• *Mail:* General Services Administration, Regulatory Secretariat (MVCB), ATTN: Ms. Flowers, 1800 F Street NW., 2nd Floor, Washington, DC 20405.

Instructions: Please submit comments only and cite FAR Case 2014–025, in all correspondence related to this case. All comments received will be posted without change to *http://www.regulations.gov*, including any personal and/or business confidential information provided.

FOR FURTHER INFORMATION CONTACT: Mr. Edward Loeb, Procurement Analyst, at 202–501–0650, for clarification of content. For information pertaining to status or publication schedules, contact the Regulatory Secretariat at 202–501–4755. Please cite FAR Case 2014–025.

SUPPLEMENTARY INFORMATION:

Background

DoD, GSA, NASA published a proposed rule in the **Federal Register** at 80 FR 30548, May 28, 2015. The comment period is extended to provide additional time for interested parties to submit comments on the FAR case until August 11, 2015.

List of Subjects in 48 CFR Parts 1, 4, 9, 17, 22, and 52

Government procurement.

Dated: July 9, 2015.

Edward Loeb,

Acting Director, Office of Government-wide Acquisition Policy, Office of Acquisition Policy, Office of Government-wide Policy.

[FR Doc. 2015–17282 Filed 7–13–15; 8:45 am]

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 224

[Docket No. 150506424–5424–01]

RIN 0648–XD940

Endangered and Threatened Wildlife and Plants; 12-Month Finding and Proposed Rule To List Three Angelshark Species as Endangered Under the Endangered Species Act

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

ACTION: Proposed rule; 12-month petition finding; request for comments.

SUMMARY: We, NMFS, have completed a comprehensive status review under the Endangered Species Act (ESA) for three foreign marine angelshark species in response to a petition to list those species. These three species are the sawback angelshark (*Squatina aculeata*), smoothback angelshark (*Squatina oculata*), and common angelshark (*Squatina squatina*). Based on the best scientific and commercial information available, including the status review report (Miller 2015), and after taking into account efforts being made to protect these species, we have determined that these three angelshark species warrant listing as endangered under the ESA. We are not proposing to designate critical habitat because the geographical areas occupied by these species are entirely outside U.S. jurisdiction, and we have not identified any unoccupied areas that are currently essential to the conservation of any of these species. We are soliciting comments on our proposal to list these three angelshark species.

DATES: Comments on this proposed rule must be received by September 14, 2015. Public hearing requests must be made by August 28, 2015.

ADDRESSES: You may submit comments on this document, identified by NOAA–NMFS–2015–0084, by either of the following methods:

• *Electronic Submissions:* Submit all electronic public comments via the Federal eRulemaking Portal. Go to *www.regulations.gov/#!docketDetail;D=NOAA-NMFS-2015-0084.* Click the ''Comment Now'' icon, complete the required fields, and enter or attach your comments.

• *Mail:* Submit written comments to Maggie Miller, 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 by NMFS. All comments received are a part of the public record and will generally be posted for public viewing on *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. NMFS will accept anonymous comments (enter ''N/A'' in the required fields if you wish to remain anonymous).

You can find the petition, status review report, **Federal Register** notices, and the list of references electronically on our Web site at *http://www.nmfs.noaa.gov/pr/species/petition81.htm.*

FOR FURTHER INFORMATION CONTACT: Maggie Miller, NMFS, Office of Protected Resources (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 findings for 3 of those 24 species: the sawback angelshark (*Squatina aculeata*), smoothback angelshark (*Squatina oculata*), and the common angelshark (*Squatina squatina*). The status of the findings and relevant **Federal Register** notices for the other 21 species and 3 subpopulations can be found on our Web site 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 sawback angelshark (*Squatina aculeata*), smoothback angelshark (*Squatina oculata*), and common angelshark (*Squatina squatina*) are ''species'' under the ESA. There is nothing in the scientific literature indicating that any 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.

Status Review

The status review for the three angelshark species addressed in this finding was conducted by a NMFS biologist in the Office of Protected Resources (Miller 2015). In order to complete the status review, information was compiled on each 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 finding. In assessing extinction risk of these three species, we considered the demographic viability factors developed by McElhany *et al.* (2000). The approach of considering demographic risk factors to help frame the consideration of extinction risk has been used in many of our status reviews, including for Pacific salmonids, Pacific hake, walleye pollock, Pacific cod, Puget Sound rockfishes, Pacific herring, scalloped and great hammerhead sharks, and black abalone (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.

