snapper stock abundance trend in the U.S. Southern Atlantic Coast (NOAA SMART 2023).

2.2 Fishing Mortality

Gulf of Mexico Stock | Gulf of Mexico - Handlines and hand-operated pole-and-lines

Gulf of Mexico Stock | Gulf of Mexico - Longline (deep-set)

Moderate Concern

Current levels of fishing mortality are unknown; the species is targeted by the small-scale

fleet in Mexico, with landings averaging 2,479.5 MT in the last 3 years (Figure 25) (CONAPESCA datos abiertos 2022). Because F is unknown, this factor is considered a "moderate concern" (per line 2 of table 1.2.1 of the Seafood Watch Standard).

Supplementary Information

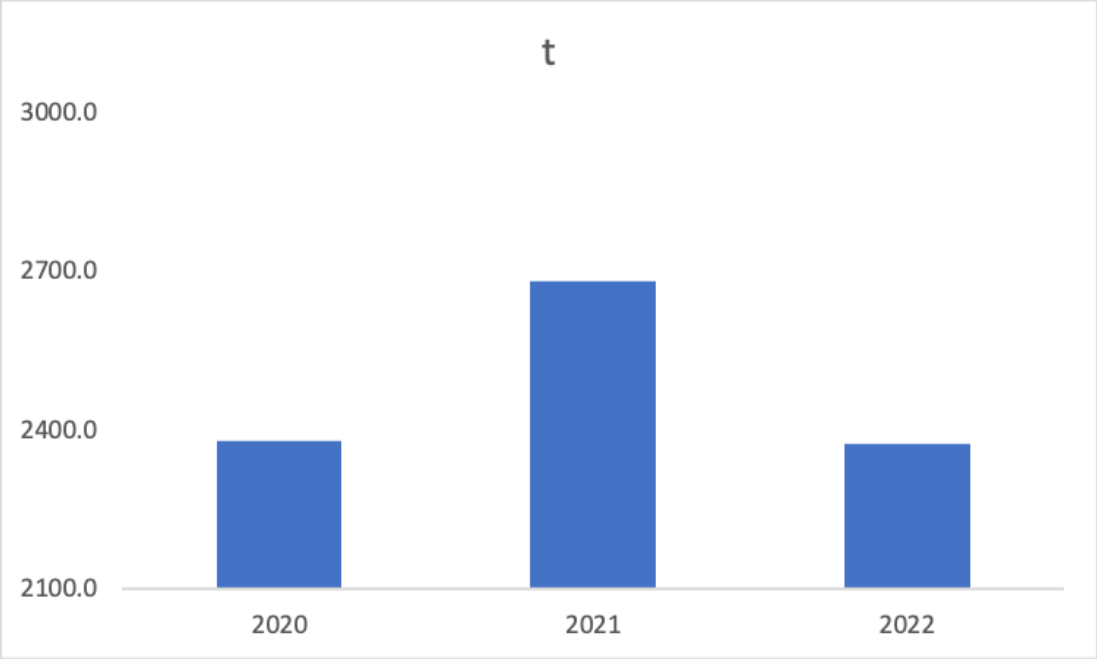


Figure 25: Vermilion snapper landings in the Gulf of Mexico (CONAPESCA datos abiertos 2022).

2.3 Discard Rate/Landings

Gulf of Mexico - Handlines and hand-operated pole-and-lines

Gulf of Mexico Stock | Gulf of Mexico - Longline (deep-set)

< 100%

The snapper fishery is a multispecies finfish fishery that targets several species. Recent information regarding the catch composition for all the gears included showed that the discards + bait/landings ratio is low (although the main bait species is > 5% of the total catch, and the species has been included as a Criterion 2 species) (Flores-Guzman 2022). In addition, some researchers have reported that low levels of discards are typical in handline fisheries (Kelleher 2005), and similar fisheries in the Gulf of Mexico (U.S. handline fishery that targets mutton snapper) used observer data and estimated a discards/landings ratio of 33% to 34% (Scott-Denton and Williams 2013). Given the gear and targeted species similarities between this fishery and the U.S. GOM handline fishery, this factor is rated at < 100%; hence, a score of 1 is given (per table 2.3.1 of the Seafood Watch Standard).

