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**DEPARTMENT OF COMMERCE**

National Oceanic and Atmospheric Administration

50 CFR Parts 223 and 224

[Docket No. 150527481-5834-01]

RIN 0648-XD971

Endangered and Threatened Wildlife and Plants: Proposed Threatened Status for Island Grouper (*Mycteroperca fusca*) and Endangered Status for Gulf Grouper (*Mycteroperca jordani*) Under the Endangered Species Act (ESA)

**AGENCY:** National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

**ACTION:** Proposed rule; 12-month findings; request for comments.

**SUMMARY:** We, NMFS, announce 12-month findings and listing determinations on a petition to list the gulf grouper (*Mycteroperca jordani*) and the island grouper (*Mycteroperca fusca*) as threatened or endangered under the Endangered Species Act (ESA). We have completed comprehensive status reviews for these two marine fish species in response to a petition submitted by WildEarth Guardians. After reviewing the best scientific and commercial data available, we have determined that the gulf grouper is currently in danger of extinction throughout its range and, therefore, meets the definition of an endangered species. After reviewing the best scientific and commercial data available, we have also determined that the island grouper is not currently in danger of extinction throughout all or a significant portion of its range, but is likely to become so

within the foreseeable future. Therefore, we conclude that the island grouper meets the definition of a threatened species. We are soliciting information that may be relevant to inform the final determinations for these two species.

**DATES:** Comments on this proposed rule must be received by [*Insert date 60 days after date of publication in the FEDERAL REGISTER*]. Public hearing requests must be made by [*Insert date 45 days after date of publication in the FEDERAL REGISTER*].

**ADDRESSES:** You may submit comments on this document, identified by the code NOAA-NMFS-2015-0071, by either of the following methods:

- **Electronic Submission:** Submit all electronic public comments via the Federal eRulemaking Portal. Go to *www.regulations.gov*/  
*#!/docketDetail;D=NOAA-NMFS-2015-0071*. Click the “Comment Now” icon, complete the required fields. Enter or attach your comments.
- **Mail:** Submit written comments to, Ron Salz, NMFS Office of Protected Resources (F/PR3), 1315 East West Highway, Silver Spring, MD 20910, USA.

**Instructions:** Comments sent by any other method, to any other address or individual, or received after the end of the comment period, may not be considered. All comments received are a part of the public record and will generally be posted for public viewing on <http://www.regulations.gov> without change. All personal identifying information (*e.g.*, name, address, etc.), confidential business information, or otherwise sensitive information submitted voluntarily by the sender will be publicly accessible. We will accept anonymous comments (enter “N/A” in the required fields if you wish to remain

anonymous). Attachments to electronic comments will be accepted in Microsoft Word, Excel, or Adobe PDF file formats only.

You can obtain the petition, status review reports, proposed rule, and list of references electronically on our NMFS Web site at

<http://www.nmfs.noaa.gov/pr/species/petition81.htm>.

**FOR FURTHER INFORMATION CONTACT:** Ronald Salz, NMFS, Office of Protected Resources (OPR), (301) 427-8171 or Marta Nammack, NMFS, OPR, (301) 427-8403.

#### **SUPPLEMENTARY INFORMATION:**

##### **Background**

On July 15, 2013, we received a petition from WildEarth Guardians to list 81 marine species or subpopulations as threatened or endangered under the Endangered Species Act (ESA). This petition included species from many different taxonomic groups, and we prepared our 90-day findings in batches by taxonomic group. We found that the petitioned actions may be warranted for 24 of the species and 3 of the subpopulations and announced the initiation of status reviews for each of the 24 species and 3 subpopulations (78 FR 63941, October 25, 2013; 78 FR 66675, November 6, 2013; 78 FR 69376, November 19, 2013; 79 FR 9880, February 21, 2014; and 79 FR 10104, February 24, 2014). This document addresses the 12-month findings for two of these species: gulf grouper (*Mycteroperca jordani*) and island grouper (*Mycteroperca fusca*). The status of the findings and relevant **Federal Register** notices for the other 21 species and 3 subpopulations can be found on our website at <http://www.nmfs.noaa.gov/pr/species/petition81.htm>.

We are responsible for determining whether species are threatened or endangered under the ESA (16 U.S.C. 1531 *et seq.*). To make this determination, we consider first whether a group of organisms constitutes a “species” under the ESA, then whether the status of the species qualifies it for listing as either threatened or endangered. Section 3 of the ESA defines a “species” to include “any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature.” On February 7, 1996, NMFS and the U.S. Fish and Wildlife Service (USFWS; together, the Services) adopted a policy describing what constitutes a distinct population segment (DPS) of a taxonomic species (the DPS Policy; 61 FR 4722). The DPS Policy identified two elements that must be considered when identifying a DPS: (1) the discreteness of the population segment in relation to the remainder of the species (or subspecies) to which it belongs; and (2) the significance of the population segment to the remainder of the species (or subspecies) to which it belongs. As stated in the DPS Policy, Congress expressed its expectation that the Services would exercise authority with regard to DPSs sparingly and only when the biological evidence indicates such action is warranted. Based on the scientific information available, we determined that the gulf grouper (*Mycteroperca jordani*) and the island grouper (*Mycteroperca fusca*) are both “species” under the ESA. There is nothing in the scientific literature indicating that either of these species should be further divided into subspecies or DPSs.

Section 3 of the ESA defines an endangered species as “any species which is in danger of extinction throughout all or a significant portion of its range” and a threatened species as one “which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” We interpret an “endangered

species" to be one that is presently in danger of extinction. A "threatened species," on the other hand, is not presently in danger of extinction, but is likely to become so in the foreseeable future (that is, at a later time). In other words, the primary statutory difference between a threatened and endangered species is the timing of when a species may be in danger of extinction, either presently (endangered) or in the foreseeable future (threatened).

When we consider whether a species might qualify as threatened under the ESA, we must consider the meaning of the term "foreseeable future." It is appropriate to interpret "foreseeable future" as the horizon over which predictions about the conservation status of the species can be reasonably relied upon. The foreseeable future considers the life history of the species, habitat characteristics, availability of data, particular threats, ability to predict threats, and the reliability to forecast the effects of these threats and future events on the status of the species under consideration. Because a species may be susceptible to a variety of threats for which different data are available, or which operate across different time scales, the foreseeable future is not necessarily reducible to a particular number of years.

Section 4(a)(1) of the ESA requires us to determine whether any species is endangered or threatened due to any one or a combination of the following five threat factors: the present or threatened destruction, modification, or curtailment of its habitat or range; overutilization for commercial, recreational, scientific, or educational purposes; disease or predation; the inadequacy of existing regulatory mechanisms; or other natural or manmade factors affecting its continued existence. We are also required to make listing determinations based solely on the best scientific and commercial data available,

after conducting a review of the species' status and after taking into account efforts being made by any state or foreign nation to protect the species.

In assessing extinction risk of these two species, we considered the demographic viability factors developed by McElhany *et al.* (2000) and the risk matrix approach developed by Wainwright and Kope (1999) to organize and summarize extinction risk considerations. The approach of considering demographic risk factors to help frame the consideration of extinction risk has been used in many of our status reviews (see <http://www.nmfs.noaa.gov/pr/species> for links to these reviews). In this approach, the collective condition of individual populations is considered at the species level according to four demographic viability factors: abundance, growth rate/productivity, spatial structure/connectivity, and diversity. These viability factors reflect concepts that are well-founded in conservation biology and that individually and collectively provide strong indicators of extinction risk.

Scientific conclusions about the overall risk of extinction faced by the gulf grouper and the island grouper under present conditions and in the foreseeable future are based on our evaluation of the species' demographic risks and section 4(a)(1) threat factors. Our assessment of overall extinction risk considered the likelihood and contribution of each particular factor, synergies among contributing factors, and the cumulative impact of all demographic risks and threats on the species.

We then assess efforts being made to protect the species, to determine if these conservation efforts are adequate to mitigate the existing threats. Section 4(b)(1)(A) of the ESA requires the Secretary, when making a listing determination for a species, to take

into consideration those efforts, if any, being made by any State or foreign nation, or any political subdivision of a State or foreign nation, to protect the species.

Status reviews for the gulf grouper and the island grouper were conducted by NMFS OPR staff and an in-house contractor. In order to complete the status reviews, we compiled the best available information on the species' biology, ecology, life history, threats, and conservation status from information contained in the petition, our files, a comprehensive literature search, and consultation with experts. We also considered information submitted by the public in response to our petition findings. Draft status review reports were also submitted to independent peer reviewers; comments and information received from peer reviewers were addressed and incorporated as appropriate before finalizing the draft reports. The gulf grouper and island grouper status review reports are available on our website (see **ADDRESSES** section). Below we summarize information from these reports and the status of each species.

## **Status Reviews**

### *Gulf Grouper*

The following section describes our analysis of the status of the gulf grouper, *Mycteroperca jordani*.

### *Species Description*

The gulf grouper (Jenkins and Evermann 1889) is a large, heavy-bodied grouper with rounded preopercle and moderate sized scales (Smith 1971). They have a comparatively elongated and compressed body shape with body depth much less than their head length (Jenkins and Evermann 1889, Heemstra and Randall 1993). The dorsal fin has 11 spines and 16 to 17 rays, with the posterior margin rounded (Heemstra and

Randall 1993). The anal fin has 3 spines and 10 to 11 rays; and the gill rakers range from 21 to 26, not counting rudiments (Heemstra and Randall 1993). Juvenile gulf grouper are greyish-brown with large, dark grey oblong blotches on the dorsal part of the body and fins (Heemstra and Randall 1993). Female adults are generally dark brown to grey, but they can assume a juvenile pattern when disturbed or excited. Larger adult males develop a white margin along the pectoral fin, with the medial fin developing a narrow white edge (Heemstra and Randall 1993). In spawning aggregations, breeding individuals exhibit conspicuous dark lines radiating from the eye (Sala *et al.* 2003). Gulf grouper can grow up to 150 cm (in total length), 91 kg (in weight), and 48 years (Heemstra and Randall 1993, Aburto-Oropeza *et al.* 2008). Gulf grouper are considered voracious, solitary predators, though little is known about their diet or feeding behavior.

#### *Reproductive Biology and Spawning Behavior*

Gulf grouper are a protogynous hermaphroditic fish, meaning they mature as females and, later in life, transition into males. Gulf grouper mature as females at an estimated six to seven years of age (Aburto-Oropeza *et al.* 2008). Gulf grouper are believed to transition from female to male based upon their size (size-advantage model) (Bhandari *et al.* 2006, Zhou and Gui 2010). The size-advantage model theorizes that if it is advantageous for one sex to reproduce at a small size and the other sex to reproduce at a larger size, then the individual should change sex at some point in life (Ghiselin 1969, Bhandari *et al.* 2006). Larger female grouper produce substantially more and higher quality eggs than smaller females. Although not studied directly in gulf grouper, an eight-year-old female *Mycteroperca* produces approximately 60 times the number of eggs that a five-year-old female produces (Aburto-Oropeza *et al.* 2008). For males, larger size is

advantageous when competing with other males for reproduction opportunities with females at spawning aggregation sites (Domeier and Colin 1997).

Gulf grouper are transient aggregate spawners. Domeier and Colin (1997) defined spawning aggregations as “a group of conspecific fish gathered for the purpose of spawning, with fish densities or numbers significantly higher than those found in the area of aggregation during the non-reproductive periods.” Spawning aggregations are further categorized as either “resident” or “transient” depending upon aggregation criteria.

Transient spawning aggregations typically (1) draw individuals from a relatively large area (individuals travel days to weeks to gather), (2) occur during a very specific time of year (one or two months), (3) persist for only a few-day period, and (4) do not occur year-round (Domeier and Colin 1997). Transient aggregate species are often large sized predators that are not known to spawn outside of aggregations (Domeier and Colin 1997).

The location and timing of gulf grouper spawning aggregations may depend upon tidal influences on egg or larvae distribution (Domeier and Colin 1997, Cherubin *et al.* 2011). All known spawning aggregation sites for gulf grouper, current and historical, are found in the Gulf of California (GOC) (Sala *et al.* 2004, Sáenz-Arroyo *et al.* 2005a, Moreno-Baez 2010). The GOC, with its length and combinations of basins, islands, and sills, has large tides (up to 4 m) and fast tidal currents (up to 1.5 m / sec) which peak during the full moon (Filonov and Lavín 2003). Gulf grouper are found on predictable spawning aggregation locations before and during the full moon in May (Sala *et al.* 2004). Their spawning aggregation sites consist of rocky reef (gorgonians and black coral) seamounts with abrupt relief habitat at 20 to 35 m depths. Adult gulf grouper form spawning aggregations of 40 or more individuals in areas larger than 1,000 m<sup>2</sup> (Aburto-

Oropeza *et al.* 2008). Based upon three observed spawning aggregations, gulf grouper spawning aggregation density was estimated at 220 fish/ha with fish sizes ranging from 100 to 150 cm total length (Sala *et al.* 2003). Along the Pacific coast, spawning aggregation sites for gulf groupers are an unknown, though the size of the historical gulf grouper fisheries suggests that spawning aggregation sites may have been present.

