OPAH – PACIFIC OCEAN

Lampris guttatus

Sometimes known as moonfish, koko, kingfish, mariposa, Jerusalem haddock, ocean moonfish, spotted moonfish, spotted opah

SUMMARY

Opah is a pelagic species of fish (swims near the surface) found throughout all tropical and temperate oceans. It can grow to six and a half feet in length, approximately 550 pounds in weight, and may live for 11 years. Opah in the Pacific Ocean is probably at a medium level of abundance; however no formal population assessment has been done. Opah is typically caught as bycatch in pelagic longline fisheries targeting tuna and swordfish. Pelagic longlines have minimal impact on bottom habitat but can accidentally capture high numbers of sea birds and sharks.

Criterion	Points
Life History	2.25
Abundance	1.75
Habitat Quality and Fishing Gear Impacts	3.25
Management	2.25
Bycatch	1.00
Final Score	**2.10**
Color	

Final Score	Color
2.40 - 4.00	
1.60 - 2.39	
0.00 - 1.59	

LIFE HISTORY

Core Points (only one selection allowed)

If a value for intrinsic rate of increase ('r') is known, assign the score below based on this value. If no r-value is available, assign the score below for the correct age at 50% maturity for females if specified, or for the correct value of growth rate ('k'). If no estimates of r, age at 50% maturity, or k are available, assign the score below based on maximum age.

1.00 Intrinsic rate of increase <0.05; OR age at 50% maturity >10 years; OR growth rate <0.15; OR maximum age >30 years.

2.00 Intrinsic rate of increase = 0.05-0.15; OR age at 50% maturity = 5-10 years; OR a growth rate = 0.16–0.30; OR maximum age = 11-30 years.

Opah can grow to 2 m in length, over 250 kg in weight, and may life for 11 years (Froese and Kesner-Reyes 2002). There is no published information on their growth rates, age at sexual maturity or intrinsic rate of increase. We have assigned a middle score because they are likely to have a life history strategy similar to other pelagic fishes which involves moderate growth rates and ages at maturity.

3.00 Intrinsic rate of increase >0.16; OR age at 50% maturity = 1-5 years; OR growth rate >0.30; OR maximum age <11 years.

Points of Adjustment (multiple selections allowed)

-0.25 Species has special behaviors that make it especially vulnerable to fishing pressure (e.g., spawning aggregations; site fidelity; segregation by sex; migratory bottlenecks; unusual attraction to gear; etc.).

-0.25 Species has a strategy for sexual development that makes it especially vulnerable to fishing pressure (e.g., age at 50% maturity >20 years; sequential hermaphrodites; extremely low fecundity).

-0.25 Species has a small or restricted range (e.g., endemism; numerous evolutionarily significant units; restricted to one coastline; e.g., American lobster; striped bass; endemic reef fishes).

-0.25 Species exhibits high natural population variability driven by broad-scale environmental change (e.g. El Nino; decadal oscillations).

+0.25 Species does not have special behaviors that increase ease or population consequences of capture OR has special behaviors that make it less vulnerable to fishing pressure (e.g., species is widely dispersed during spawning).

+0.25 **Species has a strategy for sexual development that makes it especially resilient to fishing pressure (e.g., age at 50% maturity <1 year; extremely high fecundity).**

While little information concerning Opah reproduction exists, there is some indication that spawning likely occurs in the spring off the west coast of North America (Fitch and Lavenberg 1968). However, due to the paucity of information we have not added any points

+0.25 Species is distributed over a very wide range (e.g., throughout an entire hemisphere or ocean basin; e.g., swordfish; tuna; Patagonian toothfish).

Opah is found in the open ocean throughout all tropical and temperate oceans, as well as the Mediterranean and Caribbean Seas (Russo 1981; Heemstra 1986). This is a large range, so points were added.

+0.25 Species does not exhibit high natural population variability driven by broad-scale environmental change (e.g., El Nino; decadal oscillations).

2.25 Points for Life History

ABUNDANCE

Core Points (only one selection allowed)

Compared to natural or un-fished level, the species population is:

1.00 Low: Abundance or biomass is <75% of BMSY or similar proxy (e.g., spawning potential ratio).

2.00 Medium: Abundance or biomass is 75-125% of BMSY or similar proxy; OR population is approaching or recovering from an overfished condition; OR adequate information on abundance or biomass is not available.