The draft status review report (Miller 2015) was submitted to independent peer reviewers; comments and information received from peer reviewers were addressed and incorporated as appropriate before finalizing the draft report. The status review report is available on our Web site (see **ADDRESSES** section) and the peer review report is available at *http://www.cio.noaa.gov/services_programs/prplans/PRsummaries.html.* Below we summarize information from the report and our analysis of the status of the three angelshark species. Further details can be found in Miller (2015).

Species Descriptions

Angelsharks belong to the family Squatinidae (Order: Squatiniformes) and are recognized by their batoid shape. Species identification of angelsharks is mainly conducted through the examination of external characteristics (such as dorsal spines, nasal barbels, color, etc.), but the taxonomy is often considered to be problematic since several species are morphologically similar, with overlapping characteristics (Vaz and de Carvalho 2013). In 1984, Compagno (1984) identified and described 12 *Squatina* species. Since 1984, 11 additional *Squatina* species have been recognized (Froese and Pauly 2014), bringing the present total to 23 identified *Squatina* species. Recent research suggests there are currently undescribed species, indicating that the taxonomy of the angelsharks may still be unresolved (Stelbrink *et al.* 2010; Vaz and de Carvalho 2013).

Angelsharks can be found worldwide in temperate and tropical waters. The three species proposed for listing are found in coastal and outer continental shelf sediment habitats in the Mediterranean Sea and eastern Atlantic. These species are bottom dwellers and prefer to spend most of their time buried in the sand or mud (Compagno 1984). To feed, they generally lie in wait for prey to approach before attacking (ambush predators), and, based on their diet, they are considered to be high trophic level predators (trophic level = 4.0; Cortés 1999). In terms of reproduction, all three angelshark species are ovoviviparous, meaning embryos develop inside eggs that hatch within the female's body, with young born live. However, according to Sunye and Vooren (1997), *Squatina* species also have a uterine–cloacal chamber (the chamber where embryos complete their final development stage) that is open to the external environmental through a cloacal vent. This anatomical configuration is thought to be the reason why *Squatina* species are observed easily aborting embryos during capture or handling (Sunye and Vooren 1997; Capapé *et al.* 2005). Additional species-specific descriptions are provided below.

Squatina aculeata (Cuvier, 1829), the sawback angelshark, is distinguished from other angelsharks by its row of dorsal spines (sword-like bony structure) down the middle of its body, with spines also located on the snout and above the eyes. The sawback angelshark also has fringed nasal barbels and anterior nasal flaps on its body

(Compagno 1984). It can be found on the continental shelf and upper slope in depths of 30 m to 500 m, and feeds on small sharks, jacks, and benthic invertebrates, including cephalopods and crustaceans (Compagno 1984; Corsini and Zava 2007). Gestation for the species likely lasts around a year, with litter sizes ranging from 8 to 12 pups and size at birth estimated to be around 30 cm–35 cm total length (TL) (Capapé *et al.* 2005). *Squatina aculeata* displays sexual dimorphism, with males maturing at around 120 cm–124 cm TL and reaching maximum sizes of around 152 cm TL, and females maturing at larger sizes, around 137 cm–143 cm TL, and attaining larger maximum sizes (175 cm–180 cm TL) (Capapé *et al.* 2005; Serena 2005).

Squatina oculata (Bonaparte, 1840), the smoothback angelshark, is distinguished from other angelsharks by its big thorns (sharp, tooth-like structures on the skin) that are present on the snout and above the eyes, a first dorsal fin that originates well behind the pelvic rear tips, and noticeable white spots in symmetrical patterns on the pectoral fins and body (Compagno 1984). The species occurs in depths of 20 m to 560 m on the continental shelf and upper slopes, but is more commonly found in depths between 50 and 100 m (Compagno 1984; Serena 2005). *Squatina oculata* generally feeds on small fishes, including goatfishes, and reaches sizes of at least 145 cm TL (males) and 160 cm TL (females) (Compagno 1984). Gestation likely lasts, at a minimum, around a year, with litter sizes ranging from 5 to 8 pups and size at birth around 23 cm–27 cm TL (Capapé *et al.* 1990, 2002). Maturity is attained at around 71 cm TL for males and around 90 cm TL for females (Compagno 1984; Capapé *et al.* 1990, 2002).

