The Safina Center
at Stony Brook University

And

Monterey Bay Aquarium
Seafood Watch®

Big-eye scad, Mackerel scad

Selar crumenophthalmus, Decapterus macarellus

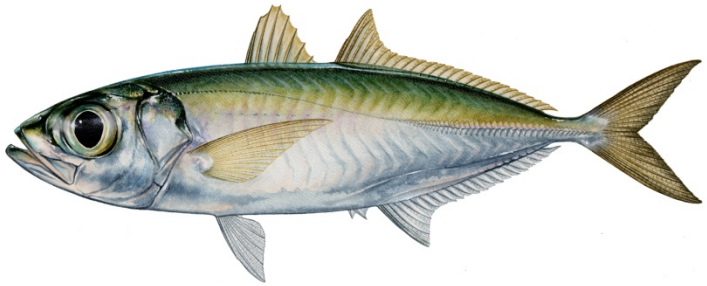

Image © Diane Rome Peebles

Hawaii

Handline, Portable lift nets, Surrounding nets

November 11, 2014

The Safina Center Seafood Analysts

About The Safina Center

The Safina Center (formerly Blue Ocean Institute) translates scientific information into language people can understand and serves as a unique voice of hope, guidance, and encouragement. The Safina Center (TSC) works through science, art, and literature to inspire solutions and a deeper connection with nature, especially the sea. Our mission is to inspire more people to actively engage as well-informed and highly motivated constituents for conservation.

Led by conservation pioneer and MacArthur fellow, Dr. Carl Safina, we show how nature, community, the economy and prospects for peace are all intertwined. Through Safina's books, essays, public speaking, PBS television series, our Fellows program and Sustainable Seafood program, we seek to inspire people to make better choices.

The Safina Center was founded in 2003 by Dr. Carl Safina and was built on three decades of research, writing and policy work by Dr. Safina.

The Safina Center's Sustainable Seafood Program
The Center's founders created the first seafood guide in 1998. Our online seafood guide now encompasses over 160-wild-caught species. All peer-reviewed seafood reports are transparent, authoritative, easy to understand and use. Seafood ratings and full reports are available on our website under Seafood Choices. TSC's Sustainable Seafood Program helps consumers, retailers, chefs and health professionals discover the connection between human health, a healthy ocean, fishing and sustainable seafood.

- Our online guide to sustainable seafood is based on scientific ratings for more than 160 wild-caught seafood species and provides simple guidelines. Through our expanded partnership with the Monterey Bay Aquarium, our guide now includes seafood ratings from both The Safina Center and the Seafood Watch® program.
- We partner with Whole Foods Market (WFM) to help educate their seafood suppliers and staff, and provide our scientific seafood ratings for WFM stores in the US and UK.
- Through our partnership with Chefs Collaborative, we created Green Chefs/Blue Ocean, a free, interactive, online sustainable seafood course for chefs and culinary professionals.
- Our website features tutorials, videos, blogs, links and discussions of the key issues such as mercury in seafood, bycatch, overfishing, etc.

Check out our Fellows Program, learn more about our Sustainable Seafood Program and Carl Safina's current work at www.safinacenter.org .

The Safina Center is a 501 (c) (3) nonprofit organization based in the School of Marine & Atmospheric Sciences at Stony Brook University, Long Island, NY. www.safinacenter.org admin@safinacenter.org | 631.632.3763

About Seafood Watch®

Monterey Bay Aquarium's Seafood Watch® program evaluates the ecological 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. Seafood Watch® makes its science-based recommendations available to the public in the form of regional pocket guides that can be downloaded from www.seafoodwatch.org. 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.

Each sustainability recommendation on the regional pocket guides is supported by a Seafood Report. Each report synthesizes and analyzes the most current ecological, fisheries and ecosystem science on a species, then evaluates this information against the program's conservation ethic to arrive at a recommendation of "Best Choices," "Good Alternatives" or "Avoid." The detailed evaluation methodology is available upon request. In producing the Seafood Reports, Seafood Watch® seeks out research published in academic, peer-reviewed journals whenever possible. Other sources of information include government technical publications, fishery management plans and supporting documents, and other scientific reviews of ecological sustainability. Seafood Watch® Research Analysts also communicate regularly with ecologists, fisheries and aquaculture scientists, and members of industry and conservation organizations when evaluating fisheries and aquaculture practices. Capture fisheries and aquaculture practices are highly dynamic; as the scientific information on each species changes, Seafood Watch®'s sustainability recommendations and the underlying Seafood Reports will be updated to reflect these changes.

Parties interested in capture fisheries, aquaculture practices and the sustainability of ocean ecosystems are welcome to use Seafood Reports in any way they find useful. For more information about Seafood Watch® and Seafood Reports, please contact the Seafood Watch® program at Monterey Bay Aquarium by calling 1-877-229-9990.

 Seafood Watch and Seafood Reports are made possible through a grant from the David and Lucile Packard Foundation and other funders.

Guiding Principles

The Safina Center and Seafood Watch define 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.

Based on this principle, Seafood Watch and the Safina Center have developed four sustainability **criteria** for evaluating wild-catch fisheries for consumers and businesses. These criteria are:

- How does fishing affect the species under assessment?
- How does the fishing affect other, target and non-target species?
- How effective is the fishery's management?
- How does the fishing affect habitats and the stability of the ecosystem?

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, we develop an overall recommendation. Criteria ratings and the overall recommendation are color-coded to correspond to the categories on the Seafood Watch pocket guide and the Safina Center's online guide:

Best Choice/Green: Are well managed and caught in ways that cause little harm to habitats or other wildlife.

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

Avoid/Red: Take a pass on these for now. These items are overfished or caught 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 is for mackerel scad and big-eye scad caught in Hawaii. The scad fishery is one of the most productive near shore fisheries in Hawaii.

Mackerel scad and big-eye scad are small schooling species found in tropical waters around the globe. Current abundance and fishing levels for mackerel scad and big-eye scad in Hawaii are unknown, because the last population assessment for these species was in 2000. However, some management measures are in place for these species and there is no indication they are depleted.

Mackerel scad are caught with lift nets and hanlines, while big-eye scad are caught with surround nets and handlines. The lift net fishery for mackerel scad and surround net fishery for big-eye scad are both highly selective for the target species. In the handline fisheries, mackerel scad and big-eye scad may be caught together, but there are minimal catches of other species.