Criterion 3: Management Effectiveness

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

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

The Criterion 3 rating is determined as follows:

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

Rating is Critical if Management Strategy and Implementation is Critical.

Guiding principle

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

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

Criterion 3 Summary

Fishery	Management Strategy And Implementation	Bycatch Strategy	Scientific Research And Monitoring	Enforcement Of Management Regulations	Stakeholder Inclusion	Score
Gulf of Mexico - Handlines and hand-operated pole-and-lines	Ineffective	Moderately Effective				Red (1.000)
Gulf of Mexico - Handlines and hand-operated pole-and-lines	Ineffective	Moderately Effective				Red (1.000)
Gulf of Mexico - Longline (deep-set)	Ineffective	Moderately Effective				Red (1.000)

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.

3.1 Management Strategy And Implementation

Gulf of Mexico - Handlines and hand-operated pole-and-lines

Ineffective

In Yucatán, yellow snapper has gained significant importance in recent years because of the decline in catches of red and black grouper, leading to increased efforts focusing on the species. The handline/hand-operated line fishery that targets yellowtail snapper in the GOM retains several target and associated species (DOF 2002). Producers retain most of the species for commercial purposes. Based on the most recent catch composition reports available (Flores-Guzman et al. 2021) (Flores-Guzman 2022) (Flores-Guzman 2023) {Rocha-Tejeda & Flores-Guzman 2024}, both gears present similar catch composition. But in terms of proportions, some species have a higher presence with one gear than another. For factor 3.1, the species evaluated were:

Gray snapper (*L. griseus*), dog snapper (*L. jocu*), lane snapper (*L. synagris*), vermilion snapper (*Rhomboplites aurorubens*), Atlantic goliath grouper (*Epinephelus itajara*), yellowedge grouper (*Hyporthodus flavolimbatus*), black grouper (*Mycteroperca bonaci*), Atlantic sharpnose shark (*Rhizoprionodon terranovae*), bonnethead shark (*Sphyrna tiburo*), southern stingray (*Dasyatis americana*), gafftopsail catfish (*Bagre marinus*), and king mackerel (*Scomberomorus cavalla*).

The grouper and snapper species are included within the red grouper management plan (DOF 2014) and the Mexican Official Norm (NOM-065-SAG/PESC-2014) (DOF 2015). These management tools include a series of measures, such as regulations on the gear (number and size of hooks) and an off-season from February to March (DOF 2014; DOF 2015). But the effectiveness of these measures is unknown, mainly because they are primarily focused on the biology of the red grouper. Regarding bonnethead shark, the species is included within the Official Mexican Norm (NOM-029) that manages the shark fishery in Mexico (DOF 2007); the norm has a series of measures that include specifications on gears, an off-season from May to July in the states of Tamaulipas, Veracruz, and Quintana Roo, and two different off-season periods for the states of Tabasco, Campeche, and Yucatán (May 15 to June 15 and August 1–29, respectively). Further, there is a designation of zones along the country where targeting shark is prohibited (DOF 2023), and shark finning is strictly prohibited (DOF 2007). These off-seasons are applicable for bonnethead and Atlantic sharpnose sharks, because the species are included in the Mexican Official Norm-029 (DOF 2007), in addition to gear specifications and a cap on the number of vessels that can target the species. The rest of the species do not have any specific management strategy.

For at least 30% of the main, targeted species in this fishery: 1) there are some management strategies in place (such as an off-season, gear specifications, and a cap on the number of vessels), but 2) management effectiveness is unknown and the fishery is likely having serious negative impacts on both target and retained species (i.e., the

abundance of targeted species is of moderate concern), and 3) managers have recognized that, for red snapper, biomass remains close to the level where it could achieve the maximum sustainable yield but the current tendency shows a decreasing trend (DOF 2023); therefore, this factor is considered "ineffective" (per line 1 in table 3.1.1 of the Seafood Watch Standard).