#### *Population Structure, Distribution, Abundance and Habitat*

The gulf grouper resides in the subtropical eastern Pacific Ocean and Gulf of California from 32.84° N (La Jolla, California, United States) to 23.22° N (Mazatlán, Sinaloa, Mexico) (Heemstra and Randall 1993). The overall range distribution for gulf grouper is considered restricted, defined as less than 800,000 km<sup>2</sup> (Morris *et al.* 2000). Gulf grouper habitat requirements vary throughout life. Groupers in general pass through a pelagic larvae phase (20-50 days) during which they settle into rocky, coastal reefs (Aburto-Oropeza *et al.* 2008). After this phase, they acquire juvenile characteristics while they settle into shallow, coastal habitats (e.g. *Sargassum* beds, seagrass areas, mangroves, and estuaries); this nursery stage can last up to two years. Adult gulf grouper predominately use rocky reefs and kelp beds of depths from five to 30 meters (Heemstra and Randall 1993) and deeper (30 to 45 m) during the summer (Moreno-Baéz 2010). During the spawning season, gulf grouper will aggregate in rocky reefs in depths from 20 to 35 m (Sala *et al.* 2003).

Historical and current gulf grouper population abundance is unknown. Estimated trends in gulf grouper abundance are based primarily on limited fisheries catch data and anecdotal reports. The available information indicates that gulf grouper were once a dominant species in rocky-reef fish communities in terms of biomass, before stocks

collapsed in the early 1970s (Sáenz-Arroyo *et al.* 2005a). In the 1930s, California fishermen reported gulf grouper as being abundant in Mexican waters between Bahía Tortugas and Bahía Magdalena, and this species represented an important component of the commercial fishery south of the U.S.-Mexico border (Croaker 1937, Fitch 1949). Combined landings of gulf grouper and broomtail grouper for the California commercial fishery peaked in the early 1950s at 376 metric tons (mt), declined to around 100-150 mt between the late 1950s until the late 1960s, after which the grouper fishery completely crashed to near zero landings by 1970 (California Department of Fish and Wildlife - <http://libraries.ucsd.edu/apps/ceo/fishbull/>). In 1976, the California Department of Fish and Game adopted no-take prohibitions for broomtail grouper and gulf grouper that are still in effect today.

In the GOC, gulf grouper accounted for a significant proportion of the commercial landings weight in the mid-20<sup>th</sup> century. In 1960, gulf grouper represented approximately 45 percent of the artisanal fishery in the GOC (Aburto-Oropeza *et al.* 2008). Based on anecdotal accounts, boats from El Club de Vuelos sport fishing resort in Loreto (Mexico) landed an estimated 63 mt of gulf grouper during a 2-month period in 1962 (Sáenz-Arroyo *et al.* 2005a). By comparison, only an estimated 58 mt of gulf grouper were harvested from 2006 through 2012 throughout the species' entire range. The El Club de Vuelos boats fished at the Punta Lobos and San Bruno seamounts, both probable spawning aggregation sites at that time. There are also anecdotal reports from the 1940s and 1950s of fishermen using dynamite to capture large numbers of gulf grouper at the San Bruno seamount (Sáenz-Arroyo *et al.* 2005a). Sáenz-Arroyo *et al.* (2005a) conducted over 30 dives from 2001 through 2004 during the gulf grouper

spawning season at sites that were recommended by the original fishermen from El Club de Vuelos. During these dives, only three gulf grouper were observed, all at the Punta Lobos seamount. In 2002 and 2003, a biologist fished the San Bruno seamount during the spawning aggregation season and was only able to capture one gulf grouper (Sáenz-Arroyo *et al.* 2005a). Since official Mexican fishery landings data at the species level are only available since 2007, these data fail to encapsulate the major decline in GOC gulf grouper abundance, which likely started in the mid-20<sup>th</sup> century.

#### *Summary of Factors Affecting the Gulf Grouper*

Available information regarding current, historical, and potential future threats to the gulf grouper was thoroughly reviewed (Dennis 2015). We summarize information regarding threats below according to three (out of five) factors specified in section 4(a)(1) of the ESA: “Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range”; “Overutilization for Commercial, Recreational, Scientific, or Educational Purposes”; and “Inadequacy of Existing Regulatory Mechanisms.” We found very little information regarding potential threats that fall into the section 4(a)(1) categories of either “Disease and Predation” or “Other Natural or Manmade Factors.” These subjects are data poor, but there are no serious or known concerns raised under these threat categories with respect to gulf grouper extinction risk; therefore, we do not discuss these categories further here. See Dennis (2015) for additional discussion of all ESA section 4(a)(1) threat categories.

#### *Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range*

Since the beginning of the 20<sup>th</sup> century, human population growth and development has resulted in the loss and degradation of coastal habitats throughout the

gulf grouper's range. Continued loss or degradation of these habitats represents a potential threat to the species. The terrestrial habitat surrounding the GOC is mostly arid to semi-arid with rivers feeding the estuaries and marine waters with sediments and fresh water. Originating in these dry environments, the rivers and estuaries are of limited supply and great importance. There are ten major rivers that provide freshwater, sediment, and nutrient inputs to the GOC. These rivers have been extensively dammed, exploited for agricultural uses, and polluted from agricultural and urban runoff. As a result, the coastal habitats bordering the GOC have been reduced and degraded, while nearshore salinities, which ecosystems have evolved for, have changed. The Río Colorado is the largest watershed flowing into the GOC, representing over two-thirds of the GOC's watershed acreage. Historically, 16.4 million acre-feet of water flowed annually into the GOC from the Río Colorado (Goodfriend and Flessa 1997, Bureau of Reclamation 2012). Today the river rarely flows to the GOC due to the cumulative effects of two large dam projects (Hoover Dam and Glen Canyon Dam) and major water diversions. Increased anthropogenic nitrogen from sewage, agricultural, and shrimp farming sources are directly utilized by macroalgae, creating more frequent blooms and corresponding anoxia throughout coastal habitats in the GOC (Piñón-Gimate *et al.* 2009). Juvenile gulf grouper reside in these coastal habitats (such as *Sargassum* and seagrass beds, mangroves, and other kinds of estuary habitats) during the first few years of life, and are susceptible to these environmental changes (Aburto-Oropeza *et al.* 2008).

Shrimp aquaculture began in the GOC in the early 1980s. The production of cultivated shrimp in the GOC has increased tremendously over the past 30 years: 35 mt in 1985; 15,867 mt in 1995; 33,480 mt in 2000; and 125,609 mt in 2009 (Gillett 2008,

SEPESCA-BC web page <http://www.sepescabc.gob.mx/x/estadisticas/>). Shrimp farms can negatively impact gulf grouper through direct loss of habitat and through habitat degradation. The conversion of natural saltmarshes and mangrove forests into shrimp farms can result in the direct loss of nursery areas for juvenile gulf grouper (Páez-Osuna 2001). In the northern GOC, an estimated 95 percent of mangrove forests are impacted by shrimp farms (Glenn *et al.* 2006). GOC shrimp ponds stock between 60,000 to 200,000 shrimp per hectare, and require a daily water exchange of three to six percent (Páez-Osuna *et al.* 1998, Páez-Osuna *et al.* 2003). During water exchanges, organic matter from unconsumed shrimp food, detritus, phytoplankton, zooplankton, and bacteria is flushed into the GOC through discharge channels (Barraza-Guardado *et al.* 2013). Shrimp farm effluents contribute 10.2 percent of the nitrogen and 3.3 percent of the phosphorus inputs into the GOC (Miranda *et al.* 2009). Adding these organic materials into the marine habitat, which is already receiving effluents from other anthropogenic sources, deteriorates water quality through oxygen depletion, light reduction, increased salinity, increased chlorophyll and bacteria levels, and changes in benthic macrofauna, resulting in possible eutrophication (Páez-Osuna 2001, Barraza-Guardado *et al.* 2013). For example, the Altata-Ensenada del Pabellón lagoon receives effluent from shrimp farms, intensive agriculture (i.e., sugar cane), and sewage from local cities, leading to phytoplankton blooms, anoxia, and fish kill events (Páez-Osuna 1999). The combined effects of shrimp farm effluents (and other sources of anthropogenic nutrient loading) with climate change may result in an increased incidence of hypoxia due to enhanced ocean stratification, decreased oxygen solubility, increased metabolism, and increased production of organic matter (Rabalais *et al.* 2009). Shrimp farm effluents also typically contain antibiotics

which are used in large quantities to preemptively treat bacterial diseases (Kautsky *et al.* 2000).

Effluents from agricultural areas and aquaculture facilities also contribute to harmful algal blooms in the GOC. Red tides, which are produced by a planktonic dinoflagellate (*Prorocentrum minimum*), were first reported in the GOC in 1990. Between 1990 and 2003, 13 red tide events occurred, with six occurring in shrimp ponds and seven occurring near aquaculture and agricultural areas (Sierra-Beltrán *et al.* 2005). Most recently, a red tide occurred in January 2015 near San Felipe, Baja California that resulted in fish, bird, and marine mammal mortalities.

GOC reefs are predominantly rocky, with a coral component in the south, which shifts to kelp (brown algae) in the north (Squires 1959). Reef habitats support a wide diversity and high density of marine life, including gulf grouper, and are particularly sensitive to anthropogenic threats. Both direct (e.g., fishing with dynamite, dredging) and indirect (e.g., anthropogenic nutrients, climate change) activities have had a detrimental impact on the reefs within the gulf grouper's range. In the past, dynamite was often used for fishing on reefs, which has resulted in permanent damage to gulf grouper spawning habitat (Lozano-Montes *et al.* 2008). Development of the GOC region has resulted in more dredging activities (Zamora-Arroyo *et al.* 2005) and increased nutrient loading into the marine ecosystem, resulting in algal growth and hypoxic waters that can degrade and kill coral (Kline *et al.* 2006). The effects of climate change can lead to coral loss and degradation through bleaching and mortality events from elevated ocean temperatures, loss of structural integrity, and ocean acidification. During the 1997-1998 El Niño event, sea surface temperature anomalies of greater than 1.5°C occurred from July 1997 through

January 1998. Coral bleaching was extensive throughout the southern GOC: over 30 percent of live coral cover was bleached, of which, nearly 70 percent died within a few months (Bonilla 2001). Though the 1997-1998 coral bleaching event was related to El Niño, similar impacts may be expected in the future due to increasing ocean temperatures associated with climate change.

The impact of anthropogenic activities on GOC marine habitats will likely increase in the future based on projected human population growth and development in this region. Population growth in the GOC region is expected to continue at a high rate with approximately 150,000 new residents per year (Source: [http://www.conapo.gob.mx/es/CONAPO/Proyecciones\\_Datos](http://www.conapo.gob.mx/es/CONAPO/Proyecciones_Datos)). The Mexican federal government has placed a major emphasis on tourism and trade development throughout the GOC. Beginning in 2008, the first paved highway along the Sonoran GOC coast was constructed from Puerto Peñasco to Mexicali (population 689,775) (Wilder *et al.* 2012b). In Puerto Peñasco, the construction of a new marina with associated breakwaters and facilities for cruise liners has started and is expected to be completed in 2015. With improved accessibility by land and sea, Puerto Peñasco is currently undergoing a construction boom, with two major resorts adding over 100,000 rooms via hotels and condominiums along with golf courses and 22 small-scale desalination plants (Wilder *et al.* 2012b). Two hundred kilometers south in Puerto Libertad, the Liberty Cove resort has been approved for 60,000 dwellings, golf courses, a race track, and a marina. Another project, the Escalera Náutica del Mar de Cortés y Riviera Maya, will construct 29 new marinas throughout the GOC with facilities to accommodate cruise ships and 60,000 boats annually (Wilder *et al.* 2012b). Another purpose of the improved ports is to

increase trade. For example, after dredging its harbor in 2013, the Port of Guaymas became the second largest Mexican port and is capable of handling vessels up to 130,000 tons, while increasing its port capacity from 8 to 30 million tons of cargo.

Increased development and infrastructure will result in increased energy and water needs. To meet these needs there are plans to greatly expand tidal power and desalination plant capacity in the region. The GOC is considered one of the best tidal power locations in the world due to its large tides and proximity to urban areas. Two GOC tidal power site locations have been identified and are in the early stages of planning: Bahía de Adair and Canal del Infiernillo. Environmental impacts from tidal power include habitat loss, increased turbidity, mobilization of contaminants, and changes in the morphodynamics of the seabed (Gill 2005, Neill *et al.* 2009). Plans for expanding tourism in the GOC often include construction of desalination plants (Wilder *et al.* 2012b). Desalination plants impact the environment by both their very substantial power requirements and the wastewater discharges, which include brine plumes (at twice the salinity of marine waters), antiscalents, coagulants, heavy metals, and membrane preservatives that get released into the marine environment (Roberts *et al.* 2010). Marine organisms can also get trapped in desalination intake systems (Wilder *et al.* 2012a). All of this increased development in and around the GOC is anticipated to have negative effects on the GOC environment as a whole, and thus, on gulf grouper habitat within that environment.

