Monterey Bay Aquarium Seafood Watch

Environmental sustainability assessment of wild-caught Bluestriped snapper from Hawaii caught using handlines and surrounding nets

Species:	Bluestriped snapper *(Lutjanus kasmira)*
Location:	Hawaii: Eastern Central Pacific
Gear:	Inshore Handline, Surrounding Net & Gillnet (combined)
Type:	Wild Caught
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Assessed using Seafood Watch Fisheries Standard v4

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About Seafood Watch

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

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

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

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

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

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

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

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

Guiding Principles

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

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

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

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

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

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

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

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

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

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

Summary

This report assesses the fisheries for a nonnative Hawaii species: bluestriped snapper (*Lutjanus kasmira*), locally referred to as ta'ape. We use the Hawaiian name throughout this report. Ta'ape is primarily caught in small-scale net and handline fisheries. Because seines and gillnets account for the majority of net landings of ta'ape, and catch composition data are aggregated as "nets," the two gears are combined into a single rating. The gillnets used in this fishery are primarily surrounding gillnets, with a small portion of landings occurring in stationary gillnets, referred to as "lay nets" in Hawaii.

Ta'ape is native to the Indo-Pacific but was intentionally introduced to Hawaii during the 1950s. Ta'ape is a reef-associated species typically found near shore in shallow waters, though it can be found to depths of 265 m. Following introduction, the ta'ape population grew rapidly and is now found throughout the main and Northwestern Hawaiian Islands. There are anecdotal concerns that this species is threatening native Hawaiian species, but to date there is no evidence of negative ecological interactions. Because ta'ape is nonnative, abundance and fishing mortality are assessed as very low and low concern, respectively.

Ta'ape forms aggregations and may at times be directly targeted by fishers, but is also caught in fisheries directed at other Hawaiian fish. The inshore handline and net fisheries target a mix of various reef fish. All fishing methods result in low catches of nontarget species. Other species regularly caught alongside ta'ape in the handline fishery include bigeye scad (*Selar crumenophthalmus*; Hawaiian name: akule), and bigscale soldierfish (*Myripristis berndti*; Hawaiian name: 'u'u or menpachi). 'U'u and yellowfin goatfish (*Mulloidichthys vanicolensis*; Hawaiian name: weke-ula) are regularly caught in inshore net fisheries with ta'ape. As with ta'ape, we refer to these species by their Hawaiian names in this report. The endangered Hawaiian monk seal is included as a main species in the net fishery because of entanglement in inshore gillnets, but mortality from the fishery is of low conservation concern.

Inshore Hawaiian fisheries are particularly difficult to assess and manage due to their scale and diversity. Species assessed in this report are managed in federal waters by the Western Pacific Region Fishery Management Council under the Hawaii Ecosystem Plan and in state waters by the Hawaii Division of Aquatic Resources. Ta'ape, akule, 'u'u, and weke-ula are managed as ecosystem component species (ECS). The primary management tools for inshore reef fisheries include gear restrictions, spatial closures, and community comanagement, but the effectiveness of these measures is unknown. Management measures do not exacerbate concern with nonnative ta'ape.

Handlines and seine nets have a low impact on bottom habitats. Local spatial closures and restricted gillnet usage in many areas, combined with the massive Papahānaumokuākea Marine National Monument, mitigate concerns about ecosystem impacts. The creation of marine protected areas like Papahānaumokuākea is broadly considered an effective ecosystem-based management strategy for reef fisheries, but there is limited evidence regarding the effectiveness relative to the ecology of all main and retained species.

Final Seafood Recommendations

SPECIES | FISHERY	C 1 TARGET SPECIES	C 2 OTHER SPECIES	C 3 MANAGEMENT	C 4 HABITAT	OVERALL	VOLUME (MT) YEAR
Bluestriped snapper | Eastern Central Pacific | United States | Hawaii | Handlines and hand-operated pole-and-lines | inshore	5.000	3.318	3.000	3.674	**Best Choice (3.677)**	3 (MT) -4
Bluestriped snapper | Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore	5.000	2.236	3.000	3.240	**Best Choice (3.229)**	12 (MT) -4

The production volume is the annual average from 2018-2022.

Summary

Bluestriped snapper caught in Hawaii with nets is rated Green or Best Choice. The harvest of bluestriped snapper is not an ecological concern in Hawaiian waters because it is a nonnative species. Bycatch is a moderate concern because of potential interactions with the endangered Hawaiian monk seal. The impact of net gears is of low concern because seine nets are set over sandy bottoms. Some policies are in place to protect the ecosystem, but limited information is available on the effectiveness of these measures for all main and retained species.

Bluestriped snapper caught in the nearshore waters of Hawaii with handlines and hand-operated pole-and-lines is also rated Green. The harvest of bluestriped snapper is not an ecological concern in Hawaiian waters because it is a nonnative species. There are no species of concern encountered in the nearshore handline fishery, and the gear has minimal habitat impacts. Some policies are in place to protect the ecosystem, but limited information is available on the effectiveness of these measures for all main and retained species.

Scoring Guide

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

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

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

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

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

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

Introduction

Scope of the analysis and ensuing recommendation

This report assesses the nonnative Hawaiian fish species, bluestriped snapper (*Lutjanus kasmira*), known locally as ta'ape. Ta'ape is primarily caught in nearshore waters with seine nets and handlines. Because catch composition data for net fisheries are aggregated, seine nets and gillnets are combined into a single rating.

Species Overview

Ta'ape is native to the Indo-Pacific region, from the Red Sea and east Africa to the Marquesas and Line Islands, north to southern Japan, and south to Australia, and was introduced into Hawaii as part of a fishery enhancement program between 1955 and 1961. The species is found in waters from 3 to 265 m deep; it forms large aggregations and is found in areas such as shallow lagoons and coral reefs and on outer reef slopes (Froese and Pauly 2015). Ta'ape experienced rapid population growth after its introduction into Hawaiian waters. It is now found throughout the main and Northwestern Hawaiian Islands, with a total range of 2,500 km (Gaither et al. 2012)(Gaither et al. 2013). Since its introduction, this snapper was not a popular food fish, and there were concerns that it was threatening native Hawaiian species (Gaither et al. 2012); however, to date, there is no evidence of negative ecological interactions (Parrish et al. 2000)(Schumacher 2011). There have been efforts in recent years by conservation groups and chefs to increase the local consumption of ta'ape (e.g., see https://www.conservation.org/stories/what-is-the-taape).