Opah abundance in the Pacific Ocean has not been determined (AFMC 2006; WPRFMC 2009a), although a population assessment for Opah caught by US Pacific Island nations is scheduled for 2011. However, Opah catch rates around American Samoa and Hawaii have remained stable during the last decade (WPRFMC 2009a) suggesting that abundance is at moderate levels, so a score of 2 was awarded.

3.00 High: Abundance or biomass is >125% of BMSY or similar proxy.

Points of Adjustment (multiple selections allowed)

-0.25 The population is declining over a generational time scale (as indicated by biomass estimates or standardized CPUE).

-0.25 Age, size or sex distribution is skewed relative to the natural condition (e.g., truncated size/age structure or anomalous sex distribution).

The average size of Opah caught in the Hawaiian longline fishery from 2005-2006 was 83 lbs (WPRFMC 2009b), with ages ranging from 1 to 6 years (Seki 2004). The average weight of Opah caught in the American Samoa fish survey has varied over time with no real trend (WPRFMC 2009a). For example, average weights ranged from 34 to 107 lbs from 1996 to 2008 (WPRFMC 2009a). However, average weights sampled from canneries in American Samoa have decreased dramatically over time from 147 lbs in 2001 to 35 lbs in 2006 (WPRFMC 2009a). The average weight of Opah caught by Hawaiian longliners has also decreased over time (WPRFMC 2009). Average weights ranged from 111 to 100 lbs from 1987 to 2000 but have since decreased to 89 lbs in 2008 (WPRFMC 2009a). We have subtracted points to account for the decrease in size over time around American Samoa and Hawaii.

-0.25 Species is listed as "overfished" OR species is listed as "depleted", "endangered", or "threatened" by recognized national or international bodies.

-0.25 Current levels of abundance are likely to jeopardize the availability of food for other species or cause substantial change in the structure of the associated food web.

+0.25 **The population is increasing over a generational time scale (as indicated by biomass estimates or standardized CPUE).**

Opah longline catch rates in American Samoa remained fairly stable from 1996 to 2005 and increased slightly from 2006 to 2008 (WPRFMC 2009a). In the Hawaiian longline fishery, catch rates of Opah have remained fairly stable since 2000 (WPRFMC 2009a). We have not added points because catch rates appear stable and are not necessarily increasing over time.

+0.25 Age, size or sex distribution is functionally normal.

+0.25 Species is close to virgin biomass.

+0.25 **Current levels of abundance provide adequate food for other predators or are not known to affect the structure of the associated food web.**

Little is known about Opah feeding habits but limited stomach content analysis suggests they feed on small fish, crustaceans, squids and octopus (Hawn et al. 2002). We have not added points due to the general lack of information related to Opah's abundance and their feeding and predator habits.

1.75 Points for Abundance

HABITAT QUALITY AND FISHING GEAR IMPACTS

Core Points (only one selection allowed)

Select the option that most accurately describes the effect of the fishing method upon the habitat that it affects

1.00 The fishing method causes great damage to physical and biogenic habitats (e.g., cyanide; blasting; bottom trawling; dredging).

2.00 The fishing method does moderate damage to physical and biogenic habitats (e.g., bottom gillnets; traps and pots; bottom longlines).

3.00 The fishing method does little damage to physical or biogenic habitats (e.g., hand picking; hand raking; hook and line; pelagic long lines; mid-water trawl or gillnet; purse seines).

Opah are incidentally caught and retained in several pelagic longline fisheries including the Eastern Tuna and Billfish fishery off the coast of Queensland and New South Wales, Australia (AFMA 2006), and the American Samoa and Hawaiian longline fisheries (WPRFMC 2009a). In 2008, 5,334 lbs of Opah were caught in the American Samoa fishery and 1,335,000 lbs in the Hawaiian fishery, which were increases of 602% and 9% compared to the previous year, respectively (WPRFMC 2009a). In the South Pacific Ocean, Opah are also caught by longlines targeting albacore tunas (WPRFC 2006). Pelagic longline gear has a very low impact on bottom habitat (Morgan and Chuenpagdee 2003).

Points of Adjustment (multiple selections allowed)

-0.25 Habitat for this species is so compromised from non-fishery impacts that the ability of the habitat to support this species is substantially reduced (e.g., dams; pollution; coastal development).

-0.25 Critical habitat areas (e.g., spawning areas) for this species are not protected by management using time/area closures, marine reserves, etc.

Critical habitat areas for Opah are not specifically protected by any management measures.