#### *Overutilization for Commercial, Recreational, Scientific, or Educational Purposes*

Gulf grouper are a highly prized commercial and recreational fish species due to their large size and palatability. Gulf grouper also exhibit the following life history traits

and behavioral characteristics that increase the species' vulnerability to fishery overutilization: slow growth, late maturation, large size, protogynous hermaphroditism, long life-span, and the formation of transient spawning aggregations (Sadovy 1994). In protogynous hermaphrodites, the largest individuals are, in order, terminal males, individuals undergoing sexual transition, and the largest, most fecund females who are next in line for sexual transition. Since fishers selectively harvest the largest individuals, these groups are removed at a high rate, leading to decreased productivity of a population. In one study of the artisanal fishery of Bahía de Los Angeles, nearly 99 percent of gulf grouper landed from 2002-2003 were immature fish (Aburto-Oropeza *et al.* 2008). These data suggest that large, mature gulf grouper have been mostly removed from the population.

Spawning aggregations sites are particularly vulnerable to overfishing because they occur at predictable places and times and they contain fish at a much higher than normal density (Domeier and Colin 1997). Many fishermen base their fishing activities upon the movement patterns of target species, and knowledge of spawning aggregation sites is highly advantageous (Sadovy *et al.* 1994, Moreno-Báez *et al.* 2012). Gulf grouper spawning aggregation sites within the GOC (e.g. Punta Lobos and San Bruno seamounts) have disappeared after periods of heavy exploitation (Sáenz-Arroyo *et al.* 2005a). The reduction or complete loss of additional spawning aggregations due to overfishing represents a continued threat to the gulf grouper.

Commercial landings of gulf grouper from the Pacific Ocean (U.S. vessels fishing in Mexican waters) peaked in the early 1950s, followed by a population decline to near commercial extinction by 1970. In 1976, California declared the gulf grouper a

prohibited species. Based on recent fishery independent surveys and fisheries data, the gulf grouper is still considered a very rare occurrence in the Pacific Ocean.

Time series fisheries catch and effort data available for gulf grouper in the GOC are sparse. Official Mexican fisheries statistics did not include artisanal landings until 1988 (only commercial were included prior to that date), and species level information specific to gulf grouper are only available since 2007. Currently, gulf grouper represent less than one percent of the artisanal fishery in the GOC. However, recent gulf grouper landings can be misinterpreted, leading one to incorrectly conclude that the gulf grouper is a naturally rare species. Anecdotal information based on Local Fishermen Knowledge (LFK) indicates that gulf grouper were once abundant in the GOC and represented approximately 45 percent of the artisanal fishery landings weight in 1960 (Sáenz-Arroyo *et al.* 2005a). Studies of LFK in the GOC indicate sharp declines in gulf grouper abundance over the past 50 years (Sala *et al.* 2004, Sáenz-Arroyo *et al.* 2005a and 2005b, Lozano-Montes *et al.* 2008, and Moreno-Báez *et al.* 2010 and 2012). Sáenz-Arroyo *et al.* (2005a and 2005b) interviewed 108 fishermen from 11 fishing communities in the central GOC. Fishermen were asked to recall their best day's catch of gulf grouper, heaviest fish caught, and years of these catches. For best day's catch, catches decreased significantly over time: 25 fish daily in the 1940s and 1950s; 10 – 12 fish daily in the 1960s; and 1 – 2 fish daily in the 1990s. For heaviest gulf grouper caught, weight per fish decreased significantly from  $\geq 80$  kg from the 1940s through the 1960s to 60 kg by 2000. Among age groups, 96 percent of the oldest ( $\geq 55$  years old) and 90 percent of the middle-aged (31-54 years old) fishermen had captured gulf grouper, while only 45 percent of the young fishermen (15-30 years old) had. When asked whether or not they considered the

gulf grouper depleted, 85 percent of the oldest considered them depleted, compared to 56 percent of the middle-aged, and 10 percent of the young fishermen (Sáenz-Arroyo *et al.* 2005a and 2005b). Sala *et al.* (2004) interviewed 63 fishermen (ages 25 to 67) from four fishing villages along the southern GOC. They found that the relative importance of gulf grouper as a target species and the maximum size of gulf grouper caught both declined markedly from the 1970s to 2000.

Gulf grouper are highly prized by recreational anglers, although data from this fishery sector are sparse and the impact of recreational fishing on this species is largely unknown. Based on anecdotal information, recreational anglers caught large numbers of gulf grouper in the 1950s and 1960s and likely targeted known spawning aggregation sites in the GOC (Sáenz-Arroyo *et al.* 2005a). During a two-month period in 1962, anglers from El Club de Vuelos sport fishing resort harvested an estimated 63 mt of gulf grouper (Sáenz-Arroyo *et al.* 2005a). More recently, Cudney-Bueno *et al.* (2009) reported finding a large sport fishing derby targeting gulf grouper in 2004 within the no-take zone of the Reserva de la Biosfera Isla San Pedro Martír.

In addition to overutilization by direct harvest, gulf grouper are indirectly harvested as bycatch in commercial shrimp trawls (Ramírez *et al.* 2012) and illegal totoaba (*Totoaba macdonaldi*) fisheries (Moreno-Báez *et al.* 2012). In 2012, commercial shrimp trawlers harvested 42,310 mt of shrimp in the GOC. Mexican shrimp fisheries are not required to use bycatch reduction devices (BRDs), and recent studies estimated the bycatch ratio (bycatch:shrimp) at 6.1:1 (85.9 percent bycatch rate; 2003-2009) in the central GOC (Meltzer 2012) and 10.2:1 (91.1 percent bycatch rate; 1992-2004) in the southern GOC (Madrid-Vera *et al.* 2007). The totoaba, currently ESA-listed as

endangered, are currently harvested via gill nets in the northern GOC for their swim bladders, which garner \$8,500 per kg (CIRVA 2014). Although it is unknown whether or not this totoaba fishery is also harvesting gulf grouper, this fishery is currently using the same fishing ports (i.e., San Felipe, Golfo de Santa Clara, and Puerto Peñasco) and harvest methods (i.e., gill nets) being used to capture gulf grouper (Moreno-Báez et al. 2012). Estimates of bycatch specific to gulf grouper in the GOC shrimp trawl fishery and the illegal totoaba fishery are not available.

#### *Inadequacy of Existing Regulatory Mechanisms*

In Mexico, the Comisión Nacional de Acuacultura y Pesca (CONAPESCA) has the authority to implement fishing regulations (<http://www.conapescasandiego.org/contenido.cfm?cont=regulations>), which are enforced by the Mexican Navy. Traditional fisheries regulations aimed at controlling catch and effort of gulf grouper in Mexican waters are scarce. Commercial fishing permits are only available to Mexican nationals and require a concession (either a cooperative or private business). Commercial permits are awarded per vessel for two to five year durations and specify species (or species group) targeted, fishing area, and fishing method or gears. Recreational fishing is allowed by national or foreign individuals through a single, non-renewable, non-transferrable permit. In ocean waters and estuaries, a retention limit of ten fish is allowed per angler per day, of which only two can be gulf grouper. Rubber-band, spring, or pneumatic harpoons are allowed during recreational skin diving.

Several marine protected areas (MPAs) have been established in Mexico within the gulf grouper's range. MPAs cover nearly one fifth of the GOC's surface area,

including 101,838 hectares designated as “no-take” areas (Aburto-Oropeza *et al.* 2011). Despite the establishment of multiple MPAs throughout the GOC over the past few decades, overall protection of fisheries resources is still inadequate for the recovery of overexploited stocks. The lack of management plans, effective regulations, and necessary resources to operationalize and enforce MPAs in the GOC significantly undermines their conservation benefits (Cudney-Bueno *et al.* 2009, Rife *et al.* 2013, Cinti *et al.* 2014). The large majority of the areas covered by GOC MPAs are still actively fished year-round with little or no regulations limiting harvest (Rodríguez-Quiroz *et al.* 2010, Moreno-Báez *et al.* 2012). The lack of adequate enforcement is a chronic and pervasive problem for several MPAs within the GOC. For example, one study of the Reserva de la Biosfera Isla San Pedro Martír, conducted from 2003 through 2008, found that 39 percent of the time sport and commercial fishermen were fishing in the 900 hectare core no-take zone, including a large sport fishing derby targeting gulf grouper in 2004 (Cudney-Bueno *et al.* 2009).

With the exception of the Parque Nacional Cabo Pulmo, fish species diversity and biomass have not increased within designated GOC MPAs (Aburto-Oropeza *et al.* 2011). The Parque Nacional Cabo Pulmo, located on the southern tip of the Baja California peninsula, was established in 1995 to protect the large coral communities found there (Aburto-Oropeza *et al.* 2011). The park includes a 2,501 hectare no-take reserve (35 percent of the total park area). In a ten-year study, fish species richness and biomass significantly increased from 1999 to 2009, and previous studies have found gulf grouper inhabit park waters (Aburto-Oropeza *et al.* 2011). The conservation benefits of Cabo

Pulmo are threatened by development from the tourist industry, as several large-scale resorts have recently been proposed for this area.

In the U.S., the California Fish and Game Commission adopted a regulation prohibiting the take or possession of gulf grouper in 1976 (Title 14, Section 28.12). This regulation went into effect on March 1, 1977, and remains in effect today.

#### *Extinction Risk Assessment*

Gulf grouper are particularly susceptible to overfishing due to a combination of life history traits and behavioral characteristics (Sadovy de Mitcheson *et al.* 2012). Biological factors that likely increase the gulf grouper's intrinsic vulnerability to overfishing include large size, late onset of reproductive maturity, slow growth rate, and long life-span. As a protogynous hermaphrodite, the gulf grouper may be even more susceptible to fishing which, through selective removal of males, could reduce reproductive capacity. As a transient aggregate spawner, gulf grouper are highly susceptible to fishing overutilization due to the predictability of their locations in time and space. Once a year, adult gulf grouper aggregate for reproduction at a known time (full moon in May), at known locations (particular reefs and seamounts), at higher than normal densities. Some historical gulf grouper spawning aggregation sites have completely disappeared following heavy harvest (e.g. Punta Lobos and San Bruno seamounts) (Sáenz-Arroyo *et al.* 2005a). An analysis of 2002 and 2003 harvest data from Bahía de Los Angeles showed that 99 percent of the gulf grouper harvested were immature-sized fish, demonstrating the lack of reproductive age fish (Aburto-Oropeza *et al.* 2008). Overall, the combination of high harvest rates at known spawning aggregation sites and the trait of protogynous hermaphroditism significantly impacts gulf grouper

productivity. Finally, gulf grouper have a small geographic range, which may restrict their ability to move and adapt to environmental changes (Morris *et al.* 2000).

Based upon the best available cumulative information from fisheries statistics, LFK, anecdotal reports, and grey literature, we conclude that gulf grouper abundance has severely declined since the mid-20th century due primarily to direct harvest by commercial and artisanal fisheries (Sala *et al.* 2004, Sáenz-Arroyo *et al.* 2005a, Aburto-Oropeza *et al.* 2008). The primary signs of population decline are: (1) sharp reductions in harvest volumes, (2) significant decrease in average size and weight of harvested fish, (3) reduced spatial distribution and likely range contraction, and (4) extirpations or reductions of spawning aggregations (Sáenz-Arroyo *et al.* 2005a, Aburto-Oropeza *et al.* 2008). In the GOC, gulf grouper were once abundant and represented approximately 45 percent of the artisanal fishery in 1960, but declined to 10 percent by the 1970s, and are now less than 1 percent of the fishery (Sáenz-Arroyo *et al.* 2005a). The sharp decrease in harvest levels since the 1970s was not due to decreased fishing effort (fishing effort has generally increased) or new protective regulations (which are of limited benefit), but rather was due to a decline in gulf grouper abundance. Commercial landings of gulf grouper from the Pacific Ocean (U.S. vessels fishing in Mexican waters) peaked in the early 1950s, before the population declined to near commercial extinction by 1970. Based on recent fishery independent surveys and fisheries data, the gulf grouper has not recovered and is still considered a very rare occurrence in the Pacific Ocean portion of its range. Outside of a known population in Bahía Magdalena (Octavio Aburto-Oropeza, Scripps Institution of Oceanography, pers. comm., 2014), there is no published evidence of gulf grouper still persisting along the Pacific coast of the Baja California peninsula.

Current gulf grouper distribution appears to be much more limited than their historical range (Sáenz-Arroyo *et al.* 2005a). In the 1930s, some irruptions of gulf groupers occurred along the San Diego coastline (Hubbs 1948); but there are no records of any occurring in this area since that time.

In addition to direct harvest, other potential threats to gulf grouper abundance include bycatch in the commercial shrimp and illegal totoaba fisheries, habitat degradation and loss from a variety of sources, and climate change. However, there are no studies directly linking these factors to the decline in gulf grouper abundance. Although the cumulative impact of these threats may be significant, the information available does not allow for an accurate assessment of the relative magnitude or contribution of these threats to gulf grouper extinction risk.