Currently, ta'ape is largely caught alongside reef-associated species in nearshore fisheries that are multigear and multispecies in nature (Grafeld et al. 2017). Fishers may engage in commercial and noncommercial fishing in a single trip, making it difficult to separate nearshore fisheries into sectors (Friedlander et al. 2014). In Hawaii, the term noncommercial fisheries refers to subsistence and cultural fisheries. Ta'ape caught in the noncommercial sector is primarily targeted with hook-and-line and spears, and in fishing tournaments that target introduced species. Ta'ape is typically targeted by noncommercial fishers at night, and data for these fisheries are based on daytime-only surveys, so the proportion of commercial to noncommercial catch by gear is uncertain. The Western Pacific Regional Fishery Management Council (WPRFMC) manages ta'ape under the Hawaii Ecosystem Plan (WPRFMC 2009), and the Hawaii Division of Aquatic Resources (HDAR) manages the fishery in state waters. Under legislation passed in 1994, a process for creating community-based subsistence fishing areas (CBSFA) was established, allowing for comanagement of fisheries at the local level, but full implementation of CBSFAs has been hindered by various challenges (Friedlander et al. 2014).

Production Statistics

In Hawaii in 2021, ta'ape ranked fourth in the top ten landed species (by pound) in ecosystem component species (ECS) fisheries (Table 1) (WPRFMC 2022). Ta'ape is caught with several gears, including handlines, casting (fishing using a pole and casting reel; i.e., jigging, fly-fishing), divers/spears, various nets (e.g., gillnet, seines, lift net, bag net), and traps (HDAR 2022). Between 2012 and 2021, an annual average of 46,607 ta'ape were caught in Hawaii commercial fisheries, and Hawaiian fishers caught more ta'ape in 2020 than any year on record (WPRFMC 2022). But landings have generally been decreasing since the late 1990s, except during 2022. The total ex-vessel value for ta'ape catch was $63,009 and $69,584 in 2021

and 2022, respectively, and this value nearly doubled to $127,274 in 2022 (HDAR 2022). The majority of the landings come from net and hook-and-line fisheries (Figure 1).

Table 1: Top ten landed species (lb) in Hawaii ECS fisheries in 2021 (WPRFMC 2022).

Species	**No. Licenses**	**Trips**	**Catch (lb)**
Selar crumenophthalmus (akule)	174	1,295	231,161
Decapterus macarellus (ʻopelu)	93	957	83,055
Myripristis spp. (menpachi)	138	753	47,706
Lutjanus kasmira (taʻape)	142	702	30,937
Acanthurus dussumieri (palani)	42	350	24,506
Parrotfish spp. (uhu)	44	418	24,090
Cellana spp. (opihi)	14	222	16,423
Mulloidichthys vanicolensis (red weke)	41	159	12,609
Naso annulatus (kala)	23	123	12,486
Portunus sanguinolentus (kuahonu crab)	3	99	11,876

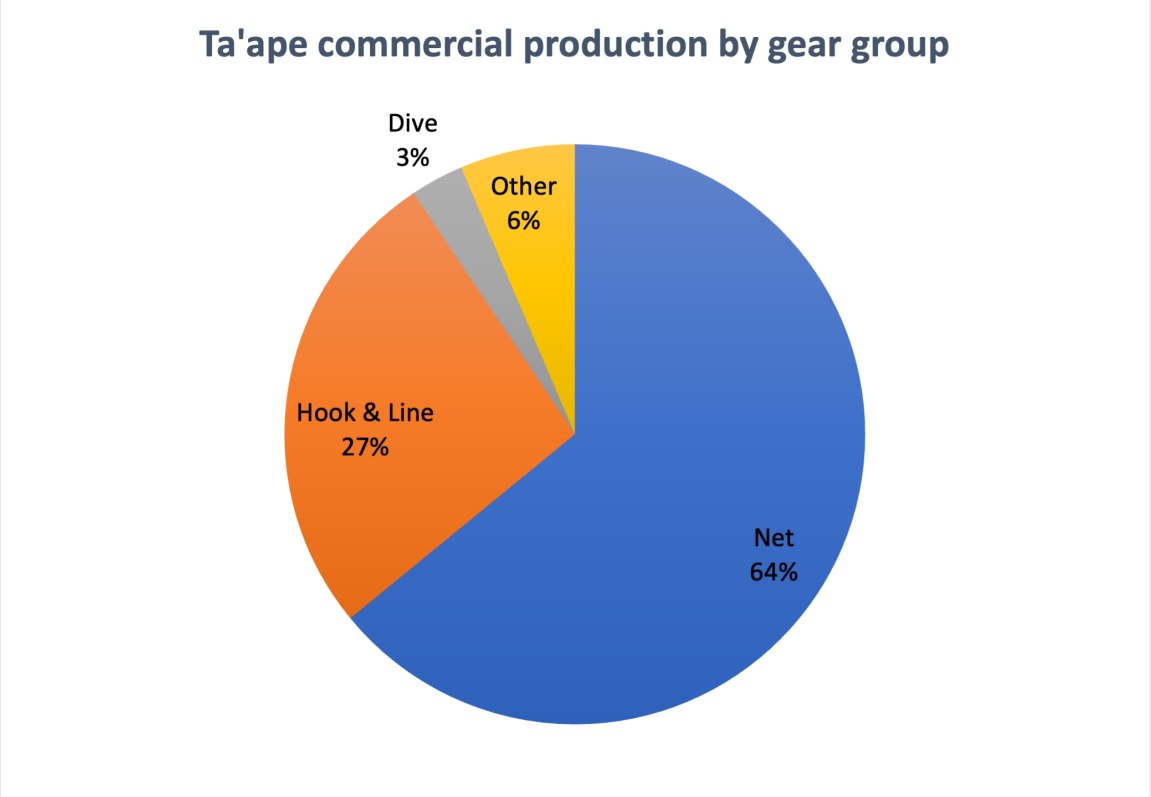

Figure 1: Proportion of ta'ape commercial catch by gear grouping from 2013 to 2022. Production data from (HDAR 2022).