Squatina squatina (Linnaeus, 1758), the common angelshark, is distinguished from other angelsharks by its simple and conical nasal barbels, high and wide pectoral fins, small spines that are present on snout and above eyes and may also be present down middle of back, and lateral trunk denticles that are very narrow with sharp-cusped crowns (Compagno 1984). Unlike the other two angelshark species, *S. squatina* is generally found in shallower water, from inshore areas out to the continental shelf in depths of 5 m to 150 m (OSPAR Commission 2010). It may also be observed in estuaries and brackish waters (OSPAR Commission 2010). *Squatina squatina* has a diet that consists mostly of bony fishes, especially flatfishes, and other demersal animals (skates, crustaceans, molluscs), with the occasional eelgrass and seabird (Day 1880; Compagno 1984; Ellis *et al.* 1996; Agri-Food & Biosciences Institute 2009; Narváez 2012). Gestation for *S. squatina* in the Canary Islands is estimated to be ±6 months with a 3-year reproductive cycle (Osaer 2009). Elsewhere in its range, gestation period is unknown but possibly lasts from 8 to 12 months, with potentially a 2-year reproductive cycle (Tonachella 2010; ICES 2014). Litter sizes range from 7 to 25 pups, with size at birth from 24 cm–30 cm TL (Osaer 2009; Tonachella 2010). Males mature between 80 cm and 132 cm TL, with maximum sizes attained at 183 cm TL, and females mature between 126 cm and 169 cm TL and attain maximum sizes of up to 244 cm TL (Compagno 1984; Capapé *et al.* 1990; Quigley 2006; Tonachella 2010). In the Canary Islands, Osaer (2009) found length at first maturity (Lm50) for males to be 100.9 cm TL and for females to be 102.1 cm TL, which is a bit smaller than the values estimated elsewhere. Weight of *S. squatina* has been recorded up to 80 kg (Quigley 2006).

Historical and Current Distribution and Population Abundance

Squatina aculeata

The sawback angelshark was historically found in central and western Mediterranean waters and in the eastern Atlantic, from Morocco to Angola. According to Capapé *et al.* (2005), it has never been recorded in Atlantic waters north of the Strait of Gibraltar. It was previously assumed to be very rare or absent from the eastern Mediterranean (Capapé *et al.* 2005; Psomadakis *et al.* 2009); however, a number of recent studies have documented its presence in this region, suggesting possible misidentification of the species in historical records. For example, in 2007, Corsini and Zava (2007) reported the first record of the species in Hellenic waters of the Southeast Aegean Sea (around Rhodes and the Dodecanese Islands). Catch of *S. aculeata* has also been reported from the Çanakkale Strait off Turkey (Ünal *et al.* 2010) and from Gökova Bay in the southern Aegean Sea (Filiz *et al.* 2005). The species was also listed as occurring in the Levantine Sea by Golani (1996) (as reported in Capapé *et al.* (2005)), with the first actual description of a specimen caught in this area from Iskenderun Bay in 1997 (Basusta 2002); however, by 2004, Golani (personal communication cited in Capapé *et al.* (2005)) noted that the species was no longer reported in the area. In their updated checklist of marine fishes of Turkey, Bilecenoğlu *et al.* (2014) recorded *S. aculeata* as occurring in the Aegean Sea and Levantine Sea, and between 2001 and 2004, Saad *et al.* (2005) captured the species along the Syrian coast.

The species is currently reported as ''doubtful'' or rare in many areas in the central and western Mediterranean Sea, such as off the Spanish and French coasts, within Italian waters, and off Algeria (Barrull *et al.* 1999; Capapé *et al.* 2005). In the central Mediterranean, specifically the Gulf of Gabès (Tunisia), the species was noted as being abundant in 1978 (Quignard and Ben Othman 1978) and ''regularly observed'' in 2006 (Bradai *et al.* 2006); however, more recent studies suggest the species has significantly declined in this region and is now a rare occurrence in Mediterranean Tunisian waters (Scacco *et al.* 2002; Capapé *et al.* 2005; Ragonese *et al.* 2013). Although the species had been previously included in inventories of sharks and ray species from the Maltese Islands (based on unconfirmed records; Schembri *et al.* 2003), recent surveys conducted in these waters (Scacco *et al.* 2002; Ragonese *et al.* 2013) cannot confirm its presence.