Due to the inadequacy of existing regulatory mechanisms, there is no reason to expect the primary threat to gulf grouper from fisheries direct harvest will diminish. Traditional fisheries regulations aimed at controlling gulf grouper catch and directed fishing effort in Mexican waters are very limited. While several MPAs have been established in the GOC in recent years, the lack of management plans, effective regulations, and necessary resources to operationalize and enforce these MPAs significantly undermines their conservation benefit (Cudney-Bueno *et al.* 2009, Rife *et al.* 2013, Cinti *et al.* 2014). With the exception of the Parque Nacional Cabo Pulmo, fish species diversity and biomass have not increased since the establishment of GOC MPAs (Aburto-Oropeza *et al.* 2011). The conservation benefits of Cabo Pulmo are currently threatened by large-scale development projects. Since 1976, the state of California has prohibited the take or possession of gulf grouper. However, this restriction only applies

within California waters, which represent a very small portion of the species' historical range and may no longer be part of the gulf grouper's current range. Gulf grouper can still be harvested and landed in Mexico by U.S. fishing vessels.

The gulf grouper was once considered abundant, but is now considered rare (Jenkins and Evermann 1889, Croker 1937, and Sáenz-Arroyo *et al.* 2005a). Direct harvest is the major reason for gulf grouper decline (Sala *et al.* 2004, Sáenz-Arroyo *et al.* 2005a, Aburto-Oropeza *et al.* 2008) and, due to the lack of protective regulations in Mexico (no meaningful quotas nor protective regulations for gulf grouper), there is no reason to expect fishing to be a diminishing threat. Moreover, gulf grouper are intrinsically vulnerable to overfishing due to life history traits, including large size, late onset of reproductive maturity, protogynous hermaphrodite life history, transient aggregate spawning, slow growth rate, long life-span, and restricted geographic range (Sadovy de Mitcheson *et al.* 2012). Sharp decreases in harvest levels observed since the 1970s are not due to decreased fishing effort (fishing effort has generally increased) or new protective regulations (which are of limited benefit), but rather are due to a decline in gulf grouper abundance. Though a series of MPAs have been set up in the GOC, only one, Cabo Pulmo, has an enforced no-take marine zone, and it is the only protected marine zone in the GOC that has seen improved marine fish life diversity and density over the past decade (Aburto-Oropeza *et al.* 2011); therefore, the MPAs are not anticipated to lead to a significant increase in gulf grouper abundance.

#### *Protective Efforts*

In 2005, Mexico established the Área de Refugio Vaquita Marina located in the northern GOC to protect and conserve the critically endangered vaquita (*Phocoena sinus*)

by prohibiting gill net and trammel net use (SEMARNAT 2008). This prohibition is not directly designed to protect gulf grouper, but gill nets and trammel nets are two of the more common gulf grouper harvest methods, so the prohibition could have the potential to benefit gulf grouper as well. However, bycatch of vaquita in the illegal gill net fishery for the endangered totoaba has continued within this MPA after implementation. In 2015, the Mexican federal government increased its efforts to protect vaquita by expanding the Área de Refugio Vaquita Marina six-fold to approximately 8,000 square kilometers. For the next two years, gill nets and long lines will be prohibited within the MPA; and fishermen from the nearby towns of San Felipe (Baja California, Mexico) and Golfo de Santa Clara (Sonora, Mexico) will be financially compensated for changing their harvest methods. Enforcement by the Mexican Navy will be increased with the additional use of enforcement boats, light aircraft, and drones. These new conservation measures could result in decreased fishing pressure on gulf grouper. However, these new measures are temporary, and there is no long-term commitment of funds for enforcement or financial compensation of displaced fishermen. There are also large uncertainties associated with the effectiveness of the proposed enhanced enforcement measures given pervasive non-compliance with Mexican fisheries regulations and the economic incentives created by the extremely high valued illegal totoaba fishery.

We did not identify any other conservation efforts to protect and recover gulf grouper that are either underway but not yet fully implemented, or are only planned. Our evaluation of the conservation efforts identified lead us to conclude that current conservation efforts cannot be considered effective measures for significantly reducing the current gulf grouper extinction risk.

### *Proposed Determination*

Based on the best available scientific and commercial information, as summarized here and in Dennis (2015), and consideration of efforts being made to protect the species, we conclude that the gulf grouper, *Mycteroperca jordani*, is currently at high risk of extinction throughout its range. We therefore propose to list this species as endangered under the ESA.

### *Island Grouper*

The following section describes our analysis of the status of the island grouper, *Mycteroperca fusca*.

### *Species Description*

The island grouper was first described under the name *Serranus fuscus* by Lowe (1836) based on specimens from Madeira, Portugal. Diagnostic features of the island grouper include an oblong and compressed body with depth less than head length, lower jaw extending well in front of upper jaw, dorsal fin with 11 spines and 14-16 rays, anal fin with 3 spines and 10-12 rays with rounded margin, and caudal-fin rear margin truncate (juveniles) to concave (adults) (Heemstra and Randall 1993). Adults are brownish or dark grey, with irregular pale blotches and spots and a prominent maxillary streak. Under stress this pattern may be reversed so that the head and body are pale with irregular dark markings. Juveniles are mottled greenish-brown with prominent white spots on head and body, white streaks on median fins, with hyaline golden pectoral fins (Craig *et al.* 2011). The color pattern of mature females from the Canary Islands suggests sexual dichromatism (i.e., males and females differ in color) (Bustos 2008). A large proportion of sexually active females have yellow pigmentation (dorsal fins and/or chest,

ventral or uniformly throughout), while males are uniformly brown (Bustos 2008). This species is also known to display a yellow (xanthic) color phase (Wirtz 2007), and a few uniformly golden island grouper have been reported from Madeira (Heemstra and Randall 1993).

For many years island grouper were confused with another closely related species, *Mycteroperca rubra*. Based primarily on differences in gill raker counts, Heemstra (1991) established that the species found in the Atlantic Macaronesian region (from the Azores to Cape Verde) was *M. fusca* (with 20-24 lower limb gill rakers), with the distribution of *M. rubra* (with 28-31 lower limb gill rakers) being limited to the west coast of Africa and the Mediterranean Sea (Heemstra and Randall 1993).

The island grouper is a slow-growing, long-lived species which can attain maximum sizes of at least 86 cm total length (TL) and 7.8 kg (Bustos 2008, Bustos *et al.* 2010). Longevity of island grouper is estimated to be between 30 and 40 years (Bustos (2008, Bustos *et al.* 2009). The instantaneous rate of natural mortality estimated for island grouper is between 0.146 and 0.158 per year (Bustos 2008). Island grouper length at age was described by Bustos (2008) from commercial catches off Gran Canaria and Fuerteventura (Canary Islands) between January 2004 and December 2005. Von Bertalanffy growth model parameters were as follows:  $L_{\infty} = 898$  mm;  $k = 0.062$  per year; and  $t_0 = -3.83$  years. Only 22 percent of the island grouper sampled were older than ten years, and the oldest fish in this study was around 20 years old, 50 percent less than the maximum age estimated by Bustos (2008). Significant differences were found between males ( $n = 35$ ) and females ( $n = 153$ ) for mean age (males 10.3 years versus females 7.1

years),  $L_{\infty}$  (males 952 mm versus females 888 mm), and growth rate  $k$  (males 0.053 per year versus females 0.063 per year) (Bustos 2008).

While slow growth after the first few years is typical for *Mycteroperca*, the island grouper is particularly slow-growing when compared to closely related species. On average, over 28 percent of island grouper growth was achieved by the second year; by the fourth year this species attains lengths of approximately half of the maximum length observed. In general, growth within the genus *Mycteroperca* tends to be faster in the early stages of life, slowing down considerably in later stages (Bullock and Murphy 1994, Manickchand-Heileman and Phillip 2000, Strelcheck *et al.* 2003). Consequently, the von Bertalanffy model typically does not describe the growth of *Mycteroperca spp.* properly for the first few years of life, as evidenced by relatively large negative  $t_0$  values.

The island grouper is a nectobenthic (i.e., free-swimming, bottom oriented) macrocarnivore that preys on fish, crustaceans, and cephalopods (Harmelin-Vivien *et al.* 2001, Bustos 2008). Island grouper are considered mobile hunters and have been observed actively exploring their territories for prey (Bustos 2008).

#### *Reproductive Biology and Spawning Behavior*

Bustos *et al.* (2010) studied the pattern of sexual development and reproductive characteristics of island grouper in the Canary Islands based on samples of commercially harvested fish. Island grouper are a protogynous hermaphroditic fish. Results of histological analyses and demographic structure suggest a monandric protogynous sexual pattern, where males develop only through sex change (Bustos 2010). The length at which 50 percent of the population reaches sexual maturity was estimated at 335 mm total length (TL), or about 4 years old. Of the females over 398 mm TL (5-6 years old),

95 percent were considered to be mature. Island grouper sexual transition occurs between 428-725 mm TL, with 50 percent of females transformed into males at around 678 mm TL (Bustos 2010). The presence of females in the larger size categories (up to 725 mm TL) implies that the conversion (female to male) is not essential in all individuals. The overall sex ratio of males to females (1:4.9) and the sex ratio of males to mature females (1:3.4) were both significantly different from 1:1 (Bustos 2010).

In the Canary Islands, reproduction is initiated in February, when water temperatures are around 18° C, and continues through August or September when temperatures peak around 24-26° C (Bustos *et al.* 2010). The central period of spawning, as defined by months when 50 percent or more of females are in vitellogenesis (i.e., yolk deposition), is from April to July (Bustos *et al.* 2010). The formation of spawning aggregations is a common trait among groupers (Sadovy de Mitcheson *et al.* 2008). Although there are no published studies on island grouper reproductive behavior, spawning aggregations have been reported through personal communication (J.P. Barreiros, UAC/IMAR in Rocha *et al.* 2008) from two locations in the Azores.

#### *Population Structure, Distribution, Abundance and Habitat*

The island grouper is a subtropical species (40° N - 10° N) that is endemic to volcanic archipelagos of Macaronesia: Canary Islands (Spain), Madeira and Azores (Portugal), and Cape Verde (Heemstra and Randall 1993). The Canary Islands are located between 27° and 29° N latitude and 13° and 18° W longitude at a minimum distance of 100 km and maximum distance of 450 km off the coast of Morocco. The Canary Islands archipelago is formed by seven main islands, with 1,379 km of coastline, a total land area of 7,447 km<sup>2</sup>, and a human population size of approximately 2.1 million (Popescu and

Ortega-Gras 2013). The Madeira archipelago is located from 32° 37' to 32° 52' N latitude and 16° 39' to 17° 15' W longitude, 754 km from the coast of Africa and 964 km southwest of Lisbon. The archipelago consists of the two main inhabited islands (Madeira and Porto Santo), with an estimated combined human population of 268,000, and five uninhabited islands (Desertas and Selvagens Islands). The Madeira archipelago has 153 km of mostly rocky and steep coastline, and a total land area of 801 km<sup>2</sup>. The Azores archipelago is located between 37° and 40° N latitude and 24° and 32° W longitude, about 1,500 km west of Lisbon and 1,900 km southeast of Newfoundland. It is composed of nine islands and some small islets (Harmelin-Vivien *et al.* 2001), with 667 km of coastline, a total land area of 2,333 km<sup>2</sup>, and a human population size of approximately 246,000. The Cape Verde archipelago is located between 14° and 17° N latitude and 22° and 25° W longitude, due west of Senegal, off the west coast of Africa. It is composed of ten islands (of which nine are inhabited) and eight islets, with 1,020 km of coastline, a total land area of 4,033 km<sup>2</sup>, and a human population size of approximately 531,000. There are no confirmed reports of island grouper off the coast of West Africa, although ichthyofauna studies are lacking in this region. One specimen was caught by a spearfisherman off Israel's coast (Heemstra *et al.* 2010), but there are no data confirming the existence of an island grouper population in the Mediterranean.

The island grouper is a demersal species that is found predominantly near rocky or sandy-rocky sea-beds (Heemstra and Randall 1993). Studies have shown a positive correlation between island grouper abundance and structural complexity, algal cover (Bustos 2008), and upright seaweed cover (Sangil *et al.* 2013b). The habitat requirements of larval and juvenile island grouper are not well-studied. All groupers pass through a

pelagic larval phase, lasting between 20-50 days, during which they can actively swim (Aburto-Oropeza *et al.* 2008). After the larval phase, groupers acquire juvenile characteristics during which they settle into shallow, coastal nursery habitats (e.g., *Sargassum* beds, seagrass areas, mangroves, and estuaries); this nursery stage can last up to two years.

The overall range distribution for island grouper is considered restricted, defined as less than 800,000 km<sup>2</sup> (Morris *et al.* 2000). The seafloor bathymetry around the Macaronesian Islands is typically abrupt with a narrow contiguous shelf and a steep slope plunging to depths of more than 1,000 meters. As a result, viable habitat for demersal species such as the island grouper is considerably smaller than on continental shores, limiting the abundance of these populations (Diogo and Pereira 2013a, Popescu and Ortega-Gras 2013). Based on a wide range of sources, Morris *et al.* (2000) classified the island grouper as having a “narrow depth range” defined as occurrence at depths typically less than 20-30 m. Although island grouper have occasionally been reported at greater depths (e.g., 50 m by Heemstra and Randall 1993; 150 m by Bustos 2008; and 200 m by Craig *et al.* 2011), based on the majority of observations, it is assumed that their normal distribution in the water column is at depths less than 30 m.