Importance to the US/North American market.

Ta'ape is primarily consumed locally. Nearshore fisheries in Hawaii likely contribute to food security and are culturally important for local communities (Grafeld et al. 2017), and this species' affordability and relatively small size offers an affordable option for local fresh fish (pers. comm., Bryan Ishida, HDAR, 2023).

Common and market names.

Ta'ape is also known as bluestriped snapper. Vernacular names include bluebanded snapper, savani, funai, and yellow and blue seaperch (FDA 2022).

Primary product forms

Ta'ape is sold in fresh and frozen forms.

Assessment

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

Criterion 1: Impacts on the species under assessment

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

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

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

Guiding principles

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

Criterion 1 Summary

BLUESTRIPED SNAPPER			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Eastern Central Pacific | United States | Hawaii | Handlines and hand-operated pole-and-lines | inshore	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

Criterion 1 Assessments

SCORING GUIDELINES

Factor 1.1 - Abundance

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

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

vulnerable.

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

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

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

Bluestriped snapper

Factor 1.1 - Abundance

Eastern Central Pacific | United States | Hawaii | Handlines and hand-operated pole-and-lines | inshore
Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore

Very Low Concern
Ta'ape was introduced to Hawaii from the Marquesas Islands in the central Pacific Ocean in the 1950s (Schumacher 2011). Because this species is nonnative to Hawaiian waters, we have awarded a score of very low concern for abundance.

Factor 1.2 - Fishing Mortality

Eastern Central Pacific | United States | Hawaii | Handlines and hand-operated pole-and-lines | inshore
Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore

Low Concern
Ta'ape is both targeted and caught in fisheries aimed at other species. In 2021, there were 702 trips for ta'ape that caught a total of 30,937 lbs (WPRFMC 2022). A total of 62,198 ta'ape were caught in 2021, an increase of 33.5% from the 10-year average (WPRFMC 2022). Because this species is nonnative, fishing mortality is assessed a low concern.

Criterion 2: Impacts on Other Species

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

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

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

Guiding principles

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

Criterion 2 Summary

Criterion 2 score(s) overview

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

BLUESTRIPED SNAPPER			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Eastern Central Pacific | United States | Hawaii | Handlines and hand-operated pole-and-lines | inshore	3.318	1.000: < 100%	Green (3.318)
Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore	2.236	1.000: < 100%	Yellow (2.236)

Criterion 2 main assessed species/stocks table(s)

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

EASTERN CENTRAL PACIFIC | UNITED STATES | HAWAII | HANDLINES AND HAND-OPERATED POLE-AND-LINES | INSHORE			
SUB SCORE: 3.318	DISCARD RATE: 1.000	**SCORE: 3.318**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Squirrelfish	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)
Bigeye scad	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Bluestriped snapper	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

EASTERN CENTRAL PACIFIC | UNITED STATES | HAWAII | SURROUNDING NETS | GILLNETS AND ENTANGLING NETS | INSHORE			
SUB SCORE: 2.236	DISCARD RATE: 1.000	**SCORE: 2.236**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Hawaiian monk seal	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Squirrelfish	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)
Yellowfin goatfish	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Bluestriped snapper	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

Catch data presented within this report are based on trips in which ta'ape constitutes at least 5% of the overall catch in the inshore handline and net fisheries. The species assessed under Criterion 2 were selected based on their occurrence in logbook data for fishing trips in which ta'ape made up at least 5% of the catch. SFW obtained this logbook data from the Hawaii Department of Aquatic Resources (HDAR). Because of the multispecies nature of inshore fisheries for nonmanagement unit species (non-MUS), combined with low discard rates, the bycatch levels in the fisheries under assessment are considered relatively low (WPRFMC 2022). The Hawaiian monk seal is included in the net fishery because of its endangered status and known interactions with inshore gillnets (Carretta et al. 2022).

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

Bigeye scad

Factor 2.1 - Abundance

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

Moderate Concern

Akule or bigeye scad (*Selar crumenophthalmus*) was classified as an ecosystem component species (ECS) in 2019, which means that stock assessments are no longer required but catches are still closely monitored (WPRFMC 2022). Researchers have recently compared biomass estimates from aerial surveys with commercial catch per unit effort (CPUE) data and determined that the latter are adequate to track abundance trends (WPRFMC 2015b)(Wiley et al. 2021). The annual commercial CPUE was stable from 2007 to 2014 (WPRFMC 2015b), but we were unable to find an update on this trend. Like other coastal pelagics, akule abundance is affected by high recruitment variability, which in turn affects trends in commercial catch (WPRFMC 2015b). In the absence of recent reliable abundance estimates, we score this factor based on the International Union for the Conservation of Nature (IUCN) assessment. Akule is assessed by the IUCN as "Least Concern" because the species is widespread, common, and locally abundant, and there are no known major threats (Smith-Vaniz et al. 2015). Therefore, we score abundance a moderate concern.

Factor 2.2 - Fishing Mortality

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

Low Concern

In 2021, there were 1,295 trips for akule that caught a total of 231,161 lb (WPRFMC 2022), down from 1,558 trips and 267,551 lb in 2020 (WPRFMC 2021a). Over the last 3 years, on trips in which ta'ape constituted at least 5% of the catch in the inshore handline fishery, akule made up approximately 13% of the catch (HDAR 2022), but the number of akule caught in the fishery under assessment is negligible compared to other fisheries. For example, in 2021, Hawaiian commercial fishers landed a total of 231,161 lb of akule (WPRFMC 2022), while the fishery under assessment caught 5,691 fish (HDAR 2022). In Hawaii, the minimum size limit for akule is 8.5", a length that corresponds to an average total weight of 114 g (0.25 lb) (Espino-Barr et al. 2016). Using an average weight of 0.25 lb, an estimated 1,422 lb of akule were caught by the fishery under assessment, representing <1% of the reported landings of this species in 2021. We score this factor a low concern because the fishery under assessment is not a substantial contributor to fishing mortality.