Gulf of Mexico - Handlines and hand-operated pole-and-lines

Gulf of Mexico - Longline (deep-set)

Ineffective

In the Gulf of Mexico, authorities manage snappers as part of the multispecies fishery known as "snapper" or "huachinango" (DOF 2012). Currently, only some measures related to limiting the number of fishing licenses and specifications on the gear characteristics (e.g., the number and size of hooks) are in place (DOF 2023). There is no management plan and there are no defined objectives for the target species in the region, and it is unclear if the few regulations (e.g., hook size) are effective: they are based only on red snapper biology, because of its historical importance in volume. For red snapper, two main gears are recognized: the handline/hand-operated lines and bottom longlines. In 2000, INAPESCA researchers suggested that establishing stricter controls on fishing mortality could help recover snapper species biomass {SAGARPA-INAPESCA 2000}. In their report, researchers proposed to limit fish extraction in the Campeche Bank to an annual quota of 1,117 MT (ibid). Also, in 2012, CONAPESCA suggested that total landings for snapper in the Gulf of Mexico should remain under 4,295 MT (82% of the maximum historic catch of 5,252 MT) (DOF 2012), and recommended that stronger management regulations should be in place to reduce fishing mortality by about 30% in Yucatán, Campeche, and Veracruz (DOF 2012). But no new regulations have been established to reduce fishing efforts. The only requirement that U.S. buyers place on Mexican exporters is a commercial size minimum (not an official limit) of 370 mm fork length for red snapper (Brule et al. 2008).

For at least 30% of the main, targeted species in this fishery: 1) there are some management strategies in place (such as gear specifications), but 2) management effectiveness is unknown and the fishery is likely having serious negative impacts on both target and retained species (i.e., the abundance of targeted species is of moderate concern), and 3) managers have recognized that, for red snapper, biomass remains close to the level where it could achieve the maximum sustainable yield but the current tendency shows a decreasing trend (DOF 2023); therefore, this factor is considered "ineffective" (per line 1 in table 3.1.1 of the Seafood Watch Standard).

3.2 Bycatch Strategy

Gulf of Mexico - Handlines and hand-operated pole-and-lines

Moderately Effective

For this factor, and considering the multispecies nature of the fishery where most of the species are retained and/or sold, the score focuses on the strategies that aim to prevent adverse impacts on those bycatch species that are not the main target species and that individually compose less than 5% of the catch but collectively make up more than 5% of the catch composition.

In Mexico, several species are contained within the limits of more general legislation (e.g., finfish fishery license that covers hundreds of species (DOF 2024)). The measures include limits on the number of licenses or specifications on the gears and, in some cases, the existence of a nonfishing season. But it is unclear if these measures are effective or not. For this reason, bycatch strategy is scored "moderately effective" (per line 2 in table 3.2.1 of the Seafood Watch Standard).

Gulf of Mexico - Longline (deep-set)

Moderately Effective

As mentioned in Criterion 2, the snapper fishery in the Gulf of Mexico considers most species caught as associated species (DOF 2002). Producers retain most of the species for commercial purposes. Those species that presented enough proportion of the catch are considered main species and scored within the previous factor (see factor 3.1).

But the most recent catch reports (Flores-Guzman et al. 2021; Flores-Guzman 2022; Flores-Guzman 2023; Rocha-Tejeda & Flores-Guzman 2024} included several other species, such as lane snapper (*Lutjanus synagris*), southern stingray (*Dasyatis americana*), gray snapper (*L. griseus*), and at least seven other species (Flores-Guzman et al. 2021). These are considered non-main species that are still retained and collectively compose around 5% or more of the catch composition, so they are included in this factor. In addition to the taxa identified by the UBM, sea turtles, marine mammals, and seabirds are included.

The grouper and snapper species are included within the red grouper management plan (DOF 2014) and the Mexican Official Norm (NOM-065-SAG/PESC-2014) (DOF 2015). These management tools include a series of measures, such as regulations on the gear (number and size of hooks) and an off-season from February to March. But the effectiveness of these measures is still being determined, mainly because these are primarily focused on the biology of the red grouper. Regarding bonnethead shark, the species is included within the Official Mexican Norm (NOM-029) that manages the shark fishery in Mexico (DOF 2007); the norm has a series of measures that include specifications on gears, an off-season from May to July, the designation of zones along the country where targeting shark is prohibited (DOF 2023), and strictly prohibiting shark finning (DOF 2007).