Historical and current island grouper population abundance is unknown. Available information on island grouper distribution and abundance is primarily from Underwater Visual Census (UVC) studies conducted at various locations throughout the species' range. There is a considerable amount of variation in island grouper mean densities reported in the literature. Island grouper were reported as being very rare (0.03 – 0.10 fish/100 m<sup>2</sup>) in two UVC studies of benthic fish communities in the Azores

(Harmelin-Vivien *et al.* 2001, Bertoncini *et al.* 2010). Compared to the Azores, a relatively higher mean density of island grouper (0.825 fish/100 m<sup>2</sup>) was reported from a single study in Cape Verde (Freitas 2012). However, since sampling was conducted within the only operationalized MPA in Cape Verde, on the uninhabited island of Santa Luzia (UNDP 2010), island grouper mean density from this study may not be representative of more heavily fished areas throughout the archipelago. Based on limited information, island grouper appear to be rare around Madeira Island, with the possible exception of within the Garajau Marine Reserve (Ribeiro *et al.* 2005, Ribeiro 2008). Island grouper mean densities were highly variable in studies conducted around the Canary Islands. The highest mean densities were reported around the lightly fished, remote island of El Hierro and within the designated marine reserves of La Graciosa (Chinijo Islands) and La Palma. Island grouper were generally reported as being very rare on the more populous and heavily fished Canary Islands of Gran Canaria and Tenerife.

#### *Summary of Factors Affecting the Island Grouper*

Available information regarding current, historical, and potential future threats to the island grouper was thoroughly reviewed (Salz 2015). We summarize information regarding threats below according to three (out of five) factors specified in section 4(a)(1) of the ESA: “Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range”; “Overutilization for Commercial, Recreational, Scientific, or Educational Purposes”; and “Inadequacy of Existing Regulatory Mechanisms.” We found very little information regarding potential threats under the section 4(a)(1) factors “Disease and Predation” or “Other Natural or Manmade Factors.” These areas are data poor, but there are no serious or known concerns raised under these threat categories with

respect to island grouper extinction risk; therefore, we do not discuss these categories further here. See Salz (2015) for a more detailed discussion of all ESA section 4(a)(1) threat categories.

*Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range*

Demersal fish populations around volcanic islands may be particularly vulnerable to habitat related threats, as they are typically confined to a narrow band within a few kilometers from shore due to the surrounding bathymetry. Various human activities throughout the Macaronesian region can negatively impact near-shore, rocky marine habitats occupied by island grouper. Increased anthropogenic pressure on the more densely populated Macaronesian Islands (Madeira Island, and Tenerife and Gran Canaria in the Canary Islands) has resulted in continuous modification and degradation of inshore habitats, placing new and unprecedented demands on coastal marine resources (Hajagos and Van Tassell 2001, Ribeiro 2008). Potential threats to island grouper habitat include ecosystem changes driven by overfishing, dynamite fishing, physical alteration of the coast, pollution, the effects of global climate change, and the introduction of invasive species.

The island grouper is primarily found near the ocean bottom in areas with high structural complexity (or “roughness”) and benthic cover (Bustos 2008, Monteiro *et al.* 2008, Sangil *et al.* 2013b). Canopy-forming macroalgae are a principal engineer organism on shallow rocky bottoms, providing the necessary habitat complexity and benthic cover to support and maintain equilibrium of natural assemblages (Hernández *et al.* 2008, Clemente *et al.* 2010, Sangil *et al.* 2013b). Canopy-forming macroalgae may also ameliorate the effects of a range of disturbances on understory assemblages, thus

enhancing the resistance of associated systems (Bertocci et al. 2014). The loss of canopy-forming macroalgae, and consequent increased environmental stress on associated organisms, could result in drastic reduction or local extinction of understory species unable to survive harsh environmental conditions without the protective canopy (Bertocci et al. 2014). In the Canary Islands, the natural balance between seaweeds, herbivores, and predators has been disturbed due to the fishing depletion of predators (e.g., sparids and labrids) of the sea urchin (*Diadema africanum*), the most important herbivore of sublittoral rocky bottoms (Hernández et al. 2008, Clemente et al. 2011). This has resulted in an ecosystem imbalance whereby sea urchin populations have increased, while cover of upright seaweeds and canopy-forming macroalgae have decreased (Tuya et al. 2004, Hernandez et al. 2008, Clemente et al. 2011, Riera et al. 2014). Seaweed beds have declined throughout much of the Canary Islands archipelago and are now found in abundance only in restricted fishing areas, remote islands, or areas where prevailing winds and currents limit fishing pressure (Sangil et al. 2013b). Steady declines in benthic cover of the canopy-forming brown macroalgae (*Fucus spiralis* and *Cystoseira spp.*) in the Canary Islands have been linked to growing sea urchin populations in combination with rising sea surface temperatures (Hernández et al. 2008). Population declines and increased fragmentation of the endemic red alga (*Gelidium canariense*) have also been observed in Tenerife and Gran Canaria during the last 20 years (Bouza et al. 2006). These studies suggest that, in addition to the direct impact of fishery removals of island grouper, fishing can initiate trophic cascades that may modify and degrade island grouper habitats or preferred microhabitats.

Large-scale coastal development began in the Canary Islands in the early 1970s to meet the needs of a growing tourist industry (Hajagos and Van Tassell 2001). Similarly, the Madeira Island coast has been extensively armored and developed in the past two decades (Ribeiro 2008). Artificial harbors, marinas, beaches, ripraps, rubble mounds, and hotels were constructed on these islands, with few environmental precautions, resulting in massive alterations to the shoreline and siltation of nearshore benthic communities (Hajagos and Van Tassell 2001). Baseline (pre-development) studies of the near-shore marine communities in these heavily developed areas are lacking and, therefore, the impacts of these habitat changes on marine fish populations in general, and the island grouper in particular, are largely unknown.

Pollution from a variety of sources also threatens marine ecosystems in the Macaronesian region. In the Canary Islands, land-based sources of pollution include organic and inorganic pollutants from developed areas and farms (mainly banana and tomato), brine releases from desalination plants, and thermal pollution from power plants (Riera *et al.* 2014). Other sources include nitrogenous waste from aquaculture, pollution derived from ship traffic, and extraction of construction materials from the seabed (Riera *et al.* 2014). In the Canary Islands, sharp declines in red alga (*Gracilaria cervicornis*) coverage over the last 10 years have been linked to coastal pollution from desalination plants and sewage from pipelines (Riera *et al.* 2014). On the island of Madeira, pollution from raw sewage discharges, sand mining, and sediment run-off severely decreases water clarity, which affects algae production (Ribeiro 2008). The direct impacts of different pollution sources on demersal fish populations in the Macaronesian region are not well-studied. The presence of continuous coastal currents around islands in this region likely

facilitates the dispersion of pollutants (Riera *et al.* 2014). Thus, while localized impacts may be acute near highly concentrated point sources, broader and long lasting impacts of coastal pollution in this region have not been identified.

Certain changes are likely to occur in the world's oceans due to long-term changes in global mean temperature and possible anthropogenic impacts that could pose potential future threats to island grouper habitats. Warmer oceanographic conditions associated with climate change (combined with overfishing) have likely contributed to the sea urchin population increase discussed above (Hernández *et al.* 2010). In addition, Brito *et al.* (2005) found 24 out of the 30 new records of littoral bony fishes reported between 1991 and 2005 from two Canary Island marine reserves (La Graciosa in Chinijo Islands and La Restinga in El Hierro) were species with tropical origins. The emergence of tropical species in subtropical latitudes has also been reported in Madeira and the Azores (Brito *et al.* 2005). However, the impact of progressive tropicalization of Macaronesian marine ecosystems on island grouper survival is widely unknown.

The introduction of invasive species through aquaculture poses a potential threat to island grouper. Total production of marine finfish in open-net cages increased in the Canary Islands from 1,685 mt in 2001 to 7,900 mt in 2009 (APROMAR 2012). A massive escape event occurred at an aquaculture operation on La Palma between December 2009 and January 2010 resulting in the accidental release of 1.5 million fish (90 percent European sea bass and 10 percent sea bream) into the wild (Toledo-Guedes *et al.* 2014). As an opportunistic, high trophic level, piscivorous species, non-native European sea bass could be competing with native species such as the island grouper (Toledo-Guedes *et al.* 2009). Toledo-Guedes *et al.* (2012) found evidence of gonadal

maturation occurring in the wild in escaped male and female European sea bass in the Canary Islands. The combination of suitable biotic and non-biotic conditions, high frequency of escape events (Toledo-Guedes *et al.* 2009), and overutilization of native fish assemblages (Tuya *et al.* 2006a) could facilitate establishment of self-reproducing non-native European sea bass populations within the island grouper's range. However, studies indicating that aquaculture escape events have resulted in a decline in island grouper abundance are lacking.

The introduction of invasive species through ship ballast water is also a potential threat to the island grouper. Approximately 30,000 commercial vessels enter Canarian harbors each year, mostly in Gran Canaria and Tenerife (ISTAC 2013 in Riera *et al.* 2014). The African hind (*Cephalopholis taeniops*) is an invasive species from Guinea (West Africa) that is thought to have arrived in the Canary Islands in ballast water (Riera *et al.* 2014). Stable populations of this predatory fish may have already established in the port cities of Las Palmas and Santa Cruz (Riera *et al.* 2014). However, as with the European sea bass, there are no studies indicating that the invasive African hind has negatively impacted native fish populations.

#### *Overutilization for Commercial, Recreational, Scientific, or Educational Purposes*

Island grouper are highly susceptible to overfishing due to their limited range and a combination of life history characteristics including very slow growth, late maturation, large size, and long life span (Bustos 2008, Bustos *et al.* 2009, Saavedra 2011, Diogo and Pereira 2013a). Saavedra (2011) used a scale developed by the Food and Agriculture Organization (FAO) to characterize fishing vulnerability of target species in the Canary Islands. Input parameters used for this scale included age at maturity, longevity, ratio of

natural to total mortality, growth rate, sexual strategy, and sex ratio. Island grouper vulnerability was rated as either “high” or “very high” for all six parameters individually, and “very high” overall. Certain behavioral traits, which are common in groupers, may also add to this species’ vulnerability to fishing. Territoriality, site specificity, and the formation of spawning aggregations often result in groupers being an easy target for fishermen (Randall and Heemstra 1991, Domeier and Colin 1997), although these traits have not been studied or well documented in the island grouper. Spawning aggregations, in particular, are highly vulnerable to fishing due to their spatial and temporal predictability and to the large increase in catchability that often occurs when fish aggregate (Sadovy and Domeier 2005). Although information on island grouper spawning aggregations is lacking, there are documented examples of sharp population declines resulting from fisheries specifically targeting aggregations of other grouper species (Colin 1992, Sala *et al.* 2001, Hamilton and Matawai 2006, Sadovy de Mitcheson *et al.* 2012). The economic value of island grouper is also a factor that likely contributes to overutilization of this species. The island grouper is highly prized by commercial and artisanal fishermen for the quality of their flesh and typically fetch high market prices (Heemstra and Randall 1993, Ribeiro 2008).

In protogynous hermaphrodites, such as the island grouper, the largest individuals are, in order, terminal males, individuals undergoing sexual transition, and the largest females next in line for sexual transition. Selective removal of these groups at high rates can lead to decreased productivity of a population. Island grouper may be particularly vulnerable to over-fishing due to the reduction in the species’ potential reproductive capacity caused by the decrease in the number of males in the population (Huntsman and

Schaaf 1994, Bustos *et al.* 2010). As the relative numbers of terminal males fall, females may have difficulty finding a terminal male to spawn with even if some remain (Hawkins and Roberts 2003). In addition, sexual transition takes time and energy, including energy expended on social interactions and competition among females vying for dominance. Since removal of terminal males by fishing will result in more sexual transitions, overall population fitness may be negatively impacted.

Historical commercial and artisanal fisheries data are not available to evaluate long-term trends in island grouper landings, directed effort, or catch rates over time. The limited landings data available for more recent years indicate that island grouper are currently a very minor component of commercial and artisanal fisheries throughout its range. The nearshore demersal fishery in the Canary Islands is artisanal, consisting primarily of small boats (Saavedra 2011). Fishing methods used to catch demersal species include hook and line, fish traps, trammel nets, and gill nets (Bustos *et al.* 2009). Significant declines in populations of tunas and other pelagics since the 1970s have contributed to the increased pressure on coastal demersal species (Moreno-Herrero 2011). In addition, in the 1980s the Moroccan government restricted European Union vessel access to the Canary-Saharan Bank fishing grounds, resulting in a shift in fishing effort by the Canary artisanal fleet to coastal species (Pascual-Fernandez and Diaz 1991 *in* Moreno-Herrero 2011). While landings volume of demersal species in the Canary Islands are relatively small compared to landings of pelagic species, these resources often have high economic value (i.e., price per pound) as well as cultural value. In 2011, demersal fish species accounted for 16.7 percent of the total fishery landings weight but 33.2 percent of the landing value in the Canary Islands (Popescu and Ortega-Gras 2013).