The handline gears and the lift net gear used to catch mackerel scad do not make contact with the seafloor. The surround net gears used to catch big-eye scad do contact the seafloor, but only have a low impact on bottom habitats. The fisheries for mackerel scad and big-eye scad could affect ocean food webs, since they are important prey fish for many species, including tunas, marlins, and mahi-mahi. Some efforts are underway in Hawaii to consider species' ecological roles and manage fisheries using an ecosystem approach.

Mackerel scad caught with lift nets and big-eye scad caught with surround nets are rated “green” or “best choice”, while big-eye scad and mackerel scad caught with handline gear is rated “yellow” or “good alternative”.

Table of Conservation Concerns and Overall Recommendations

Species / Fishery	Criterion 1 Impacts on the Species Under Assessment	Criterion 2 Impacts on other Species	Criterion 3 Management Effectiveness	Criterion 4 Impacts on Habitat and Ecosystem	Overall Recommendation
Mackerel scad ('opelu) Hawaii Western Central Pacific - Handline	Yellow (2.64)	Yellow (2.64)	Yellow (3.00)	Green (3.87)	**Yellow/Good Alternative (3.002)**
Big-eye scad (akule) Hawaii Western Central Pacific - Handline	Yellow (2.64)	Yellow (2.64)	Yellow (3.00)	Green (3.87)	**Yellow/Good Alternative (3.002)**
Mackerel scad ('opelu) Hawaii Western Central Pacific - Portable lift nets	Yellow (2.64)	Green (5.00)	Yellow (3.00)	Green (3.87)	**Green/Best Choice (3.520)**
Big-eye scad (akule) Hawaii Western Central Pacific - Surrounding net	Yellow (2.64)	Green (4.75)	Yellow (3.00)	Yellow (3.12)	**Green/Best Choice (3.294)**

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 Concern[2], **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**Error! Bookmark not defined.**, **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).

Table of Contents

Introduction

Scope of the analysis and ensuing recommendation

This report is for mackerel scad (*Decapterus macarellus*) and big-eye scad (*Selar crumenopthalmus*) caught in Hawaii. Mackerel scad are caught with handlines and lift nets. Big-eye scad are caught with handlines and various types of surround nets (surround seines, surround gillnets and bag nets).

Overview of the species and management bodies

Mackerel scad and big-eye scad are members of the jack fmaily (Carangidae). They are found in tropical waters around the globe. They are often found in schools (or groups) in deep lagoons, coastal bays and offshore waters. Mackerel scad and big-eye scad feed on small planktonic crustaceans and small fish. They are important prey for tuna, marlins, dolphinfish, wahoo, and rainbow runner (Weng and Sibert 2000).

This report focuses on the mackerel scad and big-eye scad fisheries in Hawaii. Mackerel scad and big-eye scad in Hawaii are caught in near shore waters with both handline and net gears. The fisheries are managed by the State of Hawaii's Department of Land and Natural Resources (DLNR) and in federal waters by the Western Pacific Regional Fishery Management Council (WPRFMC) under the Hawaii Ecosystem Plan.

Production Statistics

The Hawaii fisheries for mackerel scad and big-eye scad are some of the most productive near shore fisheries in the state (Weng and Sibert 2000). Commercial catches of mackerel scad have varied over time, peaking in the late 1940's (566,229 lbs), and early 1980's (474,322 lbs). Since 2000, catches have been fairly stable but lower than peak levels (PIFSC 2013). In 2012, 118,143 lbs of mackerel scad were caught in the handline fishery and 120,902 lbs in the lift net fishery (DLNR 2013). Recreational catches of mackerel scad in Hawaii have ranged from 2,317 lbs to 162,917 lbs since 2004. Recreational catches in 2013, still considered preliminary at the time of this report, were 34,874 lbs.

Commercial catches of big-eye scad peaked at much higher levels than mackerel scad in the late 1960's and early 1970's (898,770 lbs) and again in 1998 (1,177,018 lbs). Since 2000, catches of big-eye scad have been closer to mackerel scad catches, but still slightly higher (PIFSC 2013). In 2012, 280,132 lbs of big-eye scad were reported caught in the commercial fishery (DLNR 2014).The surround net fishery accounts for the majority of the catch, 60-82%, while the handline fishery accounts for around 15 to 37% of the total catch. A very small proportion (~1-2%) of the big-eye scad catch is taken with casting nets (DLNR 2014b). Big-eye scad recreational catches in Hawaii are high, ranging from 213,320 lbs to 1,001,339 lbs since 2004. In 2013, preliminary data indicates recreational catches of big-eye scad were 817,658 lbs (NOAA 2014).