-0.25 No efforts are being made to minimize damage from existing gear types OR new or modified gear is increasing habitat damage (e.g., fitting trawls with roller rigs or rockhopping gear; more robust gear for deep-sea fisheries).

-0.25 If gear impacts are substantial, resilience of affected habitats is very slow (e.g., deep water corals; rocky bottoms).

+0.25 Habitat for this species remains robust and viable and is capable of supporting this species.

Opah is found in the open ocean, ranging from shallow to deepwater (Parin 1970). Satellite tagging in the central Pacific suggests a depth range of 32 to 456 m and a temperature range of 8-26 ºC (Kerstetter et al. 2004). In Hawaiian waters Opah have a general depth range of 50-400 m and a temperature range of 8-22 ºC, with a daily average of 14.7 to 16.5 ºC (Polovina et al. 2008). Research in Hawaiian waters also suggests that Opah may move to shallower waters (50-150 m) during the night (Abécassis 2006; Polovina et al. 2008) and deeper waters (100-400 m) during the day (Polovia et al. 2008). Catch rates of Opah increase with depth and they are often caught near seamounts (Boggs 1992; Nakano et al. 1997). There is no indication that this habitat is not capable of supporting Opah.

+0.25 Critical habitat areas (e.g., spawning areas) for this species are protected by management using time/area closures, marine reserves, etc.

+0.25 Gear innovations are being implemented over a majority of the fishing area to minimize damage from gear types OR no innovations necessary because gear effects are minimal.

Pelagic longlines have a very low impact on bottom habitat (Morgan and Chuenpagdee 2003) and therefore gear innovations are not necessary.

+0.25 If gear impacts are substantial, resilience of affected habitats is fast (e.g., mud or sandy bottoms) OR gear effects are minimal.

3.25 Points for Habitat Quality and Fishing Gear Impacts

MANAGEMENT

Core Points (only one selection allowed)

Select the option that most accurately describes the current management of the fisheries of this species.

1.00 Regulations are ineffective (e.g., illegal fishing or overfishing is occurring) OR the fishery is unregulated (i.e., no control rules are in effect).

2.00 Management measures are in place over a major portion over the species' range but implementation has not met conservation goals OR management measures are in place but have not been in place long enough to determine if they are likely to achieve conservation and sustainability goals.

Management measures in the eastern tuna and billfish fishery off Australia include limited entry, gear restrictions, area closures, maximum catch limits, bycatch limits, observers, logbooks and bycatch mitigation measures to avoid seabird interactions (AFMA 2006).

Opah are managed under the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region (American Samoa, Guam, Hawaii, Northern Mariana Islands and US possession of the Western Pacific region) (WPRFMC 2005). Management measures under this plan include: permits, reporting requirements, area closures, limited entry (some fleets), maximum vessel size, and observer programs (WPRFMC 2009c).

3.00 Substantial management measures are in place over a large portion of the species range and have demonstrated success in achieving conservation and sustainability goals.

Points of Adjustment (multiple selections allowed)

-0.25 There is inadequate scientific monitoring of stock status, catch or fishing effort.

In Hawaii, catches of Opah appear to be accurately reported in logbooks (PFRP 2002), but overall there is little to no information available relative to Opah’s age and growth, size at sexual maturity, spawning behavior or migrations (Hawn et al. 2002) and there is

not enough fishery data to complete a population assessment. We have therefore subtracted points.

-0.25 Management does not explicitly address fishery effects on habitat, food webs, and ecosystems.

-0.25 This species is overfished and no recovery plan or an ineffective recovery plan is in place.

-0.25 Management has failed to reduce excess capacity in this fishery or implements subsidies that result in excess capacity in this fishery.

+0.25 There is adequate scientific monitoring, analysis and interpretation of stock status, catch and fishing effort.

+0.25 Management explicitly and effectively addresses fishery effects on habitat, food webs, and ecosystems.

In the US western Pacific Ocean, management plans address fishery effects on the ecosystem (WPRFMC 2008).

+0.25 This species is overfished and there is a recovery plan (including benchmarks, timetables and methods to evaluate success) in place that is showing signs of success OR recovery plan is not needed.

+0.25 Management has taken action to control excess capacity or reduce subsidies that result in excess capacity OR no measures are necessary because fishery is not overcapitalized.

There has been a declining trend in the number of longline vessels in American Samoa over time along with a limited entry program (WPRFMC 2009a;c). The number of Hawaii longline vessels has increased slightly in recent years because California based vessels have moved back to Hawaii after the closure of the California longline swordfish fishery (WPRFMC 2009a) but there is limited entry in this fishery as well (WPRFMC 2009c).