Squatina aculeata has also seen significant declines in neighboring Mediterranean waters, such as in the Tyrrhenian Sea and Adriatic Sea. Based on historical commercial landings data and recent survey data, Ferretti *et al.* (2005) concluded that the species has been extirpated from the northern Tyrrhenian Sea since the early 1970s. Similarly, Capapé *et al.* (2005) noted past records of *S. aculeata* in the Adriatic Sea (dated to 1975); however, more recent and extensive bottom trawl surveys conducted from 1994–2005 throughout the Adriatic Sea have failed to locate the species (Jukic-Peladic *et al.* 2001; Ferretti *et al.* 2013). In contrast, in waters off Libya, the species was described as relatively common by the United National Environment Programme (UNEP) in 2005 (UNEP-Mediterranean Action Plan Regional Activity Centre For Specially Protected Areas (UNEP–MAP RAC/SPA) 2005); however, the data on which this statement was based, and present abundance, are unknown.

In the western Mediterranean, the only information concerning the distribution and abundance of *S. aculeata* is the mention of a few specimens held in Spanish and French museums (The Global Biodiversity Information Facility (GBIF) 2013) and a discussion of the Balearic Islands (Spain) population in the International Union for Conservation of Nature (IUCN) Red List assessment of the species by Morey *et al.* (2007a).

Specifically, Morey *et al.* (2007a) suggest that *Squatina* species (presumably *S. aculeata* or *S. oculata* based on fishing depths) were commonly caught in the Balearic Islands until the 1970s, after which captures became more sporadic. By the mid-1990s, the species was no longer observed or recorded from the area (Morey *et al.* 2007a).

In the eastern Atlantic, observed population declines appear to have occurred within the past 40 years, particularly in waters off West Africa. According to a personal communication in the Morey *et al.* (2007a) assessment (from F. Litvinov in 2006), *S. aculeata* was commonly reported in Russian surveys off the coast of West Africa during the 1970s and 1980s. Similarly, in their 1973 checklist of marine fishes, Hureau and Monod (1973) also referred to the species as common in these waters. By the early 1980s, however, there were signs of decline based on observations of the species. In fact, by 1985, Muñoz-Chapuli (1985) considered the species to be rare in the eastern Atlantic. This characterization was based on data from 181 commercial trawls conducted in 0 m–550 m depths from 1980–1982 along the northwestern African coast (27° N–37° N) and Alboran Sea. Only 28 *S. aculeata* sharks were captured, with 25 of them caught off the coast of Morocco (between 31° N and 34° N). In waters farther south, Morey *et al.* (2007a) indicate that the species was frequently caught by artisanal Senegalese fishermen 30 years ago (mid-1970s), with catches now very rare according to artisanal fishermen and observers of the industrial demersal trawl fleets (Morey *et al.* (2007a) citing a personal communication from M. Ducrocq). Similarly, Capapé *et al.* (2005) noted that the species was relatively abundant off the coast of Senegal and was landed throughout the year; but, in recent years, Senegalese fishermen have reported fewer observations of all squatinid species (Dr. Christian Capapé, Professor at Université Montpellier 2, personal communication 2015). In Sierra Leone, Morey *et al.* (2007a), citing a personal communication from M. Seisay, state that the species was ''periodically caught by demersal trawlers in the 1980s, but are now caught very infrequently.'' These observations tend to support the available survey data, although data are only available through the year 2002. From 1962 to 2002, species recorded from 246 surveys conducted along the west coast of Africa were reported in two databases: Trawlbase and Statbase, as part of the Système d'Information et d'Analyse des Pêches (SIAP) project (Mika Diop, Program Officer at Sub-Regional Fisheries Commission, personal communication 2015). Based on the information from these databases, *S. aculeata* was recorded rather sporadically and in low abundance in the surveys since the 1970s, the exception being a 1997 survey conducted off Senegal, which recorded 24 individuals. However, in the surveys that followed (conducted from 1999–2002; with surveys off Senegal conducted in 1999 and 2000), no *S. aculeata* individuals were caught, with the last record of the species from the database dating back to 1998.