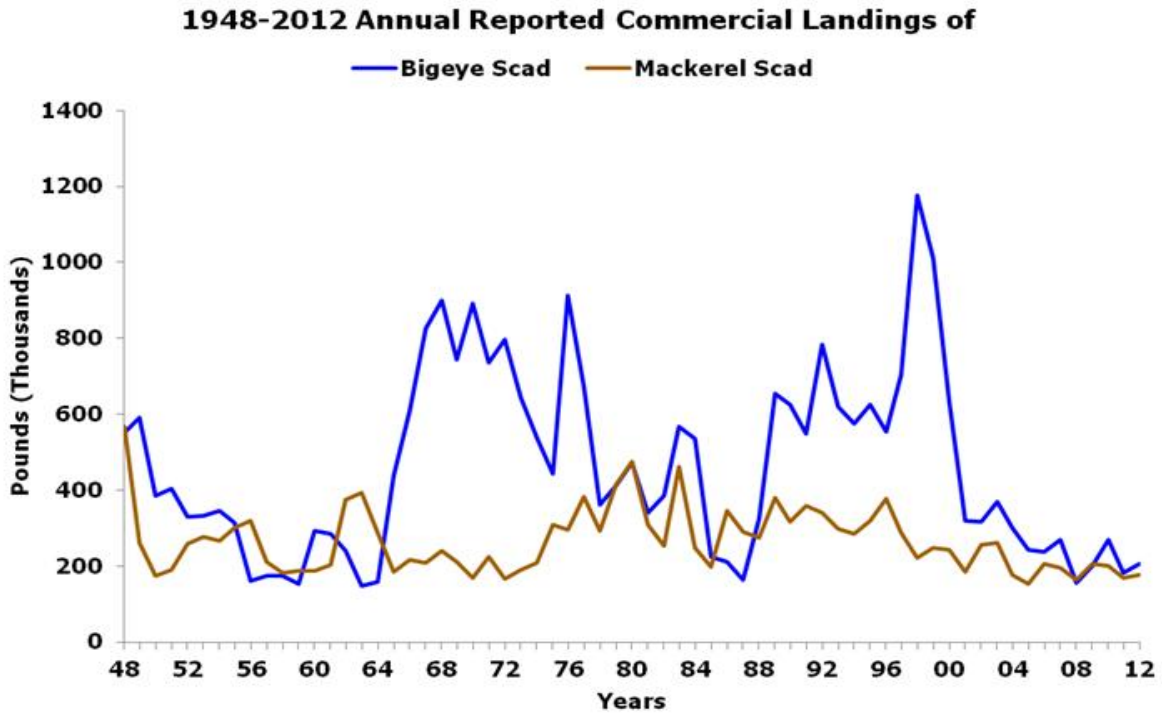

Figure 1: Annual reported catches of big-eye scad and mackerel scad, 1948-2012 {PIFSC 2013}.

Importance to the US/North American market

Mackerel scad and big-eye scad are primarily consumed in Hawaii, although some products may be sent to the U.S. mainland (Weng and Sibert 2000).

Common and market names

Other common names for mackerel scad include round scad and in Hawaii, opelu. Other common names for big-eye scad include goggle eye, goggle eye jack, cigarfish, and chicharro. In Hawaii, big-eye scad are known as akule.

Primary product forms

Mackerel scad and bigeye scad are sold fresh but also in dried and salted and frozen forms.

Assessment

This section assesses the sustainability of the fishery(s) relative to the Seafood Watch Criteria for Fisheries, available at http://www.seafoodwatch.org.

Criterion 1: Impacts on the species under assessment

This criterion evaluates the impact of fishing mortality on the species, given its current abundance. The inherent vulnerability to fishing rating influences how abundance is scored, when abundance is unknown.

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.

Criterion 1 Summary

BIG-EYE SCAD (AKULE)				
Region / Method	**Factor 1.1 Inherent Vulnerability**	**Factor 1.2 Abundance**	**Factor 1.3 Fishing Mortality**	**Criterion 1 Score**
Hawaii Western Central Pacific Handline	Low	3.00:Moderate Concern	2.33:Moderate Concern	**Yellow (2.644)**
Hawaii Western Central Pacific Surrounding net	Low	3.00:Moderate Concern	2.33:Moderate Concern	**Yellow (2.644)**

MACKEREL SCAD ('OPELU)				
Region / Method	**Factor 1.1 Inherent Vulnerability**	**Factor 1.2 Abundance**	**Factor 1.3 Fishing Mortality**	**Subscore**
Hawaii Western Central Pacific Handline	Low	3.00:Moderate Concern	2.33:Moderate Concern	**Yellow (2.644)**
Hawaii Western Central Pacific Portable lift nets	Low	3.00:Moderate Concern	2.33:Moderate Concern	**Yellow (2.644)**

The last population assessment for mackerel scad and big-eye scad was in 2000, so current abundance and fishing mortality levels on these species are unknown. However, these species have biological traits (e.g, short-lived and fast growing) that make them inherently resilient to fishing pressure.

Criterion 1 Assessment

BIG-EYE SCAD (AKULE)

Factor 1.1 - Inherent Vulnerability

Scoring Guidelines

- *Low— FishBase vulnerability score for species 0-35 OR species exhibits life history characteristics that make it resilient to fishing, e.g., early maturing (<5 years), short lived (< 10 years), small maximum size, and low on food chain.*
- *Medium— FishBase vulnerability score for species 36-55 OR life history characteristics that make it neither particularly vulnerable or resilient to fishing, e.g. moderate age at sexual maturity (5-15 years), moderate maximum age (10-25 years), moderate maximum size, and middle of food chain.*
- *High— FishBase vulnerability score for species 56-100 OR life history characteristics that make is particularly vulnerable to fishing, e.g. long-lived (>25 years), late maturing (>15 years), low reproduction rate, large body size, and top-predator.*

Note: The FishBase vulnerability scores is an index of the inherent vulnerability of marine fishes to fishing based on life history parameters: maximum length, age at first maturity, longevity, growth rate, natural mortality rate, fecundity, spatial behaviors (e.g. schooling, aggregating for breeding, or consistently returning to the same sites for feeding or reproduction) and geographic range.

Hawaii Western Central Pacific, Handline
Hawaii Western Central Pacific, Surrounding net

Low

Fishbase assigned a low vulnerability to fishing score of 26 out of 100 to big-eye scad (Froese and Pauly 2013). Big-eye scad reach sexual maturity at 7 months old and 20 cm in length. They live to only 2 years old and grow to a maximum length of 70 cm. Big-eye scad are broadcast spawners, producing around 92,000 eggs per spawn. They feed on juvenile fish and larvae as adults and on crustaceans as juveniles (Clark and Privitera 1995)(Roux and Conand 2000)(Weng and Sibert 2000)(Froese and Pauly 2013).