Bluestriped snapper

Factor 2.3 - Discard Rate/Landings

Eastern Central Pacific | United States | Hawaii | Handlines and hand-operated pole-and-lines | inshore
Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore

< 100%

Nearly all fish caught in the reef fish fisheries are retained and eaten, so discards are minimal. When discards do occur, they are due to fish being below the minimum size limit or toxicity concerns (WPRFMC 2009). Discard rates in Hawaiian inshore net fisheries are primarily driven by the releases of akule and ʻopelu in fisheries targeting those species; the discard rate for those fisheries ranged from 0.04% to 20.3% from 2002 to 2021 (WPRFMC 2022). The number of fish reported to be released or discarded in Hawaiian handline fisheries is generally <2% of the total retained catch (WPRFMC 2022). Globally, handline fisheries have discard rates <10% (Pérez Roda et al. 2019). Ta'ape is primarily caught with artificial lures; frozen squid is considered a secondary bait, and the specific amount of lure and bait use is unknown (pers. comm., Bryan Ishida, HDAR 2023). Therefore, we have awarded a discard rate score of <100%.

Hawaiian monk seal

Factor 2.1 - Abundance

Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore

High Concern

Hawaiian nearshore gillnets are known to lethally entangle Hawaiian monk seal, but it is not possible to determine if entanglements occur in gillnets from the commercial fishery (Carretta et al. 2022). We have included this species because of its potential interaction with the fishery under assessment. The Hawaiian monk seal is listed as "Endangered" under the Endangered Species Act (ESA) (Carretta et al. 2022). The current population is estimated at 1,437 (95% CI, 1,369–1,532) and has grown at an average rate of 2% from 2013 to 2019 (Carretta et al. 2022). Abundance for this species is scored a high concern because of its ESA "Endangered" listing.

Factor 2.2 - Fishing Mortality

Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore

Low Concern

The Hawaiian inshore gillnet fishery is a Category III fishery because of historical interactions with bottlenose dolphin and spinner dolphin (NOAA 2022), but there has been an increasing number of Hawaiian monk seal entanglements in nearshore gillnets in recent years (e.g., there were two confirmed and one suspected monk seal mortalities in nearshore gillnet gear in 2019) (Carretta et al. 2022). The total annual fishing mortality is ≥2.0, with inshore gillnet gear accounting for at least 1.8 takes on average. The potential biological removal (PBR) for this species is 4.8. Because the PBR is not exceeded and the inshore gillnet fishery accounts for <50% of PBR, this factor is scored a low concern.

Squirrelfish

Factor 2.1 - Abundance

Eastern Central Pacific | United States | Hawaii | Handlines and hand-operated pole-and-lines | inshore
Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore

Low Concern
'U'u is one of the 27 reef-associated fish species assessed under an age-structured population model (Nadon 2017). The latest stock assessment indicated that 'u'u had a spawning potential ratio of 59% (the ratio of current spawning biomass relative to an unfished level) in 2016, which suggests that the species is not overfished (overfished limit: SPR = 30%) (Nadon 2017). Multiple species of soldierfishes are reported in the commercial dataset, which prevents the use of catch data in the stock analysis, but abundance estimates are available from fishery-independent surveys (Nadon 2017). Because the stock is not overfished but the stock assessment is >5 years old, we have scored this factor a low concern.

Factor 2.2 - Fishing Mortality

Eastern Central Pacific | United States | Hawaii | Handlines and hand-operated pole-and-lines | inshore
Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore

Moderate Concern
In 2021, there were 753 trips for 'u'u that caught a total of 47,706 lb (WPRFMC 2022), down from 862 trips and 60,518 lb in 2020 (WPRFMC 2021a). Over the last 3 years, on trips in which ta'ape constituted at least 5% of the catch in the inshore handline fishery, 'u'u made up approximately 40% of the catch in the inshore handline fishery and 6% of the catch in the net fishery (HDAR 2022). Although the latest stock assessment shows that 'u'u is not undergoing overfishing (F/F_{30} = 0.4), commercial catch data are not reported to the species level. Given this uncertainty, we score this factor a moderate concern.

Yellowfin goatfish

Factor 2.1 - Abundance

Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore

Low Concern
Weke-ula is an Ecosystem Component Species (ECS) for which catch data are regularly monitored by DAR (WPRFMC 2022), and it is one of the 27 coral reef species under an age-structured population model (Nadon 2017). The latest stock assessment indicated that yellowfin goatfish had a spawning potential ratio of 0.55 (the ratio of current spawning biomass relative to an unfished level) in 2016, which suggests that the species is at a healthy abundance (Nadon 2017). Because the stock is not overfished but the stock assessment is >5 years old, we have scored this factor a low concern.

Factor 2.2 - Fishing Mortality

Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore

Low Concern

In 2021, there were 159 trips for weke-ula that caught a total of 12,609 lb (WPRFMC 2022), down from 191 trips and 20,615 lb in 2020 (WPRFMC 2021a). Over the last 3 years, on trips in which ta'ape constituted at least 5% of the catch in the net fishery, weke-ula made up approximately 20% of the catch (HDAR 2022). The latest stock assessment shows that weke-ula is not undergoing overfishing (F/F_{30} = 0.4) (Nadon 2017). Therefore, we score this factor a low concern.