Regarding sea turtles and marine mammals, the Mexican Official Norm-059 {DOF2010} lists these species groups. In addition, turtles are included in the National Program to Preserve Sea Turtles (CONANP 2022), which comprises a series of measures that include a ban on the possession and commercialization of any species of sea turtles, the creation of sanctuary beaches known to be critical nesting sites, and, in terms of fishing regulations, a ban on the use of drift gillnets, the mandatory use of circular hooks, and a minimum depth to operate longlines within the shark fishery (NOM-029) (DOF b 2010).

Federal legislation (penal code) protects marine mammals, including up to 9 years in prison for those who catch, harm, or transport any protected marine mammal (DOF 2024). The federal wildlife law also prohibits the capture of any marine mammal species, and it only allows it under special research authorizations (DOF b 2022).

Overall, some measures aim to limit the impact on some species that are part of the snapper fishery's bycatch. But the effectiveness of these measures remains uncertain, so this factor is scored "moderately effective" (per line 2 in table 3.2.1 of the Seafood Watch Standard).

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	Impact of Fishing Gear on the Habitat/Substrate	Modifying Factor: Mitigation of Gear Impacts	Ecosystem-based Fisheries Management	Score
Gulf of Mexico - Handlines and hand-operated pole-and-lines	Score: 4	Score: 0	High Concern	Yellow (2.828)
Gulf of Mexico - Handlines and hand-operated pole-and-lines	Score: 4	Score: 0	High Concern	Yellow (2.828)
Gulf of Mexico - Longline (deep-set)	Score: 3	Score: 0	High Concern	Yellow (2.449)

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.*

4.1 Impact of Fishing Gear on the Habitat/Substrate

Gulf of Mexico - Handlines and hand-operated pole-and-lines

Score: 4

Monroy (2010) found that the industrial fleet that targets snappers operates mainly near deep-water coral reefs, such as Los Bajos del Norte, Arrecife Alacranes, Cayo Arenas, and Triangles (Figure 26; squares 1, 2, 4, and 8) (Monroy 2010), and when using handlines, operates on the south regions (Figure 26) (ibid). In addition, when comparing these fishing areas with the substrate map for the region (Figure 28), the industrial fleet operates mainly on a combination of hard and sandy bottoms. In contrast, artisanal operations operate primarily on muddy and sandy bottoms. For these reasons, and considering that fishing gears could have some contact with the bottom, this factor is scored a "4" for hand-operated lines (per lines 1 and 2 in table 4.1.1 of the Seafood Watch Standard).