Factor 1.2 - Abundance

Scoring Guidelines

- *5 (Very Low Concern)—Strong evidence exists that the population is above target abundance level (e.g., biomass at maximum sustainable yield, BMSY) or near virgin biomass.*
- *4 (Low Concern)—Population may be below target abundance level, but it is considered not overfished*
- *3 (Moderate Concern) —Abundance level is unknown and the species has a low or medium inherent vulnerability to fishing.*
- *2 (High Concern)—Population is overfished, depleted, or a species of concern, OR abundance is unknown and the species has a high inherent vulnerability to fishing.*
- *1 (Very High Concern)—Population is listed as threatened or endangered.*

Hawaii Western Central Pacific, Handline
Hawaii Western Central Pacific, Surrounding net

Moderate Concern

A population assessment for big-eye scad was conducted in 2000. The assessment utilized fisheries catch rate data (catches per unit of fishing effort) to estimate abundance. The assessment indicated that abundance of big-eye scad varied over the assessment period (1966-1997), with peaks in abundance occurring in the late 1970's and low abundance occurring in the late 1980's. However, it should be realized that fisheries catch rate data does not always provide a reliable indicator of abundance, since catch rates are influenced by a variety of factors, such as environmental conditions and the efficiency of the fishing gear. Abundance was estimated to be above the biomass at maximum sustainable yield (BMSY), the target abundance level. The assessment did note that big-eye scad have high site fidelity and this could lead to localized depletion in abundance (Weng and Sibert 2000). This assessment was never formally reviewed by the National Marine Fisheries Service, but was considered data-limited (NMFS 2014). No further assessments of big-eye scad have been conducted. The National Marine Fisheries Service considers the current abundance of big-eye scad unknown (NMFS 2013). Because current abundance is unknown and this species has a low vulnerability to fishing, we have awarded a moderate concern score.

Factor 1.3 - Fishing Mortality

Scoring Guidelines

- *5 (Very Low Concern)—Highly likely that fishing mortality is below a sustainable level (e.g., below fishing mortality at maximum sustainable yield, FMSY), OR fishery does not target species and its contribution to the mortality of species is negligible (≤ 5% of a sustainable level of fishing mortality).*
- *3.67 (Low Concern)—Probable (>50%) chance that fishing mortality is at or below a sustainable level, but some uncertainty exists, OR fishery does not target species and does not adversely affect species, but its contribution to mortality is not negligible, OR fishing mortality is unknown, but the population is healthy and the species has a low susceptibility to the fishery (low chance of being caught).*
- *2.33 (Moderate Concern)—Fishing mortality is fluctuating around sustainable levels, OR fishing mortality is unknown and species has a moderate-high susceptibility to the fishery and, if species is depleted, reasonable management is in place.*
- *1 (High Concern)—Overfishing is occurring, but management is in place to curtail overfishing, OR fishing mortality is unknown, species is depleted, and no management is in place.*
- *0 (Critical)—Overfishing is known to be occurring and no reasonable management is in place to curtail overfishing.*

Hawaii Western Central Pacific, Handline
Hawaii Western Central Pacific, Surrounding net

Moderate Concern

Big-eye scad were last assessed in 2000. The assessment suggested that fishing levels have been light to moderate and at that time were below the maximum sustainable catch/yield (Weng and Sibert 2000). However, the assessment was data-limited and is outdated (NMFS 2014). Currently fishing mortality on mackerel scad is unknown (NMFS 2013), but recent commercial catches are less than peak levels and

have been below the established catch limit. We have awarded a moderate concern score.

MACKEREL SCAD ('OPELU)

Factor 1.1 - Inherent Vulnerability

Scoring Guidelines

- *Low— FishBase vulnerability score for species 0-35 OR species exhibits life history characteristics that make it resilient to fishing, e.g., early maturing (<5 years), short lived (< 10 years), small maximum size, and low on food chain.*
- *Medium— FishBase vulnerability score for species 36-55 OR life history characteristics that make it neither particularly vulnerable or resilient to fishing, e.g. moderate age at sexual maturity (5-15 years), moderate maximum age (10-25 years), moderate maximum size, and middle of food chain.*
- *High— FishBase vulnerability score for species 56-100 OR life history characteristics that make is particularly vulnerable to fishing, e.g. long-lived (>25 years), late maturing (>15 years), low reproduction rate, large body size, and top-predator.*

Note: The FishBase vulnerability scores is an index of the inherent vulnerability of marine fishes to fishing based on life history parameters: maximum length, age at first maturity, longevity, growth rate, natural mortality rate, fecundity, spatial behaviors (e.g. schooling, aggregating for breeding, or consistently returning to the same sites for feeding or reproduction) and geographic range.

Hawaii Western Central Pacific, Handline
Hawaii Western Central Pacific, Portable lift nets

Low

Fishbase assigned a low vulnerability to fishing score of 23 out of 100 for mackerel scad (Froese and Pauly 2013). Mackerel scad reach sexual maturity around 18 months old and 24-26 cm in length. They can live for up to 4-5 years and grow to a maximum length of 33-39 cm (Weng and Sibert 2000). They are broadcast spawners producing around 136,000 eggs per spwan (Clark and Privitera 1995). Mackerel scad is an intermediate species within the food web. They feed on fish larvae and small crustaceans (McNaughton 2008)(Froese and Pauly 2013).

Factor 1.2 – Abundance

Scoring Guidelines

- *5 (Very Low Concern)—Strong evidence exists that the population is above target abundance level (e.g., biomass at maximum sustainable yield, BMSY) or near virgin biomass.*
- *4 (Low Concern)—Population may be below target abundance level, but it is considered not overfished*
- *3 (Moderate Concern) —Abundance level is unknown and the species has a low or medium inherent vulnerability to fishing.*
- *2 (High Concern)—Population is overfished, depleted, or a species of concern, OR abundance is unknown and the species has a high inherent vulnerability to fishing.*
- *1 (Very High Concern)—Population is listed as threatened or endangered.*

Hawaii Western Central Pacific, Handline
Hawaii Western Central Pacific, Portable lift nets

Moderate Concern

A population assessment for mackerel scad was conducted in 2000. The assessment utilized fisheries catch rate data (catches per unit of fishing effort) to estimate abundance. According to the assessment, abundance trends for mackerel scad from 1966-1997 showed a fairly stable trend over time, with peaks occurring during the late 1970's and early 1980's (Weng and Sibert 2000). However, it should be realized that fisheries catch rate data does not always provide a reliable indicator of abundance, since catch rates are influenced by a variety of factors, such as environmental conditions and the efficiency of the fishing gear. Abundance was estimated to be above the biomass at maximum sustainable yield (BMSY), the target abundance level (Weng and Sibert 2000). This assessment was never formally reviewed by the National Marine Fisheries Service, but was considered data-limited (NMFS 2014). No further assessments of mackerel scad have been conducted. The National Marine Fisheries Service considers the current abundance of mackerel scad unknown (NMFS 2013). Because current abundance is unknown and this species has a low vulnerability to fishing, we have awarded a moderate concern score.