Factor 2.3 - Discard Rate/Landings

Eastern Central Pacific | United States | Hawaii | Handlines and hand-operated pole-and-lines | inshore
Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore

< 100%

Nearly all fish caught in the reef fish fisheries are retained and eaten, so discards are minimal. When discards do occur, they are due to fish being below the minimum size limit or toxicity concerns (WPRFMC 2009). Discard rates in Hawaiian inshore net fisheries are primarily driven by the releases of akule and ʻopelu in fisheries targeting those species; the discard rate for those fisheries ranged from 0.04% to 20.3% from 2002 to 2021 (WPRFMC 2022). The number of fish reported to be released or discarded in Hawaiian handline fisheries is generally <2% of the total retained catch (WPRFMC 2022). Globally, handline fisheries have discard rates <10% (Pérez Roda et al. 2019). Ta'ape is primarily caught with artificial lures; frozen squid is considered a secondary bait, and the specific amount of lure and bait use is unknown (pers. comm., Bryan Ishida, HDAR 2023). Therefore, we have awarded a discard rate score of <100%.

Criterion 3: Management Effectiveness

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

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

The Criterion 3 rating is determined as follows:

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

Rating is Critical if Management Strategy and Implementation is Critical.

Guiding principle

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

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

Criterion 3 Summary

FISHERY	MANAGEMENT STRATEGY	BYCATCH STRATEGY	DATA COLLECTION AND ANALYSIS	ENFORCEMENT	INCLUSION	SCORE
Eastern Central Pacific | United States | Hawaii | Handlines and hand-operated pole-and-lines | inshore	Moderately Effective	Highly effective	Highly effective	Moderately Effective	Highly effective	**Yellow (3.000)**
Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore	Moderately Effective	Moderately Effective	Highly effective	Moderately Effective	Highly effective	**Yellow (3.000)**

Criterion 3 Assessment

SCORING GUIDELINES

Factor 3.1 - Management Strategy and Implementation

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

Factor 3.2 - Bycatch Strategy

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

Factor 3.3 - Scientific Research and Monitoring

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

Factor 3.4 - Enforcement of Management Regulations

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

Factor 3.5 - Stakeholder Inclusion

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

Factor 3.1 - Management Strategy And Implementation

Eastern Central Pacific | United States | Hawaii | Handlines and hand-operated pole-and-lines | inshore
Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore

Moderately Effective
HDAR is responsible for fisheries management within state waters; commercial fishing in state waters is subject to gear restrictions, seasonal closures, spatial closures, and license requirements (HDAR 2022d). There are 11 Marine Life Conservations Districts (MLCDs), which "are designed to conserve and replenish marine resources" within nearshore waters (HDAR 2022e).

Ta'ape is managed as an ecosystem component species (ECS); such species are not subject to catch limits and accountability measures (WPRFMC 2018), but ta'ape is a priority species that is regularly monitored by HDAR (WPRFMC 2022). Ta'ape is a nonnative to the Hawaiian Islands that was introduced to Hawaii as part of a fishery enhancement program between 1955 and 1961, and eradication at this point would be extremely difficult and costly (Fukunaga et al. 2017). Since its introduction, there have been concerns that it threatens native Hawaiian species (Gaither et al. 2012); however, to date, there is no evidence of strong negative ecological effects (Parrish et al. 2000)(Schumacher 2011)(Jones et al. 2020). There are no catch or size limits for ta'ape, and management does not exacerbate concern with nonnative ta'ape, but there is no known plan in place to reduce or control the spread of nonnative species (other than fishing and a prohibition on the release of any live nonnative fish into any waters in Hawaiian waters) (HDAR 2022b). Other main and retained species meet the threshold for moderately effective management because the effectiveness is unknown and it is unlikely that the fishery is having serious negative impacts. For these reasons, we score this factor as moderately effective; management of other main and retained species is discussed below.

Justification:

Handline Fishery

- 'U'u is managed as an ECS and is assessed against SPR-based reference points, and the stock assessment provides a range of catch limits and an overfishing limit of F at SPR = 30% (Nadon 2017), but there are currently no annual catch limits in place.
- Akule is managed in federal waters by the WPRFMC under the Hawaii Fishery Ecosystem Plan (WPRFMC 2009). In Hawaii state waters, the Hawaii Division of Aquatic Resources (DAR) manages the species. All fishing takes place in the main Hawaiian Islands. The Northwest Hawaiian Islands (NWHI) were declared a National Monument and closed to fishing in 2010. In Hawaii state waters, where most fishing for these species occurs, there are minimal regulations in place. Permits are required and there are regional restrictions (HDAR 2022b). Recent population assessments have not been conducted for this species, no abundance targets/conservation goals have been established, and it is unclear if current management measures are sufficient to sustain akule populations, but the instruments to ensure effective implementation of management exist.

Net Fishery

- Weke-ula is managed as an ECS and is assessed against SPR-based reference points, and the stock assessment provides a range of catch limits and an overfishing limit of F at SPR = 30% (Nadon 2017). There is a statewide minimum size limit, but no catch limit other than in Maui waters (HDAR 2022b).
- ʻU'u (see above).

Table 2. Permitted and prohibited fishing activities in selected state waters of Hawaii (HDAR 2022b).

Area	Permitted	Prohibited
All state waters		Unlawful to take akule under 8.5 inches with net during July–October; or possess or sell more than 200 lb of akule less than 8.5 inches per day during July–October.
Waimea Bay	To take with legal nets and possess akule during November and December.	To snag any akule while fishing from the shore of Waimea Bay.
The Kealakekua Bay Marine Life Conservation District	Within Subzone B only, to fish for, take, or possess any finfish with or by the use of hook-and-line and thrownet, provided that any legal fishing device or method except traps may be used for the taking of akule, ʻopelu, and crustaceans.	
The Old Kona Airport Marine Life Conservation District	To fish for, take, possess, or remove akule by handline at night, and ʻōpelu by lift or ʻōpelu net method using bait or chum for commercial or home consumption.	
Kailua Bay	Within Zone B only, to use nets of mesh size not less than 3 inches to take fish, or akule net to take akule only, provided that nets shall not be in the water between sunset and sunrise, or remain in the water except during active retrieval or unloading of fish from that net.	
Hanamāʻulu Bay Fisheries Management Area		To take or possess more than 75 akule or more than 5 mullet per person per day in Zone 1.
Miloliʻi Community-Based Subsistence Fishing Area	To fish for akule using legal nets.	To take or possess any menpachi from April through June. To spear any uhu, pākuʻikuʻi, weke ʻula, moano kea, or menpachi within Puakai'a Miloli'i.
Nāwiliwili Harbor, Port Allen		To take or possess more than 75 akule per person per day.