Canary Islands landings data prior to 2006 are only available from one port (Puerto de Mogán on Gran Canaria), and effort data are not available at all. Solari *et al.* (2003) reported landings of island grouper in the multi-species trap fishery from Puerto de Mogán for the period 1989-1999. Average monthly landings (for months with data available) of island grouper were 46 fish. Detailed monthly data were not available to assess trends in island grouper landings over time. Island grouper accounted for about 2.3 percent of the total catch in numbers of fish over this time period. Given their relatively large size and market price, it is likely that the proportional contribution of island grouper to the landings weight and value in the Gran Canaria trap fishery is considerably greater. Bustos *et al.* (2009) found very few island grouper greater than ten years old in commercial catches from Gran Canaria and Fuerteventura between January 2004 and December 2005. For a species with a life-span between 30-40 years, these results suggest that the island grouper is experiencing a high rate of fishing mortality in the more populated areas within the Canary Islands archipelago.

Island grouper are considered an important component of the small artisanal fishery on El Hierro, where fish traps are banned and demersal species are mainly caught with hook-and-line gears (Falcón *et al.* 2007a). Falcón *et al.* (2007c) compared demersal species landings on El Hierro Island in the period before and after implementation of the La Restinga Marine Reserve. From 1990-1995 (before implementation) a total of 700 island grouper were landed (116.7 fish per year). From 1997-2005 (after implementation) a total of 1,239 island grouper were landed (137.7 fish per year). Over the entire period (1990-2005), island grouper were the 9<sup>th</sup> most abundant species landed in numbers of fish.

In the Azores archipelago, the bottom longline and handline artisanal fishery for demersal species accounts for a significant portion of the total fishery landings, and is by far the highest valued fishery (Morato 2012). Annual landings by this fishery sector are consistently around 4,000 mt from 2000 through 2010 (Morato 2012). By comparison, reported landings of island grouper for the Azores archipelago were less than 1 mt for every year from 2001-2013 (INE 2015). Official data from the Portugal National Institute of Statistics (INE) indicates a sharp and steady decline in combined “grouper” landings in the Azores from a high of 99 mt in 2003 to a low of 26 mt in 2013. The combined grouper category includes species of *Epinephelus* and *Mycteroperca*. Although island grouper landings account for a very minor component of combined grouper landings, this declining trend suggests that groupers, in general, are being overfished, which would likely have negative implications for the island grouper. Without effort data, it is not possible to say definitively that the decrease in landings is due to a decline in population abundance. However, total demersal species landings in the Azores are consistently around 4,000 mt during the period when combined grouper landings declined precipitously, which suggests that directed fishing effort for demersal species did not decline.

The Cape Verde artisanal fishery typically lands between 4,000 mt and 5,000 mt of fish annually, of which about 1,000 mt are demersal species (PRAO – CV 2012). Since 1992, the Cape Verde National Institute for Fisheries Development (INDP) has compiled data on fishing catch and effort for the more important artisanal fishery target species (Medina *et al.* 2007). However, as a small component of the total catch, island grouper are not one of the species monitored or reported in INDP official statistics (Albertino

Martins, personal communication). A recent assessment of mackerel scad (*Decapterus macarellus*), bigeye scad (*Selar crumenophthalmus*), and black spot picarel (*Spicara melanurus*) indicates that stocks of commercially important small pelagics are either fully exploited or overexploited in Cape Verde (DeAlteris 2012). Continued overfishing of these stocks could result in added fishing pressure on demersal species in Cape Verde. In Madeira, demersal species account for less than one percent of total fisheries landings (Morato 2012). Reported landings of island grouper in Madeira are less than 1 mt per year for all years from 2000-2013 (INE 2015).

Island grouper are also targeted in recreational and subsistence fisheries, and there are indications that these sectors are expanding rapidly in some parts of the species' range. Recreational fishing pressure has increased in the past few decades as a direct result of human population growth and a growing tourism sector (Sangil *et al.* 2013b). For example, the number of recreational spearfishing licenses sold in São Miguel Island (Azores) increased from 138 in 1995 to 717 in 2011; and the number of recreational fishing licenses sold in the Canary Islands more than doubled from 48,000 in 2005 to 116,000 in 2011 (Diogo and Pereira 2013a, Castro 2014). There are also indications that Spain's economic crisis and growing unemployment have resulted in increased levels of subsistence fishing and poaching in the Canary Islands (Moreno-Herrero 2011). In Cape Verde, subsistence catches have shown an increasing trend in recent years, suggesting increased dependence on fish as a source of food, and possibly related to declines in agricultural production due to climate change induced droughts (Trindade-Santos *et al.* 2013).

Recreational and subsistence fishery landings data are lacking, as there are no monitoring programs for these fishery sectors throughout the Macaronesian Islands. Jimenez-Alvarado (2010, *in* Saavedra 2011) estimated total recreational fishery landings in the Canary Islands based on license sales by fishing mode, number of recreational fishing vessels, and limited recreational catch and effort survey data. Results suggest that recreational fisheries have a significant impact on fish populations, and on three islands (Gran Canaria, Gomera, and Fuerteventura) recreational landings of benthic-demersal species likely exceed artisanal fishery landings. Although species level recreational landings data are not available, this study indicates that the Canary Islands recreational fishery likely has an impact on island grouper abundance.

Diogo and Pereira (2013a) conducted a characterization study of spearfishing activity in Ponta Delgada, the capital of São Miguel Island, the most populated island in the Azores archipelago. From August 2001 through May 2002, they recorded data from 220 spearfishing trips (out of an estimated 281 total spearfishing trips taken). A total of nine island grouper were captured throughout the study period. By weight, island grouper accounted for less than one percent of the total biomass of finfish captured with spear guns in the survey. The mean length of island groupers captured (38 cm TL) was only slightly larger than the size at first maturity. Results from this survey, in general, suggest that abundances of species vulnerable to fishing (including island grouper) within the study site have been significantly reduced due to heavy fishing pressure (Diogo and Pereira 2013a).

Diogo and Pereira (2013b) also studied impacts of recreational boat fishing on demersal fish species off the Azores islands of Faial and Pico from 2004-2005. No island

grouper catch were reported in a creel survey of 87 angler trips, and only 3 dusky grouper (*E. marginatus*) were reported. Diogo and Pereira (2013b) estimated the annual landings of all species by the recreational boat fishery on these two islands to be around 163 mt, which represents about 40 percent of the artisanal fishery landing weight in these areas. These results suggest that the impact of the recreational boat fishery on demersal fish communities in the Azores may be substantial. The absence of island grouper in the recreational fishing survey is consistent with UVC studies indicating the rareness of this species in the Azores (Harmelin-Vivien *et al.* 2001, Bertoncini *et al.* 2010).

Without basic fisheries time series data (e.g., catch, effort, sizes, and gears), it is difficult to quantitatively assess the impact of artisanal and recreational fishing on island grouper abundance. A few studies have demonstrated the negative impact of fishing by correlating relative fishing pressure with measures of island grouper abundance based on UVC sampling at different locations. Tuya *et al.* (2006a) found that, in the Canary Islands, island grouper mean density and mean biomass were significantly higher on islands with the lowest fishing pressure and lowest population density (El Hierro and Chinijo Islands) compared to other islands within the archipelago. Similar results were found for the dusky grouper, suggesting that human intervention in the Canary Islands has negatively impacted abundance of these large, slow growing species, with low population turnover rates.

Tuya *et al.* (2006b) compared island grouper mean densities on El Hierro and the Chinijo Islands across sites with varying levels of protection from fishing: RI = no-take zone; ZA = reserve buffer zone, with only recreational fishing allowed for grouper species; and AV = outside reserve, with recreational and commercial fishing permitted,

except fish traps, which are banned throughout these islands. A “reserve effect” (i.e., higher abundance within than outside the reserve boundary) was not evident for island grouper within the El Hierro Restinga Reserve: i.e., no statistically significant differences were found in mean density between the no-take zone, the buffer zone, and the fishing area outside the reserve. A “reserve effect” was found within the Chinijo Islands La Graciosa Reserve: i.e., island grouper mean densities were statistically larger within the reserve (both RI and ZA zones) than in neighboring sites outside the reserve (AV zone). Bustos (2008) also found evidence for a “reserve effect” within La Graciosa, and she observed no island grouper in the two areas sampled outside the La Graciosa Reserve boundary.

Sangil *et al.* (2013a) studied the relationship between fishing pressure and conservation status at sites around La Palma Island (Canary Islands). Fishing effort data were collected from boat-based and shore-based surveys conducted twice per month for one full year at fishing access sites around the island. Effort data included number and location of deployed fish traps, active fishing boats (commercial and recreational), shore based fishermen, and spearfishermen. The following biological parameters were used as indicators of conservation status: percentage of seaweed cover; mean density of the sea urchin; mean biomass of sea urchin predators; mean biomass of combined grouper species (*E. marginatus*, *M. fusca*, *Serranus atricauda*); and mean biomass of the Mediterranean parrotfish (*Sparisoma cretense*), a highly prized fishing resource and indicator of fish stock status. Data were collected in 2009 using a UVC point-count method at 51 sites (nine transects per site) around the island. The correlation between fishing pressure and each biological parameter, including combined grouper biomass,

was high and negative. Sampled locations with the highest combined grouper mean biomass corresponded with areas of lowest fishing pressure – i.e., inside the La Palma MPA, particularly within the no-take portion, where all fishing activity is prohibited. The overall mean grouper biomass across all sites was 303.1 g/100 m<sup>2</sup>, compared to 569.9 g/100 m<sup>2</sup> within the limited fishing MPA area, and 2,401.5 g/100 m<sup>2</sup> within the no-take area. Grouper were virtually absent from the heavily fished areas just to the north of the MPA and on the eastern side of the island. Although this study did not provide mean biomass data for groupers at the species level, island grouper accounted for approximately one-third of the total biomass of the three grouper species combined (Sangil *et al.* 2013b).

Ribeiro (2008) found higher density and larger mean size of island grouper within the protected Garajau Marine Reserve (GMR) on Madeira Island compared to nearby unprotected areas with similar habitat types. She attributed these differences to the regulations prohibiting all fishing in the GMR. Before it was designated a marine reserve, the GMR area was subjected to heavy fishing pressure from amateur fishermen using explosives, gill nets, and spears (Ribeiro 2008).

#### *Inadequacy of Existing Regulatory Mechanisms*

The nearshore demersal fisheries throughout the Macaronesian Islands region are lightly regulated. Although these fisheries are primarily small-scale and artisanal, the cumulative impact on fish populations can be substantial, particularly for a species such as the island grouper, with a restricted range and high vulnerability to overexploitation. There are no commercial catch quotas, daily bag limits, or seasonal closures in place for island grouper in any part of their range. The Canary Islands is the only archipelago with

a minimum size limit for this species, and enforcement does not appear adequate to address non-compliance with this regulation. Gear restrictions (e.g., bans on fish traps, gill nets, bottom longlines, and SCUBA) are in place for demersal fisheries in some areas and the use of explosives is widely prohibited. However, the effectiveness of gear restrictions is substantially reduced by inadequate enforcement, as well as a shift in fishing effort to other (legal) methods of capturing demersal species. There is some indication that banning fish traps has had a positive impact on island grouper abundance in the Canary Islands, although this ban only applies to two sparsely populated regions within the archipelago. Overall, it appears that current fishing regulations are inadequate for addressing the direct threat to island grouper from fisheries overutilization. Current regulations are also likely inadequate to control overfishing of the main sea urchin predators, which, based on recent studies from the Canary Islands, has resulted in a trophic cascade that has modified and degraded island grouper habitat.

In recent decades, no-take MPAs have received increased attention as a conservation tool aimed at protecting vulnerable fish populations (Halpern and Warner 2002). For some grouper species, increased fish density and size within no-take reserves may increase reproductive potential by promoting the occurrence of spawning aggregations (Sanchez-Lizaso *et al.* 2000). The “reserve effect” on island grouper abundance (i.e., higher abundance within than outside the reserve boundary) was reported for one reserve on Madeira Island and two reserves in the Canary Islands archipelago. However, overall, the system of MPAs throughout the Macaronesian Islands is likely inadequate to protect island grouper from the threat of fishing overutilization. No-take zones account for only a small fraction of the total area covered by MPAs within the

island grouper's range, as most areas still allow some types of fishing. In the Azores, Madeira, and Canary Islands archipelagos, there are only five no-take marine reserves, which occupy a total area of 28 km<sup>2</sup> (Fenberg *et al.* 2012). Given their small size and physical isolation from one another, no-take zones may lack the connectivity to allow the flow of larval and juvenile fish across islands and archipelagos within the region (Martín-García *et al.* 2015). There are also no MPAs or time-area closures designed specifically to protect island grouper during spawning periods, and little is known about the timing, location, or frequency of spawning aggregations for this species.

#### *Extinction Risk Assessment*

In determining an appropriate foreseeable future timeframe for the island grouper extinction risk assessment, we considered both the life history of the species and whether we could project the impact of threats or demographic risk factors through time.