Supplementary Information

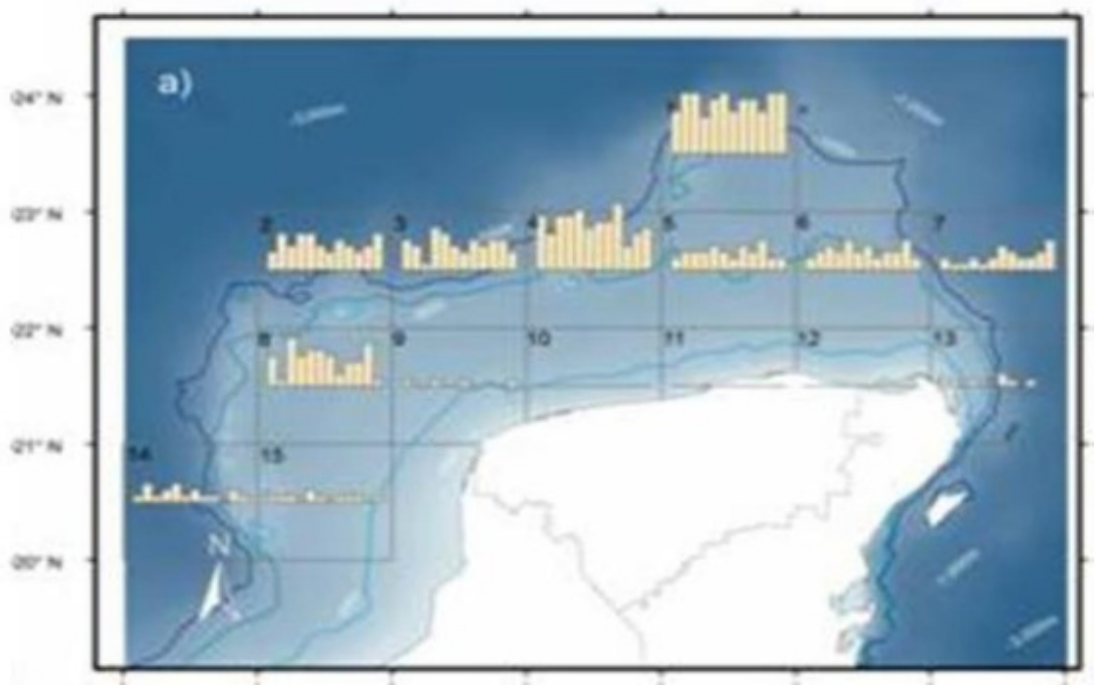


Figure 26: Fishing areas where the industrial fleet targets snapper in the Campeche Bank (taken from Monroy 2010). The bar plots within the boxes show the intensity of fishing (higher bars = greater number of fishing days).

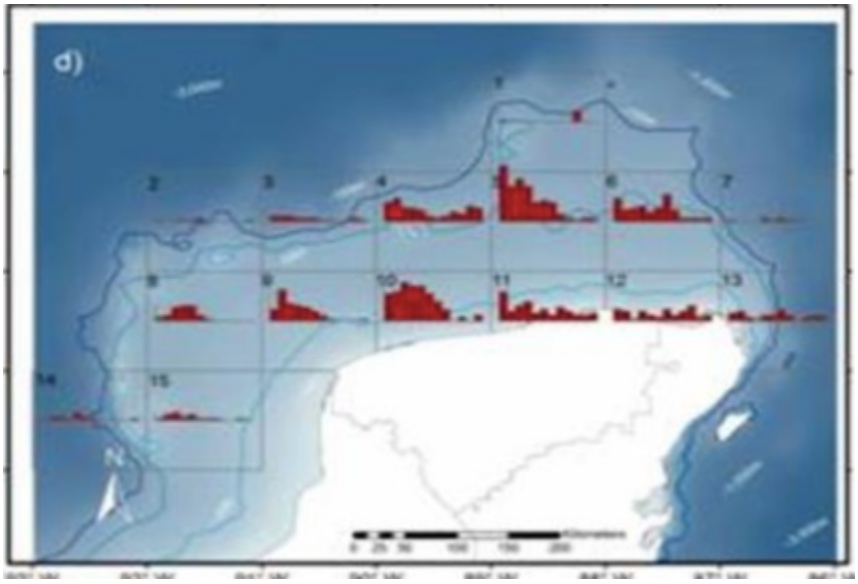


Figure 27: Fishing areas where the artisanal fleet targets snapper in the Campeche Bank using handlines (taken from Monroy 2010). The bar plots within the boxes show the intensity of fishing (higher bars = greater number of fishing days).