Honolua-Mokulē'ia Bay Marine Life Conservation District	With a permit, to bag and remove akule netted outside of the District provided the net is moved only over the sandy bottom areas of the District, and to engage in activities otherwise prohibited by law for scientific, propagation or other purposes.	

Factor 3.2 - Bycatch Strategy

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

Highly effective

Fishers are required to fill out logbooks that record information on fishing effort, fishing participants, fishing locations, number and species of fish caught, whether fish were kept or released, the condition of any released fish, and interactions with protected species such as sea turtles, Hawaiian monk seal, other marine mammals, and seabirds (HDAR 2022b)(HDAR 2022d). Bycatch in the Hawaiian inshore handline fisheries is less than 2% (WPRFMC 2022). Other measures that have been implemented to reduce bycatch include the prohibition of nonselective gears such as bottom trawls, drift gillnets, and longlines (in state waters) (HDAR 2022b), as well as outreach and training to fishers on how to reduce bycatch and bycatch mortality (WPRFMC 2009). Because bycatch measures are in place and there are no significant bycatch concerns in this fishery, we have rated this factor highly effective.

Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore

Moderately Effective

The net fishery is managed with numerous requirements and restrictions (see details in the Justification section) that are expected to minimize the impacts of the fishery on bycatch species. The inshore gillnet fishery is classified as a Category III fishery, based on rare interactions with a Hawaiian monk seal in 1976, a bottlenose dolphin in 1991, and a spinner dolphin in 1991 (NOAA 2022). Although nine monk seals were killed by gillnet gear from 2015 to 2019, it was not possible to link the nets to commercial fisheries (NOAA 2022)(Carretta et al. 2022).

Fishers are required to fill out logbooks that record information on fishing effort, fishing participants, fishing locations, number and species of fish caught, whether fish were kept or released, the condition of any released fish, and interactions with protected species such as sea turtles, Hawaiian monk seal, other marine mammals, and seabirds (HDAR 2022b)(HDAR 2022d). Other measures that have been implemented to reduce bycatch include the prohibition of nonselective gears such as bottom trawls, drift gillnets, and longlines (in state waters) (HDAR 2022b), as well as outreach and training to fishers on how to reduce bycatch and bycatch mortality (WPRFMC 2009).

There are mitigation measures to reduce monk seal entanglement and local prohibitions on the gear (e.g., gillnets are prohibited from all waters surrounding the island of Maui (HDA R 2022d)), but the effectiveness of these measures is uncertain, given continued entanglement. Therefore, we have rated this factor moderately effective.

Justification:

Gillnet Requirements (HDAR 2022b)

- Minimum size 2-3/4 inch stretched mesh; maximum net size 125 feet long and 7 feet high.
- Lay nets may not be used during the period from 1/2 hour after sunset to 1/2 hour before sunrise.
- Unlawful to fish with more than one lay net at a time.
- Unlawful to leave a lay net unattended for more than 1/2 hour.
- Lay nets must be inspected completely within 2 hours after the beginning of the set. All threatened, endangered, prohibited, or unwanted species must be released.
- Lay nets may not be used for more than 4 hours during any set. After the end of one set, the same lay net may not be used again within 24 hours.
- The same person may not set another lay net within 24 hours after the end of a set.
- Lay nets may not be used in water more than 25 feet deep, except that commercial marine licensees may use lay nets in water up to 80 feet deep.
- Unlawful to use a lay net within 250 feet of another lay net.
- Multipanel lay nets are prohibited.
- Unlawful to retrieve a lay net in a manner that causes any stony coral to break from its attachment to the bottom, or to break into smaller pieces. No stony coral may be brought to the surface in the net.
- Unlawful to discard, abandon, or leave any lay net, or portion thereof, in the water for longer than 4 hours.
- Lay nets may not be used in freshwater streams or stream mouths.

Seine Net Requirements (HDAR 2022b)

- Minimum size for nets generally 2 inch stretched mesh.
- Unlawful to leave any gillnet unattended without visually inspecting the net every 2 hours and releasing or removing any undersized, illegal, or unwanted catch.
- Unlawful to leave any gillnet in the water for a period of more than 4 hours in any 24-hour period.

Factor 3.3 - Scientific Data Collection and Analysis

Eastern Central Pacific | United States | Hawaii | Handlines and hand-operated pole-and-lines | inshore
Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore

Highly effective
There have been recent studies aimed at understanding the current distribution and abundance of ta'ape in the Hawaiian archipelago. One study examined fish community structure on artificial reef sites, with an emphasis on the potential impact of ta'ape occurrence and density (Jones et al. 2020). The study found no strong evidence of competition between ta'ape and native species at adult life stages, nor were there detectable changes to fish community with increases in ta'ape abundance on artificial reefs in Hawaii (Jones et al. 2020). In addition, researchers investigated the distribution and potential associations of ta'ape with other reef fish species in the Northwestern Hawaiian Islands (Fukunaga et al. 2017). The abundance and geographic range of this nonnative species are monitored. Observer programs are not in place for this fishery, but bycatch rates are quite low (WPRFMC 2022) and fishers are required to record information on the number and species of fish caught (HDAR 2022b). Therefore, we have awarded a highly effective score.