Factor 1.3 - Fishing Mortality

Scoring Guidelines

- *5 (Very Low Concern)—Highly likely that fishing mortality is below a sustainable level (e.g., below fishing mortality at maximum sustainable yield, FMSY), OR fishery does not target species and its contribution to the mortality of species is negligible (≤ 5% of a sustainable level of fishing mortality).*
- *3.67 (Low Concern)—Probable (>50%) chance that fishing mortality is at or below a sustainable level, but some uncertainty exists, OR fishery does not target species and does not adversely affect species, but its contribution to mortality is not negligible, OR fishing mortality is unknown, but the population is healthy and the species has a low susceptibility to the fishery (low chance of being caught).*
- *2.33 (Moderate Concern)—Fishing mortality is fluctuating around sustainable levels, OR fishing mortality is unknown and species has a moderate-high susceptibility to the fishery and, if species is depleted, reasonable management is in place.*
- *1 (High Concern)—Overfishing is occurring, but management is in place to curtail overfishing, OR fishing mortality is unknown, species is depleted, and no management is in place.*
- *0 (Critical)—Overfishing is known to be occurring and no reasonable management is in place to curtail overfishing.*

Hawaii Western Central Pacific, Handline
Hawaii Western Central Pacific, Portable lift nets

Moderate Concern

Mackerel scad was last assessed in 2000. The assessment suggested that fishing levels had been light to moderate and at the time were below the maximum sustainable catch/yield (Weng and Sibert 2000). However, the assessment was considered data-limited and is outdated (NMFS 2014). Currently fishing mortality on mackerel scad is unknown (NMFS 2013), but recent commercial catches are less than peak levels and have been below the established catch limit. We have awarded a moderate concern score.

Criterion 2: Impacts on other species

All main retained and bycatch species in the fishery are evaluated in the same way as the species under assessment were evaluated in Criterion 1. 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.

To determine the final Criterion 2 score, the score for the lowest scoring retained/bycatch species is multiplied by the discard rate score (ranges from 0-1), which evaluates the amount of non-retained catch (discards) and bait use relative to the retained catch. 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 Critical.

Criterion 2 Summary

Big-eye scad (akule)				
Region / Method	**Factors 2.1-2.3**		**Factor 2.4 Discard Rate Modifying Score ((Discards+ Bait)/Retained Catch)**	**Criterion 2 Score**
	Lowest Scoring of Other Species	**Lowest Species Subscore**		
Hawaii Western Central Pacific, Handline	Mackerel Scad	2.644	1.00 (<20%)	Yellow (2.644)
Hawaii Western Central Pacific, Surrounding net	No other main species caught	5.000	0.95 (20-40%)	Green (4.750)

Mackerel scad ('opelu)				
Region / Method	**Factors 2.1-2.3**		**Factor 2.4 Discard Rate Modifying Score ((Discards+ Bait)/Retained Catch)**	**Criterion 2 Score**
	Lowest Scoring of Other Species	**Lowest Species Subscore**		
Hawaii Western Central Pacific, Handline	Big-eye Scad	2.644	1.00 (<20%)	Yellow (2.644)
Hawaii Western Central Pacific, Portable lift nets	No other main species caught	5.000	1.00 (<20%)	Green (5.000)

Bycatch in the mackerel scad and big-eye scad fisheries is very low. In the big-eye scad handline fishery, the only other species caught in significant quantities (>5% of total catch) is mackerel scad. Similarly, in the mackerel scad handline fishery, the only other species caught in significant quantities (>5% of total catch) is big-eye scad. The big-eye scad surround net fishery and the mackerel scad portable lift net fishery are both very selective for the target species, with no other species caught in significant

quantities {DLNR 2013}{DLNR 2014b}. Discards (fish thrown to back to sea) are slightly higher in the big-eye scad net fishery compared to the other fisheries.

Criterion 2 Assessment

See Criterion 1 for assessments of big-eye scad and mackerel scad.

ALL SPECIES

Factor 2.4 – Modifying Factor: Discards and Bait Use

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 2.4 score
<20%	1
20-40%	0.95
40-60%	0.9
60-80%	0.85
80-100%	0.8
>100%	0.75

Hawaii/Western Central Pacific, Handline
Hawaii/Western Central Pacific, Portable lift nets

< 20%

In both the mackerel scad handline and lift net fisheries, discards (fish thrown back to sea) have been less than 1% of the total retained catch in recent years (DLNR 2013). Discards in the big-eye scad handline fishery are also less than 1% of the total retained catch (DLNR 2014b).

Hawaii/Western Central Pacific, Surrounding net

< 20%

In the big-eye scad surround net fishery, discard rates (number of fish released/total retained catch) are higher than in other scad fisheries. The highest discard rate, 71%, was observed in 2009. However, since 2010 discard rates have been much lower, ranging from 1% to 23% (DLNR 2014b). The majority of discarded fish are big-eye scad. We have awarded a score of 20-40% to account for high discard rates in some years.

Criterion 3: Management effectiveness

Management is separated into management of retained species (harvest strategy) and management of non-retained species (bycatch strategy).

The final score for this criterion is the geometric mean of the two scores. 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 or either the Harvest Strategy (Factor 3.1) or Bycatch Management Strategy (Factor 3.2) is Very High Concern = Red or High Concern*

Rating is Critical if either or both of Harvest Strategy (Factor 3.1) and Bycatch Management Strategy (Factor 3.2) ratings are Critical.

Criterion 3 Summary

Region / Method	Factor 3.1 Harvest Strategy	Factor 3.2 Bycatch Management Strategy	Criterion 3 Score
Hawaii Western Central Pacific Handline	3.00: Moderate Concern	All Species Retained	Yellow(3.000)
Hawaii Western Central Pacific Portable lift nets	3.00: Moderate Concern	All Species Retained	Yellow(3.000)
Hawaii Western Central Pacific Surrounding net	3.00: Moderate Concern	All Species Retained	Yellow(3.000)

Mackerel scad and big-eye scad make up the majority of the catch in these fisheries. Bycatch and discards are low {DLNR 2013}{DLNR 2014b}. Therefore bycatch management is considered not applicable and has not been evaluated. The criteria 3 management score is based only on the harvest strategy score. The harvest strategy for mackerel scad and big-eye scad is considered a moderate concern because it is unclear if current management measures are sufficient to sustain the mackerel scad and big-eye scad populations, since there have been no recent population assessments for these species.