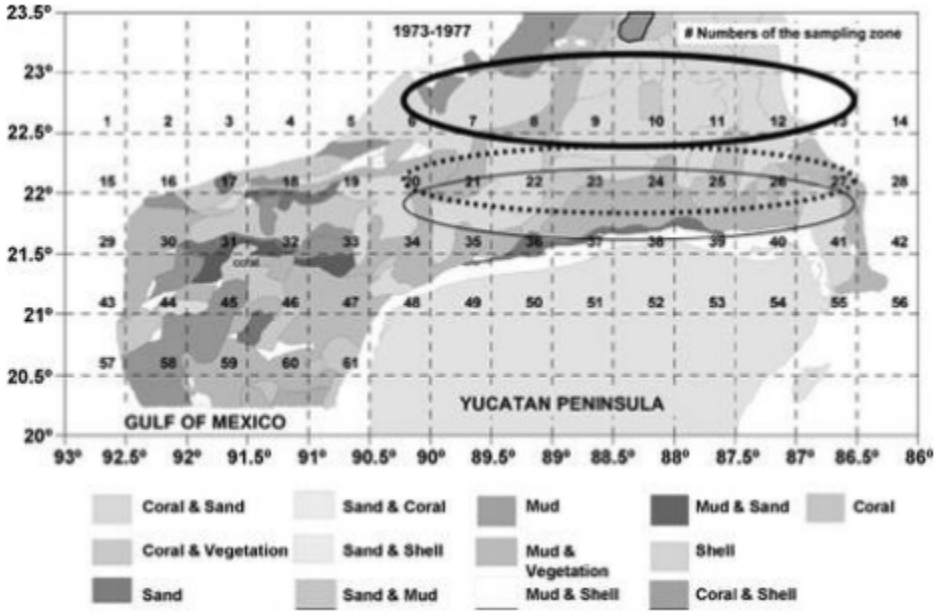


Figure 28: Campeche Bank continental shelf bottom types. Ellipses indicate the gross spatial distribution of red grouper and operation for the industrial fleet (bold line) while the thin line represents the juvenile distribution (small-scale fleet operation zone) (image from Garcia 1980 in (Albañez-Lucero and Arreguin-Sanchez 2009)).

Gulf of Mexico - Longline (deep-set)

Score: 3

Monroy (2010) found that the industrial fleet that targets snappers operates mainly near deep-water coral reefs, such as Los Bajos del Norte, Arrecife Alacranes, Cayo Arenas, and Triangles (see Figure 26; squares 1, 2, 4, and 8) (Monroy 2010). In addition, when comparing these fishing areas with the substrate map for the region (see Figure 28), the industrial fleet operates mainly on a combination of hard and sandy bottoms. According to the author, the adults of the target species are mainly found on sandy bottoms (Monroy 2010), and, considering that it has been reported that the catch comprises mostly adults (ibid), it is estimated that the majority of the fishing occurs on soft substrates. For these reasons, and considering that bottom longlines are used that could have some contact with the bottom and the gear is set mainly on soft bottoms, this factor is scored a "3" for deep-set longlines (per line 1 in table 4.1.1 of the Seafood Watch Standard).

4.2 Modifying Factor: Mitigation of Gear Impacts

Gulf of Mexico - Handlines and hand-operated pole-and-lines

Gulf of Mexico - Longline (deep-set)

Score: 0

No measures are currently in place to limit gear impacts on the habitat, so no mitigation credit, or a score of "0," is awarded (per table 4.2.1 of the Seafood Watch Standard).

4.3 Ecosystem-based Fisheries Management

Gulf of Mexico - Handlines and hand-operated pole-and-lines

Gulf of Mexico - Longline (deep-set)

High Concern

The Campeche Bank has been studied in detail for several reasons: fishing activities, oil exploration, and the region's ecology (Tunnell and Chapman 2000) (Zarco-Perello et al. 2013). The trophic role of snappers was evaluated in two areas of the Gulf of Mexico (southwest coast and the Campeche Bank) (Arreguin-Sanchez and Manickchand-Heileman 1998). Using the Eco-path and Ecosim models, researchers simulated the trophic changes in the areas and measured the perturbations in the ecosystems due to changes in snapper fishing mortality (ibid). The authors concluded that snappers act like top predators in the ecosystems, and play an active role in the energy flow dynamics of both study areas; when the system was perturbed (due to changes in biomass), the impact propagated through the food web to different trophic levels (ibid). Hence, the authors found that the Yucatán shelf was less resilient to changes in the snapper populations (ibid).