Factor 3.4 - Enforcement of and Compliance with Management Regulations

Eastern Central Pacific | United States | Hawaii | Handlines and hand-operated pole-and-lines | inshore
Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore

Moderately Effective
HDAR requires all commercial fishers who fish in state waters to submit monthly logbooks, state catches are monitored through the commercial fishing reporting system, and noncommercial catch estimates are provided via the Hawaii Marine Recreational Fishing Survey (HMRFS) (WPRFMC 2021b). There is a Division of Conservation and Resource Enforcement within the Hawaii Department of Land and Natural Resources that is responsible for enforcement of state laws, conducting field observations and inspections, and verifying all licenses (DLNR 2022). In federal waters, the National Marine Fisheries Service Office of Law Enforcement handles enforcement issues (WPRFMC 2009). The latest stock assessment notes that it is uncertain to what degree minimum size regulations are respected by fishers (Nadon 2017), but we found no evidence of systematic noncompliance with fishing regulations in state waters. Because there are surveillance and enforcement programs in place, but the effectiveness of these programs may be uncertain, we score this factor moderately effective.

Factor 3.5 - Stakeholder Inclusion

Eastern Central Pacific | United States | Hawaii | Handlines and hand-operated pole-and-lines | inshore
Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore

Highly effective

The public is given time to comment on proposed management measures, and meetings held by the federal management council and state management agency are open to the public (WPRFMC 2014) (WPRFMC 2018). In previous years, fishers expressed concern regarding the potential impact of ta'ape to native fish populations (Parrish et al. 2000). Such concern led to research into the issue with funding and assistance from HDAR (Parrish et al. 2000)(Schumacher 2011), which shows that stakeholders are involved in setting research priorities. There is a legal mandate for collaborative management between state and local communities in Hawaii and movement toward comanagement of nearshore fisheries (Delaney et al. 2017). Thus, we have awarded a highly effective score.

Criterion 4: Impacts on the Habitat and Ecosystem

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

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

Guiding principles

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

Rating cannot be Critical for Criterion 4.

Criterion 4 Summary

FISHERY	FISHING GEAR ON THE SUBSTRATE	MITIGATION OF GEAR IMPACTS	ECOSYSTEM-BASED FISHERIES MGMT	FORAGE SPECIES?	SCORE
Eastern Central Pacific | United States | Hawaii | Handlines and hand-operated pole-and-lines | inshore	Score: 4	+.5	Moderate Concern		**Green (3.674)**
Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore	Score: 3	+.5	Moderate Concern		**Green (3.240)**

Criterion 4 Assessment

SCORING GUIDELINES

Factor 4.1 - Physical Impact of Fishing Gear on the Habitat/Substrate
Goal: The fishery does not adversely impact the physical structure of the ocean habitat, seafloor or associated biological communities.

- *5 - Fishing gear does not contact the bottom*
- *4 - Vertical line gear*

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

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

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

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

- *5 — Policies that have been shown to be effective are in place to protect species' ecological roles and ecosystem functioning (e.g. catch limits that ensure species' abundance is maintained at sufficient levels to provide food to predators) and effective spatial management is used to protect spawning and foraging areas, and prevent localized depletion. Or it has been scientifically demonstrated that fishing practices do not have negative ecological effects.*
- *4 — Policies are in place to protect species' ecological roles and ecosystem functioning but have not proven to be effective and at least some spatial management is used.*
- *3 — Policies are not in place to protect species' ecological roles and ecosystem functioning but detrimental food web impacts are not likely or policies in place may not be sufficient to protect*

species' ecological roles and ecosystem functioning.

- *2 — Policies are not in place to protect species' ecological roles and ecosystem functioning and the likelihood of detrimental food impacts are likely (e.g. trophic cascades, alternate stable states, etc.), but conclusive scientific evidence is not available for this fishery.*
- *1 — Scientifically demonstrated trophic cascades, alternate stable states or other detrimental food web impact are resulting from this fishery.*

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

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

Score: 4

Handline gear has a very low impact on bottom habitats (Morgan and Chuenpagdee 2003). In Hawaii, ta'ape is most abundant in forereef habitats in depths ≥18 m (Fukunaga et al. 2017). This factor is scored 4 because the fishery uses vertical line to target a reef-associated species.

Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore

Score: 3

Several net gears are used in the reef fish fisheries that capture ta'ape, including surround seines, surround gillnets (also called lay nets), bag nets, and lift nets (WPRFMC 2009), though seines and gillnets are the main net gears used to specifically target ta'ape (pers. comm., HDAR 2022). The other two main fish species in this fishery are ʻuʻu and weke-ula; ʻuʻu inhabit ledges, caves, and crevices during the day (Williams and Greenfield 2016) and weke-ula is found in large, inactive aggregations in coral reefs during the day (Smith-Vaniz and Williams 2016). Fishers typically target schools of ta'ape in sandy areas with seine nets; this technique accounts for the majority of ta'ape landings by nets (pers. comm., HDAR 2022). Therefore, this factor receives a score of 3.

Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts

Eastern Central Pacific | United States | Hawaii | Handlines and hand-operated pole-and-lines | inshore
Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore

+.5

Hawaii has committed to the *Holomua: Marine 30x30* initiative to effectively manage at least 30% of nearshore waters as marine managed areas (MMAs) by 2030; current MMAs cover 6% of nearshore waters, and each MMA is managed under a specific set of rules that may include fishing regulations (HDAR 2022c). The entire Northwest Hawaiian Islands (NWHI) were closed to bottomfish fishing in 2010 (commercial fishing is prohibited within the 582,578 mi^2 area protected by the Papahānaumokuākea Marine National Monument (NOAA Office of National Marine Sanctuaries 2020)), so now all fishing for reef-associated species occurs within the waters surrounding the main Hawaiian Islands. There are many state-managed areas that limit fishing within nearshore waters (Delaney et al. 2017), including a prohibition of gillnets around the entire island of Maui and several areas off O'ahu (HDAR 2022d), but we are unable to quantify what percentage of the representative habitat is protected from the gears used in the fisheries under assessment. We have awarded a score of +0.5 because a substantial proportion of all representative habitats are protected from all bottom contact.