Factor 3.1: Harvest Strategy

Scoring Guidelines

Seven subfactors are evaluated: Management Strategy, Recovery of Species of Concern, Scientific Research/Monitoring, Following of Scientific Advice, Enforcement of Regulations, Management Track Record, and Inclusion of Stakeholders. Each is rated as 'ineffective,' 'moderately effective,' or 'highly effective.'

- *5 (Very Low Concern)—Rated as 'highly effective' for all seven subfactors considered.*

- *4 (Low Concern)—Management Strategy and Recovery of Species of Concern rated 'highly effective' and all other subfactors rated at least 'moderately effective.'*
- *3 (Moderate Concern)—All subfactors rated at least 'moderately effective.'*
- *2 (High Concern)—At minimum, meets standards for 'moderately effective' for Management Strategy and Recovery of Species of Concern, but at least one other subfactor rated 'ineffective.'*
- *1 (Very High Concern)—Management exists, but Management Strategy and/or Recovery of Species of Concern rated 'ineffective.'*
- *0 (Critical)—No management exists when there is a clear need for management (i.e., fishery catches threatened, endangered, or high concern species), OR there is a high level of Illegal, unregulated, and unreported fishing occurring.*

Factor 3.1 Summary

Factor 3.1: Harvest Strategy								
Region /Method	**Management Strategy and Impl.**	**Recovery of Species of Concern**	**Scientific Research & Monitoring**	**Record of Following Scientific Advice**	**Enforcement of Regs.**	**Track Record**	**Stakeholder Inclusion**	**Factor 3.1 Score**
Hawaii Western Central Pacific Handline	Moderately Effective	N/A	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Highly Effective	3:00 Moderate Concern
Hawaii Western Central Pacific Portable lift nets	Moderately Effective	N/A	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Highly Effective	3:00 Moderate Concern
Hawaii Western Central Pacific Surrounding net	Moderately Effective	N/A	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Highly Effective	3:00 Moderate Concern

Factor 3.1 Assessment

Subfactor 3.1.1 – 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? To achieve a highly effective rating, there must be appropriate management goals, and evidence that the measures in place have been successful at maintaining/rebuilding species.

Hawaii Western Central Pacific, Handline
Hawaii Western Central Pacific, Portable lift nets
Hawaii Western Central Pacific, Surrounding net

Moderately Effective

In federal waters, the Western Pacific Regional Fishery Management Council (WPRFMC) manages mackerel scad and big-eye scad under the Hawaii Fishery Ecosystem Plan (WPRFMC 2009). In Hawaii state waters, the Hawaii Division of Aquatic Resources (DAR) manages these species. All fishing takes places in the Main Hawaiian Islands. The Northwest Hawaiian Islands (NWHI) was declared a National

Monument and closed to fishing in 2010 (President Proclamation 8031: FR Doc E9-7860).

Under the federal management plan, mackerel scad and big-eye scad are managed as part of the Hawaii coral reef ecosystem management unit species. Management regulations include prohibitions on the use of destructive fishing gears and annual catch limits for mackerel scad and big-eye scad since 2012. The annual catch limit (ACL) for mackerel scad is 393,563 lbs and the annual catch limit for big-eye scad is 651,292 lbs (FR 2014). These catch limits are set equal to the maximum sustainable yield/catch estimates for these species in the 2000 assessment (NOAA 2011b).

In Hawaii State waters, where most fishing for these species occurs, there are minimal regulations in place. Permits are required and there are some gear restrictions, such as a prohibition on fishing for mackerel scad with animal bait, except with handline, in waters off the coast of South Kona (DAR 2013a). The only restrictions for big-eye scad apply to the net fishery. There is size limit of 8 1/2 inches for big-eye scad caught in nets from July through October and there are restrictions on the size of the net that can be used. There are no regulations in place for the handline fishery (DAR 2013a)(DAR 2013c).

Commercial catches for these species (in state and federal waters) have remained under the federal annual catch limits (FR 2012)(PIFSC 2013). However, because recent population assessments have not been conducted for these species and no abundance targets/conservation goals have been established, it is unclear if current management measures are sufficient to sustain the mackerel scad and big-eye scad populations. We have therefore awarded a moderately effective score.

Subfactor 3.1.2 – Recovery of Species of Concern

Considerations: When needed, are recovery strategies/management measures in place to rebuild overfished/threatened/ endangered species or to limit fishery's impact on these species and what is their likelihood of success? To achieve a rating of Highly Effective, rebuilding strategies that have a high likelihood of success in an appropriate timeframe must be in place when needed, as well as measures to minimize mortality for any overfished/threatened/ endangered species.

Hawaii Western Central Pacific, Handline
Hawaii Western Central Pacific, Portable lift nets
Hawaii Western Central Pacific, Surrounding net

N/A

The last population assessment for mackerel scad and big-eye scad in 2000 indicated that these species were at healthy abundance levels (Weng and Sibert 2000). Since these species have not been assessed since then, their current status remains uncertain, but there is no indication that these species are depleted/overfished. We have therefore awarded a score of N/A.

Subfactor 3.1.3 – Scientific Research and Monitoring

Considerations: How much and what types of data are collected to evaluate the health of the population and the fishery's impact on the species? To achieve a Highly Effective rating, population assessments must be conducted regularly and they must be robust enough to reliably determine the population status.

Hawaii Western Central Pacific, Handline
Hawaii Western Central Pacific, Portable lift nets

Hawaii Western Central Pacific, Surrounding net

Moderately Effective

Information on catches and fishing effort is provided by fishermen through the mandatory commercial fishing reporting system (DAR 2013b). The last assessment on mackerel scad and big-eye scad conducted in 2000 utilized this fishery catch and effort data to evaluate the status of these species (Weng and Sibert 2000). The National Marine Fisheries Service never reviewed this assessment, but the assessment was considered data-limited. No further assessments of these species have been conducted (NMFS 2014). We have therefore awarded only a moderately effective score.

Subfactor 3.1.4 – Management Record of Following Scientific Advice

Considerations: How often (always, sometimes, rarely) do managers of the fishery follow scientific recommendations/advice (e.g. do they set catch limits at recommended levels)? A Highly Effective rating is given if managers nearly always follow scientific advice.