Most recently, Pérez-Jiménez et al. (2022) evaluated the potential ecosystem impacts of the snapper fishery in the Gulf of Mexico by using fishing efforts and landing data from

government agencies as well as the fishery improvement project in place for the fishery in Campeche (Fishery Progress 2024). The authors reported on the ecosystem's functional groups and found that most of the energy flows in the ecosystem belong to detritus (59%), while the highest structural index values were found in the epifauna level (Pérez-Jiménez et al. 2022). Overall, the authors reported that the small-scale snapper fishery impacts include interactions with species at risk (e.g., silky shark, scalloped hammerhead, or southern stingray), but the results suggested that the small-scale snapper fishery has a relatively low impact on the ecosystem's structure and function {Perez-Jimenez et al. 2022}. But the authors confirmed that continuous fishery monitoring is necessary to assess the population status and establish effective management strategies (ibid).

Despite this, no spatial management is in place for the snapper fishery in the Gulf of Mexico, and although plans to increase the knowledge of these species have been proposed within the red grouper management plan, which considered red and yellowtail snappers as associated species (DOF 2014), no management plan is in place for the snapper fishery. Other than limited access and regulations on the fishing gear, no spatial management regulations are in place (e.g., no protected areas, off-season, or protection during spawning aggregation season). Because of the lack of policies to protect the ecosystem and the potential for negative food web impacts, ecosystem-based fisheries management is considered a "high concern" (per lines 1a and 1b of table 4.3.1 of the Seafood Watch Standard).

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

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Appendix A: Review Schedule

Updates to the Mexican snapper assessment and ratings were made in September 2024.

The number of recommendations between the 2018 report and the 2024 update changed, based on a review of the most recent information. One change was made:

- The deep-set bottom longline was included as a gear for red snapper.

There were no changes in the overall score; however, some updates were made to the content, as follows:

- Criterion 1: Abundance and fishing mortality for red and yellowtail snappers were scored using recent assessments that were not available during the previous report.
- Criterion 2: Catch composition was updated based on data from a fishery improvement project, which improved the scoring from red (1.0) to yellow (2.644) for hand-operated lines.

Appendix B: Associated Species

Nombre común	Nombre científico
Pez puerco, peje puerco	*Balistes capriscus*
Lengua, brótula, rótula	*Brotula barbata*
Mojarrón	*Calamus bajonado*
Mojarra tigre	*Calamus nodosus*
Tigre, pluma, jorobada	*Calamus proridens*
Jurel amarillo, vaca	*Caranx hippos*
Jurel blanco, ojón	*Caranx latus*
Blanquillo ojo amarillo	*Caulolatilus chrysops*
Blanquillo payaso	*Caulolatilus intermedius*
Raya grande, balá	*Hypanus americanus*
Mero rojo	*Epinephelus morio*
Cabrilla, payaso	*Epinephelus adscensionis*
Seda, pejerrey	*Etelis oculatus*
Boquilla, chac-chi	*Haemulon plumieri*
Cherna prieta	*Hyporthodus nigritus*
Pargo criollo, lunajero, chacalcay	*Lutjanus analis*
Pargo	*Lutjanus apodus*
Cubera, pargo, colmillón	*Lutjanus cyanopterus*
Pargo mulato, parguete	*Lutjanus griseus*
Pargo perro, caballera	*Lutjanus jocu*
Rubia, villajaiba	*Lutjanus synagris*
Negrillo	*Mycteroperca bonaci*
Cabrilla	*Mycteroperca interstitialis*
Abadejo	*Mycteroperca microlepis*
Abadejo garropa	*Mycteroperca phenax*
Canané	*Ocyurus chrysurus*
Cobia	*Rachycentron canadum*
Cazón tripa, ley	*Rhizoprionodon terraenovae*
Besugo	*Rhomboplites aurorubens*
Esmedregal	*Seriola dumerili*
Esmedregal	*Seriola rivoliana*
Medregal rayado	*Seriola zonata*
Barracuda, picuda	*Sphyraena barracuda*
Cornuda, martillo	*Sphyrna lewini*
Cornuda cabeza de pala	*Sphyrna tiburo*
Cazón cubano	*Squalus cubensis*

Figure 29: List of associated species to the snapper fishery in the Gulf of Mexico (DOF 2023).