Factor 4.3 - Ecosystem-based Fisheries Management

Eastern Central Pacific | United States | Hawaii | Handlines and hand-operated pole-and-lines | inshore
Eastern Central Pacific | United States | Hawaii | Surrounding nets | Gillnets and entangling nets | inshore

Moderate Concern

Ta'ape is now found throughout the Main and Northwestern Hawaiian Islands (Gaither et al. 2012) (Gaither et al. 2013). Ta'ape feeds on some planktonic crustaceans and some fish, but its diet is primarily benthic invertebrates (Parrish et al. 2000). Although fishers have expressed concern with the impact of ta'ape on native species (Parrish et al. 2000), recent research found no evidence of overall negative ecological effects (Schumacher 2011)(Fukunaga et al. 2017), ta'ape do not compete with food resources with native species (Fukunaga et al. 2017), and were there not discernable changes in community structure at artificial reef sites with high ta'ape abundance (Jones et al. 2020).

There are currently no management measures specifically aimed at reducing ta'ape spread and abundance, though the species distribution is actively monitored and there are no catch limits. Researchers have cautioned against eradication of the species without strong evidence of negative impacts on native fauna (Fukunaga et al. 2017).

'U'u is a benthic carnivore that mainly feeds on plankton such as crab larvae (Piché et al. 2010), though the WPRFMC categorizes it as a planktivore (WPRFMC 2022). Weke-ula is a benthic carnivore that primarily feeds on crustaceans, mollusks and other invertebrates (Piché et al. 2010). There are no annual catch limits for these species (HDAR 2022b), but general spatial management measures are in place that are expected to benefit 'u'u and weke-ula. Akule is a schooling pelagic planktivore (Grafeld et al. 2017) that is preyed upon by tunas, carangids, and billfishes (Weng and Sibert 2000). Because the fishery under assessment is not a substantial contributor to akule fishing mortality, management of this forage species is not considered in scoring this factor.

Because Hawaiian reef fisheries target species in all trophic levels, the creation of marine protected areas (MPAs) is considered an effective ecosystem-based management measure (Grafeld et al. 2017). Approximately 0.5% of nearshore waters and 3.4% of shallow (<50 m) waters within state jurisdiction in the main Hawaiian Islands are currently managed as no-take areas (Friedlander et al. 2019). In the Northwestern Hawaiian Islands, the Papahānaumokuākea Marine National Monument covers nearly 1.51 million km^2 and is closed to all commercial fishing except commercial longline fishing, which is permitted >50 nautical miles offshore (NOAA Office of National Marine Sanctuaries 2020). NOAA and its partners regularly publish a status report for coral reef ecosystems to help guide management and conservation efforts (NOAA 2018).

Policies to manage ta'ape are unlikely to have long-term adverse effects on native species, and spatial management is the main ecosystem-based management strategy for reef-associated species in Hawaii, but there is uncertainty whether the management measures for ’u’u and weke-ula are appropriate to the scale of the fisheries and ecology of the stocks. Therefore, we score this factor a moderate concern.

Acknowledgements

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

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Appendix A: Updates to the Hawaii Bluestriped Snapper Report

Updates to the February 6, 2017 Bluestriped Snapper (previously called "Blacktail and Bluestriped Snapper") report were made on January 10, 2024. The report was also updated from v2 of the Seafood Watch Fisheries Standard to v4. **The overall recommendations for the ta'ape (bluestriped snapper) net fisheries in Hawaii remained unchanged. Ta'ape caught in the deep-sea handline fishery (Yellow rating) was replaced by the inshore handline fishery, which is a Green rating. All recommendations for toau (blacktail snapper) were removed due to minimal landings of this species.** Updates are described below.

Criterion 2

Akule (bigeye scad) fishing mortality (Factor 2.2) was upgraded from moderate to low concern because the fishery under assessment is not a substantial contributor to total fishing mortality. Akule was added to the handline fishery and removed from the net fishery due to updated catch data.

'U'u (bigscale soldierfish) abundance (Factor 2.1) was upgraded from moderate to low concern because a stock assessment indicates that abundance is above target levels. The previous report included unspecified soldierfish, but updated data indicate that 'u'u (*Myripristis berndti*) is the species caught in the fishery.

Weke-ula (yellowfin goatfish) abundance (Factor 2.1) and fishing mortality (Factor 2.2) were upgraded from moderate to low concern because a stock assessment indicates that abundance is above target levels and fishing rates are sustainable.

Several changes were made based on updated catch composition data through 2021. Specifically, species that no longer fit the threshold for inclusion as a "main species" were removed from the report, while those that now make up >5% of the total catch in the fishery under assessment were added to the report.

Species removed

- Gray snapper (uku), Hawaiian grouper (hapu'u), pink snapper (opakapaka), yellowstripe snapper (onaga), and red snapper (ehu) were removed from the report because these species are caught in the deep-sea handline fishery, which accounts for a negligible amount of ta'ape catch.
- Mackerel scad ('opelu), rudderfish, and blacktail snapper (toau) were removed from the net fishery because catch of these species no longer makes up >5% of the total catch in the fishery under assessment.
- All species caught in the blacktail snapper fisheries were removed because those fisheries are not assessed in this updated report.

Species Added

- 'U'u (bigscale soldierfish) was added as a main species in both fisheries because catch of this species constitutes >5% of the total catch in the fishery under assessment.
- Hawaiian monk seal was added as a main species to the net fishery because inshore gillnets are known to entangle this endangered species.

Criterion 3

Bycatch Strategy (Factor 3.2) downgraded from highly to moderately effective for the net fishery because of uncertain effectiveness of bycatch mitigation measures related to Hawaiian monk seal entanglements.

Scientific Data Collection and Analysis (Factor 3.3) upgraded from moderately to highly effective for both fisheries because of recent research efforts into ta'ape distribution and abundance in Hawaii and potential impacts of ta'ape on native species. Also, the management process now involves up-to-date scientific stock assessments for ’u’u and weke-ula.

Criterion 4

Modifying Factor: Mitigation of Gear Impacts (Factor 4.2) upgraded from +0.25 to +0.5 for both fisheries because a substantial proportion of all representative habitats are protected from all bottom contact.