Hawaii Western Central Pacific, Handline
Hawaii Western Central Pacific, Portable lift nets
Hawaii Western Central Pacific, Surrounding net

Moderately Effective

There appears to have been limited scientific advice provided about the management of the mackerel scad and big-eye scad fisheries, so it is difficult to determine if scientific advice is followed or not. However, there is a federal mandate in place requiring the use of scientific advice and monitoring to determine annual catch limits for these species (FR 2011)(NOAA 2011). We have therefore awarded a moderately effective score.

Subfactor 3.1.5 – 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.

Hawaii Western Central Pacific, Handline
Hawaii Western Central Pacific, Portable lift nets
Hawaii Western Central Pacific, Surrounding net

Moderately Effective

Commercial fishermen are required to submit monthly catch reports, including information on fishing effort, to the Division of Aquatic Resources, which are used to determine if annual catch limits are exceeded (DAR 2013b). There is a Division of Conservation and Resource Enforcement within the Department of Land and Natural Resources that is responsible for enforcement of state laws (DLNR 2014a). In federal waters, the National Marine Fisheries Service Office of Law Enforcement handles enforcement issues (WPRFMC 2009). Annual catches of mackerel scad and big-eye scad have been well below the annual catch limits (FR 2012)(PIFSC 2013). However, there is concern about underreporting of catches (commercial, recreational, and subsistence), so we have awarded a moderately and not highly effective score.

Subfactor 3.1.6 – Management Track Record

Considerations: Does management have a history of successfully maintaining populations at sustainable levels or a history of failing to maintain populations at sustainable levels? A Highly

Effective rating is given if measures enacted by management have been shown to result in the long-term maintenance of species overtime.

Hawaii Western Central Pacific, Handline
Hawaii Western Central Pacific, Portable lift nets
Hawaii Western Central Pacific, Surrounding net

Moderately Effective

The current status of the mackerel scad and big-eye scad population is uncertain because the last assessment for these species was in 2000. It is therefore hard to determine if management measures have been effective. Since the management track record is uncertain, we have awarded a moderately effective score.

Subfactor 3.1.7 – 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 and includes stakeholder input.

Hawaii Western Central Pacific, Handline
Hawaii Western Central Pacific, Portable lift nets
Hawaii Western Central Pacific, Surrounding net

Highly Effective

There is stakeholder input in Hawaii state and federal fisheries management. 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 2011). We have therefore awarded a highly effective score.

Factor 3.2: Bycatch Management Strategy

Scoring Guidelines

Four subfactors are evaluated: Management Strategy and Implementation, Scientific Research and Monitoring, Record of Following Scientific Advice, and Enforcement of Regulations. Each is rated as 'ineffective,' 'moderately effective,' or 'highly effective.' Unless reason exists to rate Scientific Research and Monitoring, Record of Following Scientific Advice, and Enforcement of Regulations differently, these ratings are the same as in 3.1.

- *5 (Very Low Concern) —Rated as 'highly effective' for all four subfactors considered.*
- *4 (Low Concern) —Management Strategy rated 'highly effective' and all other subfactors rated at least 'moderately effective.'*
- *3 (Moderate Concern) — All subfactors rates at least 'moderately effective.'*
- *2 (High Concern) — At minimum, meets standards for 'moderately effective' for Management Strategy but some other factors rated 'ineffective.'*
- *1 (Very High Concern) —Management exists, but Management Strategy rated 'ineffective.'*

- *0 (Critical)— No bycatch management even when overfished, depleted, endangered or threatened species are known to be regular components of bycatch and are substantially impacted by the fishery.*

Factor 3.2 Summary

Factor 3.2: Bycatch Management Strategy					
Region / Method	**Management Strategy and Impl.**	**Scientific Research & Monitoring**	**Record of Following Scientific Advice**	**Enforcement of Regs.**	**Factor 3.2 Score**
Hawaii Western Central Pacific Handline	N/A	N/A	N/A	N/A	N/A
Hawaii Western Central Pacific Portable lift nets	N/A	N/A	N/A	N/A	N/A
Hawaii Western Central Pacific Surrounding net	N/A	N/A	N/A	N/A	N/A

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 (plus the mitigation of gear impacts score) and the Ecosystem Based Fishery Management 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 cannot be Critical for Criterion 4.

Criterion 4 Summary

Region / Method	Factor 4.1 Impact of Gear on Habitat Score	Factor 4.2 Mitigation of Gear Impacts Modifier	Factor 4.3 Ecosystem Based Fisheries Management Score	Criterion 4 Score
Hawaii Western Central Pacific Handline	5.00:None	0.00:Not Applicable	3.00:Moderate Concern	**Green (3.873)**
Hawaii Western Central Pacific Portable lift nets	5.00:None	0.00:Not Applicable	3.00:Moderate Concern	**Green (3.873)**
Hawaii Western Central Pacific Surrounding net	3.00:Low Concern	0.25:Minimal Mitigation	3.00:Moderate Concern	**Yellow (3.123)**

Criterion 4 Assessment

Factor 4.1 – Impact of Fishing Gear on the Habitat/Substrate
Scoring Guidelines

- *5 (None)—Fishing gear does not contact the bottom*
- *4 (Very Low)—Vertical line gear*
- *3 (Low)—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. Bottom seine on resilient mud/sand habitats. Midwater trawl that is known to contact bottom occasionally (*

- *2 (Moderate)—Bottom dragging gears (dredge, trawl) fished on resilient mud/sand habitats. Gillnet, trap, or bottom longline fished on sensitive boulder or coral reef habitat. Bottom seine except on mud/sand*
- *1 (High)—Hydraulic clam dredge. Dredge or trawl gear fished on moderately sensitive habitats (e.g., cobble or boulder)*
- *0 (Very High)—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.

Hawaii Western Central Pacific, Handline

None

The handline gears used to capture mackerel scad and big-eye scad do not make contact with bottom habitats.

Hawaii Western Central Pacific, Portable lift nets

None

The lift net (or hoop net) fishing method for mackerel scad involves attracting a school of fish over the net and then raising the net to capture the fish. Fishing occurs at depths of 40-60 meters (McNaughton 2008). This gear does not make contact with the bottom habitat.