We chose 40 years as the foreseeable future timeframe for island grouper. Threats to island grouper can potentially have long-lasting impacts, given the species' very slow growth rate, late maturation, and long maximum life span. However, considering the limited information available to predict the impacts from threats in the future, we felt 40 years was the most appropriate foreseeable future timeframe for island grouper.

Data from UVC sampling and fisheries landings indicate that the island grouper is rare throughout much of its limited range and very rare in some areas subjected to heavy fishing pressure. Of the 85 grouper species assessed by Morris *et al.* (2000), the island grouper was one out of only four species characterized as having both a "restricted" overall range and a "narrow" depth range. Although there are no population abundance estimates available for island grouper, low and decreased density combined with a highly

restricted range indicate that small population size is likely a risk factor for this species, which could be disproportionately affected by coastal development or a stochastic catastrophic event. Demographic viability factors related to growth rate and productivity are also likely to contribute to the extinction risk based on the following island grouper life history characteristics: slow growth, late maturation, low population turnover rate, large size, and long life span (Bustos 2008). While slow growth after the first few years is typical for species of *Mycteroperca*, the island grouper is one of the slowest growing species within this genus (Bustos *et al.* 2009).

Although information on spatial structure, connectivity, and dispersal characteristics specific to island grouper is sparse, it is somewhat likely that these factors represent a demographic viability risk to this species. Island grouper are rare in many areas studied, and the few documented areas with relatively higher abundance are small and patchily distributed throughout the species' range. Typical of archipelago ecosystems, the Macaronesian Islands are highly fragmented, as geographic distances, bathymetry, and other physical factors result in various degrees of isolation between islands and local populations of demersal fish species (Medina *et al.* 2007). Given their geographic distribution and narrow depth ranges, it is likely that island grouper are inherently susceptible to fragmentation, and this risk factor could be exacerbated by further population declines. Because there is insufficient information on genetic diversity, this demographic viability criterion presents an unknown likelihood of contributing to the island grouper's extinction risk.

The island grouper's intrinsic vulnerability to fishing is very high (Saavedra 2011, Diogo and Pereira 2013a). Demographic viability risk factors related to the island

grouper's growth rate, productivity, spatial structure, and range size all contribute to this species' vulnerability to fishing overexploitation (Bustos 2008, Bustos *et al.* 2009, Saavedra 2011, Diogo and Pereira 2013a). As a protogynous hermaphrodite, the island grouper may be even more susceptible to fishing, which, through selective removal of males, could reduce reproductive capacity (Huntsman and Schaaf 1994, Bustos *et al.* 2010). Certain behavioral traits (i.e., territoriality, site specificity, and spawning aggregations), which are common among groupers, often result in grouper species being an easy target for fishermen (Randall and Heemstra 1991, Domeier and Colin 1997). Although not well-studied in the island grouper, these traits may add to the fishing vulnerability of this species. The economic value of the island grouper is also a factor that likely contributes to overutilization of this species. Groupers are highly prized by commercial and artisanal fishermen for the quality of their flesh, and most species (including island grouper) fetch high market prices (Heemstra and Randall 1993, Ribeiro 2008).

Historical fisheries data are not available to evaluate long-term trends in island grouper landings, directed effort, or catch rates over time. The limited commercial and artisanal catch data available indicate that, in recent years, island grouper landings have been relatively small, and this species is currently a very minor component of commercial and artisanal fisheries throughout its range. The small contribution to recent fisheries landings is consistent with abundance information suggesting the island grouper is generally a rare species. Although fishing intensity is highly variable between islands, there are indications that artisanal fishing pressure for demersal species, in general, is relatively high in many areas throughout the island groupers' range. The depleted status

of commercially important stocks of tunas and small pelagics in the Macaronesian region has also likely contributed to the increased fishing pressure on coastal demersal species in recent years (Moreno-Herrero 2011, DeAlteris 2012).

Several studies have demonstrated a strong negative correlation between island grouper abundance and level of fishing pressure (Tuya *et al.* 2006a, Bustos 2008, Ribeiro 2008, Sangil *et al.* 2013a, Sangil *et al.* 2013b). These results suggest that fisheries overexploitation has negatively impacted island grouper abundance, and some heavily fished areas have likely experienced a sharp decline. This is particularly concerning for a rare species with a limited range and high intrinsic vulnerability to the effects of overfishing due to certain life history and behavioral traits. The lack of baseline abundance information and a time series of fishery dependent data, combined with limitations of the available studies, make it difficult to quantitatively assess the impact of this threat on island grouper abundance or species' survival. However, based on the cumulative information available, we conclude that there is a reasonable likelihood that artisanal fishing overutilization contributes to the island grouper's risk of extinction in a significant way. There are also indications that rapidly expanding recreational fisheries contribute significantly to the overutilization of island grouper in some parts of the species' range.

Current fishing regulations designed to limit catch and effort are inadequate for addressing the direct threat to island grouper from fishing overutilization. In general, there are few restrictions placed on demersal fisheries throughout the island grouper's range. In areas where regulations (e.g., size limits and gear restrictions) do exist, their effectiveness is likely reduced by lack of enforcement and relatively high levels of non-

compliance. A well-designed system of no-take MPAs may be better suited than traditional fishing regulations for addressing the threat of fishing to highly vulnerable, nearshore demersal species. The “reserve effect” on island grouper abundance (i.e., higher abundance within than outside the reserve boundary) was reported for one reserve on Madeira Island and two reserves in the Canary Islands archipelago. However, no-take zones account for only a small fraction of the total area covered by MPAs within the island grouper’s range, as most MPAs still allow some types of fishing. Given their small size, physical isolation from one another, and insufficient enforcement, the currently established marine reserves are likely inadequate to protect island grouper from the current and future threat of fishing overutilization. Overall, we conclude that there is a reasonable likelihood that the lack of adequate regulatory mechanisms and enforcement represent threats to the island grouper that contribute significantly to this species’ extinction risk.

Due to the species’ preferred depth range and the surrounding volcanic island bathymetry, island grouper habitat is typically confined to a narrow band within a few kilometers from shore. Close proximity to the shore increases the risk of habitat modification from human activities within the coastal zone, particularly on the more densely populated Macaronesian Islands. Potential threats to island grouper habitat include: declines in benthic cover (i.e., seaweeds and macroalgae) due to overfishing of key sea urchin predators; physical alteration and armoring of the coast; destructive fishing practices; pollution; and the effects of global climate change (see section “Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range” for more details). While these ecosystem disturbances are well documented, studies linking habitat

related threats to declines in island grouper abundance are lacking. Although the cumulative impact of anthropogenic threats has likely modified some portion of the island grouper's habitat, there is not enough scientific information available to support a conclusion that habitat associated changes contribute to the extinction risk of this species in a significant way. The introduction of invasive species from aquaculture escape events and ship ballast water also poses a potential threat to island grouper through increased competition for limited resources (e.g., food, shelter) and the possible spread of diseases and parasites. However, as with habitat related threats, there is not enough scientific information available to support a conclusion that threats related to invasive species contribute to the island grouper's extinction risk in a significant way.

In summary, the island grouper exhibits demographic risk factors related to abundance, growth rate and productivity, and spatial structure and connectivity. In addition, there is a reasonable likelihood that the operative threats of fishing overutilization and the lack of adequate regulatory mechanisms contribute significantly to the island grouper's risk of extinction.

#### *Protective Efforts*

We evaluated conservation efforts to protect and recover island grouper that are either underway but not yet fully implemented, or are only planned. As part of the European Union (EU), the Azores, Madeira, and Canary Islands archipelagos are influenced by EU conservation initiatives and directives. In 2008, the EU adopted the Marine Strategy Framework Directive (MSFD) in order to achieve Good Environmental Status (GES) through ecosystem-based management in EU waters by 2020. To comply with the MSFD, member states must ensure that their biological and physical marine

features adhere to the specific qualitative descriptors of GES for the maintenance of biological diversity, habitat quality, and sustainable harvest levels of fish and shellfish stocks (Fenberg *et al.* 2012). The establishment of a coherent network of MPAs is the only mandated measure of the MSFD. The emphasis on MPAs and biodiversity in the MSFD reinforces previously established commitments in the European Biodiversity Strategy and obligations under the international Convention on Biological Diversity (Bellas 2014). The adoption of the EU's MSFD policy demonstrates a general willingness to achieve long-term protection of Europe's marine ecosystems, but whether the political will is strong enough in the Macaronesian Islands to achieve its objectives remains to be seen (Santos *et al.* 2014).

The Portuguese government approved two MSFD strategies in 2012, one for the continental EEZ and one for the extended continental shelf; but no MSFD strategy has yet been approved by the autonomous governments of the Azores and Madeira archipelagos (Santos *et al.* 2014). In Spain, the MSFD has resulted in passage of the 2010 Law on the Protection of the Marine Environment (LPME). The LPME provides a general legal framework for the conservation and sustainable use of marine resources, as well as specific language regarding the creation and management of a Spanish network of MPAs, including some within the Canary Islands (Bellas 2014). Four proposed Canary Islands MPAs are currently waiting to be approved by the Spanish government: one on the north coast of La Gomera, two in Tenerife, and one on the east coast of Gran Canaria (Riera *et al.* 2014). However, previous attempts to establish new MPAs in the Canary Islands have often been stalled or abandoned due to stakeholder opposition, political infeasibility, and lack of funding (Chuenpagdee *et al.* 2013). For example, the regional

island government of Tenerife has been promoting the creation of MPAs on the island since 2004. Two proposed MPAs were finally approved in 2010 – six years after initial planning started – but to date neither one has been implemented.

A joint United Nations Development Program (UNDP) and Global Environment Facility (GEF) project titled “Consolidation of Cape Verde’s Protected Areas System” was initiated in 2010 in an effort to strengthen and expand Cape Verde’s national system of terrestrial and marine protected areas (UNDP 2013). Project objectives include: (1) consolidation, expansion, and operationalization of existing MPAs on the islands of Sal and Boavista for the protection of fisheries resources, (2) building the national capacity for MPA management through new management sectors and authorities, and (3) promotion of participatory approaches in the management and conservation of the endemic biodiversity of Cape Verde. The project is expected to add 41,214 ha of terrestrial and marine protected areas (i.e., a 38 percent expansion over the existing baseline).

Other regional, local and grassroots efforts are underway to conserve and protect marine resources in the Macaronesian Islands. Local nongovernmental organizations (NGOs) and regional governments in the Canary Islands are promoting the creation of Micro Areas Ecoturísticas Litorales (MAELs). Due to their small scale, MAELs are less demanding on public funding, typically less contentious, and follow a different legal model compared to larger scale MPAs (Riera *et al.* 2014). A well-designed and enforced network of MAELs could provide additional conservation benefit to demersal fish populations in the Canary Islands. The Canarias por una Costa Viva program is a partnership among NGOs, universities, and local and regional governments. Costa Viva

program objectives include studying the impacts of human population pressures on the coastal environment, increasing marine environmental education and awareness, promoting and facilitating stakeholder involvement in marine resource management, and collaborating with government agencies in the sustainable use of Canary Islands marine resources. The Azores University SMARTPARKS program (Planning and Management System for Small Islands Protected Areas) is aimed at facilitating the development of sustainable protected areas in the Azores through active involvement of stakeholders, promotion of economic and cultural activities compatible with nature conservation, and innovative planning and management of protected areas at the island scale (Fonseca *et al.* 2014).

In summary, there are several conservation initiatives that are either underway but not yet fully implemented or are still in the planning phase that could potentially provide conservation benefits to the marine ecosystems within the island grouper range. However, there are still major uncertainties regarding whether or not these initiatives will be fully implemented, operationalized, and adequately enforced. There are also uncertainties associated with the effectiveness of these efforts in reducing the island grouper extinction risk. Large-scale programs, such as the EU's MSFD, often have broad, general objectives for improving marine stewardship which may or may not include specific measures needed for protecting a particular species at risk. Regional, local and grassroots efforts may face fewer legal, political, and social hurdles in terms of implementation as compared to larger scale national programs. However, smaller scale programs, such as MAELs, may be limited in their effectiveness for species protection due to their small geographic size and inadequate resources for long-term management

and enforcement of conservation measures. We conclude that given large uncertainties associated with implementation, enforcement, and effectiveness, the conservation efforts identified cannot be considered reasonably likely to significantly reduce the current island grouper extinction risk.

### *Proposed Determination*

Based on the best available scientific and commercial information, as summarized here and in Salz (2015), and consideration of protective efforts being made to protect the species, we find that the island grouper (*Mycteroperca fusca*) is at a moderate risk of extinction. The nature of the threats and demographic risks identified, taking into account the uncertainty associated with the threats and risks, does not demonstrate the species is presently in danger of extinction; and therefore, it does not meet the definition of an endangered species. However, the current threats to island grouper from fishing overutilization and inadequate regulatory mechanisms are likely to continue in the future, further exacerbating the demographic risk factors associated with abundance, growth rate and productivity, and spatial structure and connectivity. We conclude that both the species' current risk of extinction and the best available information on the extent of, and trends in, the major threats affecting this species make it likely this species will become an endangered species within the foreseeable future (defined as 40 years) throughout its range. We therefore propose to list it as threatened under the ESA.