2.25 Points for Management

BYCATCH

Core Points (only one selection allowed)

Select the option that most accurately describes the current level of bycatch and the consequences that result from fishing this species. The term, "bycatch" used in this document excludes incidental catch of a species for which an adequate management framework exists. The terms, "endangered, threatened, or protected," used in this document refer to species status that is determined by national legislation such as the U.S. Endangered Species Act, the U.S. Marine Mammal Protection Act (or another nation's equivalent), the IUCN Red List, or a credible scientific body such as the American Fisheries Society.

1.00 Bycatch in this fishery is high (>100% of targeted landings), OR regularly includes a "threatened, endangered or protected species."

The Hawaiian longline fishery (deep-set) is listed as a Category I fishery (frequent incidental mortality or serious injury of marine mammals) with interactions possible with Blainville's beaked whales, bottlenose dolphins, false killer whales, humpback whales, pantropical spotted dolphins, Risso's dolphins, short-finned pilot whales and stripped dolphins (FR 74 No. 219).

In the western central Pacific Ocean a number of fish species are also incidentally caught in longline fisheries that catch Opah. These include marlins, sailfish, spearfish, swordfish, sharks, lancetfish, oilfish, sunfish, mahimahi, pomfrets, wahoo and other species (Lawson 2004). Billfish and marlin are also incidentally in Hawaiian longline fisheries that capture mahimahi (Dalzell and Boggs 2003). Although these species are incidentally caught, a number of them are landed for sale.

Bycatch in the Australian eastern tuna and billfish fishery includes tunas, billfish, other fish, sharks and rays, sea turtles and sea birds (AFMA 2006). Research in this fishery suggests lower interactions with sea turtles than in other longline fisheries and that most turtles are released alive (AFMA 2006). The most commonly discarded species in this fishery is the blue shark (AFMA 2006).

Bycatch of sharks in pelagic longline fisheries that also catch Opah can be a large percentage of the total catch and may negatively impact shark populations (Mandelman et al. 2008). Because Opah is caught in fisheries that are considered to interact with endangered marine mammals and sea turtles, and shark bycatch is high, a score of 1 was awarded.

2.00 Bycatch in this fishery is moderate (10-99% of targeted landings) AND does not regularly include "threatened, endangered or protected species" OR level of bycatch is unknown.

3.00 Bycatch in this fishery is low (<10% of targeted landings) and does not regularly include "threatened, endangered or protected species."

Points of Adjustment (multiple selections allowed)

-0.25 Bycatch in this fishery is a contributing factor to the decline of "threatened, endangered, or protected species" and no effective measures are being taken to reduce it.

-0.25 Bycatch of targeted or non-targeted species (e.g., undersize individuals) in this fishery is high and no measures are being taken to reduce it.

Bycatch of sharks in pelagic longline fisheries, which also catch Opah, can be a large percentage of the total catch and may negatively impact shark populations worldwide (Mandelman et al. 2008). For example, in the western and central Pacific Ocean (WCPO) from 1980 to 2004, 290,000 sharks representing over 40 species were observed caught by longlines (Molony 2005). The most commonly caught species was the blue shark and based on anecdotal evidence, it can be assumed that the majority of sharks were killed prior to being discarded. In the Australian tuna and billfish longline fishery and the Fiji tuna longline fishery sharks can make up more than 25% of the total catch. West Pacific longliners often catch as many unwanted sharks as tunas (Bailey et al. 1996).

In the Hawaiian swordfish longline fishery, sharks used to make up 50% of the catch and currently make up 32% of the catch (due to bait restrictions) and blue sharks (Prionace glauca) are one of the most commonly caught shark bycatch species, representing as much as 92% of the shark catch in pelagic longline fisheries (Gilman et al. 2007a). Blue, oceanic whitetip, bigeye thresher and crocodile shark non-standardized catch rates declined in this fishery between the time period of 1995-2000 and 2004-2006 (Walsh et al. 2009). This indicates that management measures implemented in the Hawaii shallow-set fishery to reduce sea turtle interactions have also reduced the incidental capture of sharks (Walsh et al. 2009).

We have subtracted points to account for the remainder of the pelagic longline fisheries that still capture sharks in large quantities.