Hawaii Western Central Pacific, Surrounding net

Low Concern

The surround net fishing methods (circle fish to capture them) used to catch big-eye scad may include surround seines, surround gillnets, or bag nets (DAR 2013c)(WPRFMC 2009). These fishing gears do make contact with bottom habitats, but are typically set over sandy habitats, so the overall impact is considered a "low concern".

Factor 4.2 – Mitigation of Gear Impacts

Scoring Guidelines

- *+1 (Strong Mitigation)—Examples include large proportion of habitat protected from fishing (>50%) with gear, fishing intensity low/limited, gear specifically modified to reduce damage to seafloor and modifications shown to be effective at reducing damage, or an effective combination of 'moderate' mitigation measures.*
- *+0.5 (Moderate Mitigation)—20% of habitat protected from fishing with gear or other measures in place to limit fishing effort, fishing intensity, and spatial footprint of damage caused from fishing.*
- *+0.25 (Low Mitigation)—A few measures are in place (e.g., vulnerable habitats protected but other habitats not protected); there are some limits on fishing effort/intensity, but not actively being reduced.*
- *0 (No Mitigation)—No effective measures are in place to limit gear impacts on habitats.*

Hawaii Western Central Pacific, Handline
Hawaii Western Central Pacific, Portable lift nets

Not Applicable

Hawaii Western Central Pacific, Surrounding net

Minimal Mitigation

In Hawaii State waters, there are several Marine Life Conservation Districts (MLCDs) on the islands of O'ahu, Hawai'i and Maui, which are designed to conserve and replenish marine resources in near shore waters. These areas either prohibit all fishing or allow for only limited fishing. There are also various other regulated fishing areas, including Fishery Replenishment Areas, Fishery Management Areas, and Public Fishing Areas. Fishing for big-eye scad is allowed in some of these areas and prohibited in others. There are a few marine reserves, refuges, and sanctuaries, where all fishing is prohibited (DAR 2014). There are also some areas where net fishing is restricted (DAR 2013c). These areas do not protect a substantial proportion of big-eye scad habitats, so we have awarded a minimal mitigation score.

Factor 4.3 – Ecosystem-Based Fisheries Management

Scoring Guidelines

- *5 (Very Low Concern)—Substantial efforts have been made to protect species' ecological roles and ensure fishing practices do not have negative ecological effects (e.g., large proportion of fishery area is protected with marine reserves, and abundance is maintained at sufficient levels to provide food to predators).*
- *4 (Low Concern)—Studies are underway to assess the ecological role of species and measures are in place to protect the ecological role of any species that plays an exceptionally large role in the ecosystem. Measures are in place to minimize potentially negative ecological effect if hatchery supplementation or fish aggregating devices (FADs) are used.*
- *3 (Moderate Concern)—Fishery does not catch species that play an exceptionally large role in the ecosystem, or if it does, studies are underway to determine how to protect the ecological role of these species, OR negative ecological effects from hatchery supplementation or FADs are possible and management is not place to mitigate these impacts.*
- *2 (High Concern)—Fishery catches species that play an exceptionally large role in the ecosystem and no efforts are being made to incorporate their ecological role into management.*
- *1 (Very High Concern)—Use of hatchery supplementation or fish aggregating devices (FADs) in the fishery is having serious negative ecological or genetic consequences, OR fishery has resulted in trophic cascades or other detrimental impacts to the food web.*

Hawaii Western Central Pacific, Handline
Hawaii Western Central Pacific, Portable lift nets
Hawaii Western Central Pacific, Surrounding net

Moderate Concern

Big-eye scad and mackerel scad play an exceptionally large role in the ecosystem because of their importance as prey for larger species, such as tunas, marlins, mahi-mahi, wahoo, and rainbow runner

(Weng and Sibert 2000). Big-eye scad and mackerel scad are managed under the Federal Hawaii Ecosystem Plan. This is the first step in moving Hawaii fisheries management to an Ecosystem Based Management Approach, which aims to consider the interconnections about species and examine all impacts to the ecosystem (WPRFMC 2009). There are some areas where fishing is prohibited or restricted in Hawaii State waters, but these areas likely only protect a small proportion of the mackerel scad and big-eye scad populations (DAR 2014). Because sufficient policies are not yet in place to protect ecosystem functioning, but efforts to manage the fishery using an ecosystem-based approach are underway, we have awarded a moderate concern score.

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Scientific review does not constitute an endorsement of The Safina Center or Seafood Watch® programs, or its seafood recommendations, on the part of the reviewing scientists. The Safina Center and Seafood Watch® are solely responsible for the conclusions reached in this report.

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Appendix A: Main Species Considered in the Assessment

Summary of all main species considered in the assessment

Big-eye scad (akule): Hawaii Western Central Pacific, Handline				
Species	**Inherent Vulnerability**	**Abundance**	**Fishing Mortality**	**Subscore**
BIG-EYE SCAD (AKULE)	Low	3.00: Moderate Concern	2.33: Moderate Concern	**2.644**
MACKEREL SCAD ('OPELU)	Low	3.00: Moderate Concern	2.33: Moderate Concern	**2.644**

Big-eye scad (akule): Hawaii Western Central Pacific, Surrounding net				
Species	**Inherent Vulnerability**	**Abundance**	**Fishing Mortality**	**Subscore**
BIG-EYE SCAD (AKULE)	Low	3.00: Moderate Concern	2.33: Moderate Concern	**2.644**

Mackerel scad ('opelu): Hawaii Western Central Pacific, Handline				
Species	**Inherent Vulnerability**	**Abundance**	**Fishing Mortality**	**Subscore**
BIG-EYE SCAD (AKULE)	Low	3.00: Moderate Concern	2.33: Moderate Concern	**2.644**
MACKEREL SCAD ('OPELU)	Low	3.00: Moderate Concern	2.33: Moderate Concern	**2.644**

Mackerel scad ('opelu): Hawaii Western Central Pacific, Portable lift nets				
Species	**Inherent Vulnerability**	**Abundance**	**Fishing Mortality**	**Subscore**
MACKEREL SCAD ('OPELU)	Low	3.00: Moderate Concern	2.33: Moderate Concern	**2.644**