### **Effects of Listing**

Conservation measures provided for species listed as endangered or threatened under the ESA include recovery actions (16 U.S.C. 1533(f)); concurrent designation of critical habitat, if prudent and determinable (16 U.S.C. 1533(a)(3)(A)); Federal agency requirements to consult with NMFS under section 7 of the ESA to ensure their actions do

not jeopardize the species or result in adverse modification or destruction of critical habitat should it be designated (16 U.S.C. 1536); and prohibitions on taking (16 U.S.C. 1538). Recognition of the species' plight through listing promotes conservation actions by Federal and state agencies, foreign entities, private groups, and individuals. The main effects of this rule if finalized as proposed for gulf grouper are prohibitions on take, including export, import, and use in foreign commerce.

#### *Identifying Section 7 Conference and Consultation Requirements*

Section 7(a)(2) (16 U.S.C. 1536(a)(2)) of the ESA and NMFS/USFWS regulations require Federal agencies to consult with us to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of listed species or destroy or adversely modify critical habitat. Section 7(a)(4) (16 U.S.C. 1536(a)(4)) of the ESA and NMFS/USFWS regulations also require Federal agencies to confer with us on actions likely to jeopardize the continued existence of species proposed for listing, or that result in the destruction or adverse modification of proposed critical habitat of those species. It is unlikely that listing the gulf grouper under the ESA will increase the number of section 7 consultations, because at present this species is only known to occur outside of the United States and is unlikely to be affected by Federal actions. Although the gulf grouper's historical range includes parts of Southern California, there are no recent records indicating that this species still exists in U.S. waters.

#### *Critical Habitat*

Critical habitat is defined in section 3 of the ESA (16 U.S.C. 1532(5)) as: (1)

specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the ESA, on which are found those physical or biological features (a) essential to the conservation of the species and (b) that may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by a species at the time it is listed upon a determination that such areas are essential for the conservation of the species. “Conservation” means the use of all methods and procedures needed to bring the species to the point at which listing under the ESA is no longer necessary. Section 4(a)(3)(A) of the ESA (16 U.S.C. 1533(a)(3)(A)) requires that, to the extent prudent and determinable, critical habitat be designated concurrently with the listing of a species. However, critical habitat shall not be designated in foreign countries or other areas outside U.S. jurisdiction (50 CFR 424.12(h)). We can designate critical habitat in areas in the United States currently unoccupied by the species, if the area(s) are determined by the Secretary to be essential for the conservation of the species. Regulations at 50 CFR 424.12(e) specify that we shall designate as critical habitat areas outside the geographical range presently occupied by the species only when the designation limited to its present range would be inadequate to ensure the conservation of the species.

The best available scientific and commercial information does not indicate that U.S. waters provide any specific essential biological or physical function for the gulf grouper. U.S. waters account for a very small portion on the northern limit of the gulf grouper’s historical range, and may no longer be part of the species’ current range. Based on the best available information, we have not identified unoccupied areas in U.S. waters

that are currently essential to the conservation of gulf grouper. Therefore, based on the available information, we do not intend to designate critical habitat for gulf grouper.

The island grouper occurs entirely outside of the United States. Therefore, we cannot designate critical habitat for island grouper.

*Identification of Those Activities That Would Constitute a Violation of Section 9 of the ESA*

On July 1, 1994, NMFS and FWS published a policy (59 FR 34272) that requires us to identify, to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the ESA. Because we are proposing to list the gulf grouper as endangered, all of the prohibitions of section 9(a)(1) of the ESA will apply to this species. These include prohibitions against the import, export, use in foreign commerce, or “take” of the species. These prohibitions apply to all persons subject to the jurisdiction of the United States, including in the United States, its territorial sea, or on the high seas. Take is defined as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” The intent of this policy is to increase public awareness of the effects of this listing on proposed and ongoing activities within the species’ range. Activities that we believe could result in a violation of section 9 prohibitions for this species include, but are not limited to, the following:

(1) Possessing, delivering, transporting, or shipping any individual or part (dead or alive) taken in violation of section 9(a)(1);

(2) Delivering, receiving, carrying, transporting, or shipping in interstate or foreign commerce any individual or part, in the course of a commercial activity;

(3) Selling or offering for sale in interstate commerce any part, except antique articles at least 100 years old;

(4) Importing or exporting any individual or part; and

(5) Harming captive animals by, among other things, injuring or killing a captive animal, through experimental or potentially injurious care or conducting research or sexual breeding activities on captive animals, outside the bounds of normal animal husbandry practices. Experimental or potentially injurious care or procedures and research or sexual breeding activities of gulf grouper may, depending on the circumstances, be authorized under an ESA 10(a)(1)(A) permit for scientific research or the enhancement of the propagation or survival of the species.

*Identification of Those Activities That Would Not Constitute a Violation of Section 9 of the ESA*

We will identify, to the extent known at the time of the final rule, specific activities involving gulf grouper that will not be considered likely to result in a violation of section 9 of the ESA. Although not binding, we are considering the following actions, depending on the circumstances, as not being prohibited by ESA section 9:

(1) Take authorized by, and carried out in accordance with the terms and conditions of, an ESA section 10(a)(1)(A) permit issued by NMFS for purposes of scientific research or the enhancement of the propagation or survival of the species; and

(2) Continued possession of parts that were in possession at the time of listing. Such parts may be non-commercially exported or imported; however the importer or exporter must be able to provide evidence to show that the parts meet the criteria of ESA

section 9(b)(1) (i.e., held in a controlled environment at the time of listing, in a non-commercial activity).

Section 11(f) of the ESA gives NMFS authority to promulgate regulations that may be appropriate to enforce the ESA. NMFS may promulgate future regulations to regulate trade or holding of gulf grouper, if necessary. NMFS will provide the public with the opportunity to comment on future proposed regulations.

*Protective Regulations Under Section 4(d) of the ESA*

We are proposing to list the island grouper as a threatened species. In the case of threatened species, ESA section 4(d) leaves it to the Secretary's discretion whether, and to what extent, to extend the section 9(a) "take" prohibitions to the species, and authorizes us to issue regulations necessary and advisable for the conservation of the species. Thus, we have flexibility under section 4(d) to tailor protective regulations, taking into account the effectiveness of available conservation measures. The 4(d) protective regulations may prohibit, with respect to threatened species, some or all of the acts which section 9(a) of the ESA prohibits with respect to endangered species. These 9(a) prohibitions apply to all individuals, organizations, and agencies subject to U.S. jurisdiction. Since the island grouper occurs entirely outside of the United States, and is not commercially traded with the United States, extending the section 9(a) "take" prohibitions to this species will not result in added conservation benefits or species protection. Therefore, we do not intend to issue section 4(d) regulations for the island grouper.

**Public Comments Solicited**

To ensure that any final action resulting from this proposed rule to list two species will be as accurate and effective as possible, we are soliciting comments and information from the public, other concerned governmental agencies, the scientific community, industry, and any other interested parties on information in the status review and proposed rule. Comments are encouraged on these proposals (See **DATES** and **ADDRESSES**). We must base our final determination on the best available scientific and commercial information when making listing determinations. We cannot, for example, consider the economic effects of a listing determination. Final promulgation of any regulation(s) on these species' listing proposals will take into consideration the comments and any additional information we receive, and such communications may lead to a final regulation that differs from this proposal or result in a withdrawal of this listing proposal.

We particularly seek:

- (1) Information concerning the threats to either of the two species proposed for listing;
- (2) Taxonomic information on either of these species;
- (3) Biological information (life history, genetics, population connectivity, etc.) on either of these species;
- (4) Efforts being made to protect either of these species throughout their current ranges;
- (5) Information on the commercial trade of either of these species; and
- (6) Historical and current distribution and abundance and trends for either of these species.

We request that all information be accompanied by: (1) Supporting documentation, such as maps, bibliographic references, or reprints of pertinent publications; and (2) the submitter's name, address, and any association, institution, or business that the person represents.

#### *Role of Peer Review*

In December 2004, the Office of Management and Budget (OMB) issued a Final Information Quality Bulletin for Peer Review establishing a minimum peer review standard. Similarly, a joint NMFS/FWS policy (59 FR 34270; July 1, 1994) requires us to solicit independent expert review from qualified specialists, concurrent with the public comment period. The intent of the peer review policy is to ensure that listings are based on the best scientific and commercial data available. We solicited and received peer review comments on each of the status review reports, including from: three marine scientists with expertise on the gulf grouper, and three marine scientists with expertise on the island grouper. Peer reviewer comments for each species are incorporated into the draft status review reports and this 12-month finding.

#### **References**

A complete list of the references used in this proposed rule is available upon request (see ADDRESSES).

#### **Classification**

##### *National Environmental Policy Act*

The 1982 amendments to the ESA, in section 4(b)(1)(A), restrict the information that may be considered when assessing species for listing. Based on this limitation of criteria for a listing decision and the opinion in *Pacific Legal Foundation v. Andrus*, 675

F. 2d 825 (6th Cir. 1981), NMFS has concluded that ESA listing actions are not subject to the environmental assessment requirements of the National Environmental Policy Act (NEPA) (See NOAA Administrative Order 216-6).

*Executive Order 12866, Regulatory Flexibility Act, and Paperwork Reduction Act*

As noted in the Conference Report on the 1982 amendments to the ESA, economic impacts cannot be considered when assessing the status of a species. Therefore, the economic analysis requirements of the Regulatory Flexibility Act are not applicable to the listing process. In addition, this proposed rule is exempt from review under Executive Order 12866. This proposed rule does not contain a collection-of-information requirement for the purposes of the Paperwork Reduction Act.

*Executive Order 13132, Federalism*

In accordance with E.O. 13132, we determined that this proposed rule does not have significant Federalism effects and that a Federalism assessment is not required. In keeping with the intent of the Administration and Congress to provide continuing and meaningful dialogue on issues of mutual state and Federal interest, this proposed rule will be given to the relevant governmental agencies in the countries in which these two species occur, and they will be invited to comment. We will confer with the U.S. Department of State to ensure appropriate notice is given to foreign nations within the range of both species. As the process continues, we intend to continue engaging in informal and formal contacts through the U.S. State Department, giving careful consideration to all written and oral comments received.

**List of Subjects**

**50 CFR Part 223**

Endangered and threatened species, Exports, Transportation.

**50 CFR Part 224**

Administrative practice and procedure, Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Dated: September 14, 2015.

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Samuel D. Rauch III,

Deputy Assistant Administrator for Regulatory Programs,

National Marine Fisheries Service.

For the reasons set out in the preamble, 50 CFR parts 223 and 224 are proposed to be amended as follows:

**PART 223—THREATENED MARINE AND ANADROMOUS SPECIES**

1. The authority citation for part 223 continues to read as follows:

Authority: 16 U.S.C. 1531-1543; subpart B, § 223.201-202 also issued under 16 U.S.C. 1361 *et seq.*; 16 U.S.C. 5503(d) for § 223.206(d)(9).

2. In § 223.102, in paragraph (e), the table is amended by adding an entry for “Grouper, island” under Fishes in alphabetical order by common name to read as follows:

**§ 223.102 Enumeration of threatened marine and anadromous species.**

\* \* \* \* \*

(e) \* \* \*

Species <sup>1</sup>			Citation(s) for listing determination(s)	Critical habitat	ESA rules
Common name	Scientific name	Description of listed entity			
*****					
Fishes					
*****					
Grouper, island	<i>Mycteroperca fusca</i>	Entire species.	[Insert <b>FEDERAL REGISTER</b> citation], [Insert date of publication in the <b>FEDERAL REGISTER</b> ]	NA	NA
*****					

<sup>1</sup>Species includes taxonomic species, subspecies, distinct population segments (DPSs) (for a policy statement, see 61 FR 4722, February 7, 1996), and evolutionarily significant units (ESUs) (for a policy statement, see 56 FR 58612, November 20, 1991).

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**PART 224—ENDANGERED MARINE AND ANADROMOUS SPECIES**

3. The authority citation for part 224 continues to read as follows:

**Authority:** 16 U.S.C. 1531-1543 and 16 U.S.C. 1361 et seq.

4. In § 224.101, in paragraph (h), the table is amended by adding an entry for “Grouper, gulf” under Fishes in alphabetical order by common name to read as follows:

§ 224.101 Enumeration of endangered marine and anadromous species.

\*\*\*\*\*

(h) \*\*\*

Species <sup>1</sup>			Citation(s) for listing determination(s)	Critical habitat	ESA rules
Common name	Scientific name	Description of listed entity			
*****					
Fishes					
*****					
Grouper, gulf	<i>Mycteroperca jordani</i>	Entire species.	[Insert <b>FEDERAL REGISTER</b> citation], [Insert date of publication in the <b>FEDERAL REGISTER</b> ]	NA	NA
*****	**				

<sup>1</sup>Species includes taxonomic species, subspecies, distinct population segments (DPSs) (for a policy statement, see 61 FR 4722, February 7, 1996), and evolutionarily significant units (ESUs) (for a policy statement, see 56 FR 58612, November 20, 1991).  
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