-0.25 **Bycatch of this species (e.g., undersize individuals) in other fisheries is high OR bycatch of this species in other fisheries inhibits its recovery, and no measures are being taken to reduce it.**

Opah are caught and discarded or used for the crew in the South Pacific albacore longline fishery (WPRFMC 2006). In this fishery, total bycatch is usually around 15% of the total catch (WPRFMC 2006). Large numbers of Opah are incidentally caught by the Hawaiian longline fishery (WPRFMC 2002). Between 2004 and 2007 65% of Opah incidentally caught in this fishery were kept (WPRFMC 2009b) and in 2008 95% were retained (WPRFMC 2009a). Opah are also a commonly caught incidental species in the California drift gillnet fishery (Hanan et al. 1993). In the Australian eastern tuna and billfish fishery Opah are caught as bycatch but are typically retained (<2% discarded between 2000-2003) (Bromhead and Wise 2005). Opah represent about 3% the total catch in longline fisheries in the western and central Pacific Ocean and are retained from 50-97% of the time (WCPFC 2010). In addition, Opah is sometimes caught as bycatch in the Western

and Central Pacific handline fishery (WCPFMC 2007). When combined with several other species (black marlin, sailfish, swordfish and unidentified species) they represent around 1.5% of the landed catch in this fishery (WCPFMC 2007). Because the majority of Opah caught as bycatch are retained and sold, no points were subtracted.

-0.25 The continued removal of the bycatch species contributes to its decline.

+0.25 Measures taken over a major portion of the species range have been shown to reduce bycatch of "threatened, endangered, or protected species" or bycatch rates are no longer deemed to affect the abundance of the "protected" bycatch species OR no measures needed because fishery is highly selective (e.g., harpoon; spear).

The Australian eastern tuna and billfish fishery employs seabird bycatch mitigations measures, such as 'tori' lines, weighted swivels during day sets and thawed bait during night sets (AFMA 2006). This has resulted in catch rates being less than 0.05 birds per 1000 hooks (AFMA 2006). Australia has also banned shark finning in response to reports of high amounts of finning going on in their tuna fisheries, particularly the eastern tuna and billfish fishery (AFMA 2006). The Australian Fisheries Management Authority (AFMA) also limits the number of sharks landed per trip and banned the use of wire leaders (AFMA 2006).

From 2004 to 2008 no short tailed albatrosses (listed under the Endangered Species Act) were incidentally captured in the re-opened Hawaiian shallow-set longline fishery (NMFS 2009). The 2004 Biological Opinion found the re-opening of the shallow-set fishery was not likely to jeopardize the continued existence of the short-tailed albatross (USFWS 2004). Fishermen in this fishery must use weighted branch lines, thawed blue-dyed bait and strategic offal discards or side setting techniques that include setting from the port or starboard side, line shooters, bird curtains and deploying gear so it does not resurface (NMFS 2009). Fisheries observers are required on all shallow setting longline vessels and on 20% of deep-set longline vessels to observer sea bird interactions (NMFS 2009). Since the introduction of these sea bird mitigation measures, the number of albatross caught by both the deep and shallow set fisheries has dropped from 2,433 in 2000 to 212 in 2008 (NMFS 2009). In the deep-set fishery sea bird interactions have been reduced by 83% (Gilman and Kobayashi 2007).

In Hawaii, the swordfish longline fleet must use circle hooks with only fish (no squid) bait and this regulation has resulted in a 34% reduction in catches of mahimahi, Opah and wahoo and an 83% and 90% reduction in capture rates of leatherback and loggerhead sea turtles respectively (Gilman et al. 2007b). Shark catch rates also declined by 36% with the use of circle hooks (Gilman et al. 2007b). The 2004 Biological Opinion found the shallow-set fishery was not likely to jeopardize the existence of any species listed under the Endangered Species Act (WPRFMC 2009b). Longliners in American Samoa must also carry equipment to handle and release incidentally caught sea turtles (NMFS 2010).

+0.25 There is bycatch of targeted (e.g., undersize individuals) or non-targeted species in this fishery and measures (e.g., gear modifications) have been implemented that have been shown to reduce bycatch over a large portion of the species range OR no measures are needed because fishery is highly selective (e.g., harpoon; spear).

+0.25 Bycatch of this species in other fisheries is low OR bycatch of this species in other fisheries inhibits its recovery, but effective measures are being taken to reduce it over a large portion of the range.

+0.25 The continued removal of the bycatch species in the targeted fishery has had or will likely have little or no impact on populations of the bycatch species OR there are no significant bycatch concerns because the fishery is highly selective (e.g., harpoon; spear).

1.00 Points for Bycatch

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