Squatina Oculata

The smoothback angelshark was historically found throughout the Mediterranean Sea and in the eastern Atlantic from Morocco to Angola. The current distribution and abundance of the species is not well known. In the western Mediterranean, it is possible that the species has been extirpated from the Balearic Islands (see discussion for *S. aculeata* above). Similarly, in the central Mediterranean, Ferretti *et al.* (2005) noted the disappearance of the entire *Squatina* genus from the northern Tyrrhenian Sea in the early 1970s. Between the Maltese Islands and Tunisia, Ragonese *et al.* (2013) noted *S. oculata*'s sporadic occurrence based on shelf and slope trawl data from 1997, 1998, and 2006, whereas Bradai *et al.* (2006) ''regularly observed'' the species in the Gulf of Gabès. Prior to these surveys, Capapé *et al.* (1990) had suggested that the Gulf of Tunis (Tunisia) was likely a nursery area for *S. oculata* based on trawl catch data. In 2005, UNEP reported the species as being relatively common in Libyan waters but provided no corresponding citation or data to support this statement or further information regarding abundance in the Mediterranean Sea (UNEP–MAP RAC/SPA 2005). The species has also been reported in the Adriatic Sea (Arapi *et al.* 2006; Soldo 2006), although, extensive bottom trawl surveys conducted from 1994–2005 throughout the Adriatic Sea failed to locate the species in these waters (Jukic-Peladic *et al.* 2001; Ferretti *et al.* 2013).

In the eastern Mediterranean, its present distribution appears to be patchy, with few observations of the species. In 2004, one female *S. oculata* individual was caught by a trawl net in depths of 60 m–70 m in Trianda Gulf off the northwest coast of Rhodes, Greece. This marked the first record of the species in Hellenic waters of the Southeastern Aegean Sea (Corsini and Zava 2007). The species also appears to be rare in the central Aegean Sea as Damalas and Vassilopolou (2011) recorded only one individual during their analysis of 335 records of bottom trawl hauls conducted between 1995 and 2006. On the other hand, the species is characterized as ''prevalent'' by Golani (2006) along the Mediterranean coast of Israel, although the data upon which this characterization was based and the present abundance are unknown. *S. oculata* is also reported as occurring in the Sea of Marmara (Bilecenoğlu *et al.* 2014) and off the Mediterranean Syrian coast (based on survey data from 2001–2004; Saad *et al.* 2006). In 2015, an individual was landed near Akyaka (Turkey) by local fishermen (Joanna Barker, UK & Europe Project Manager of Conservation Programmes at Zoological Society of London, personal communication 2015).

There is very little available information on the abundance of this species in the eastern Atlantic. The IUCN Red List assessment of the species by Morey *et al.* (2007b) also cites to the same personal communication from M. Ducrocq and F. Litvinov, found in the assessment of *S. aculeata* (Morey *et al.* 2007a), that indicates the species was frequently caught by artisanal Senegalese fishermen as well as commonly reported in Russian surveys off the coast of West Africa 30 years ago. Hureau and Monod (1973) also referred to the species as ''rather common'' in the eastern Atlantic, from Morocco to Angola. During 1981–1982, a Norwegian research vessel conducted trawl surveys off West Africa, from Aghadir to Ghana, to examine the composition and biomass of fish resources in this region. *Squatina oculata* was the only *Squatina* species caught during these surveys, with catch rates of 45.6 kg/hour off the coast of Gambia, 13.4 kg/hour off Sierra Leone, and 12.4 kg/hour off Liberia (Strømme 1984). In 2001, *S. oculata* was also reported as occurring off the coast of Ghana, with individuals usually caught between November and December but rarely landed (Edwards *et al.* 2001). No other data on abundance or frequency of occurrence were provided. Based on personal communication, Morey *et al.* (2007b) report that catches of the species in this region are now very rare, and Senegalese fishermen have noted a decrease in observations of all squatinid species in recent years (C. Capapé, pers. comm. 2015). Based on the information from the SIAP databases, *S. oculata* was recorded rather sporadically in the surveys, with a few years reporting >20 individuals, primarily from surveys

conducted off the coast of Senegal. The last record of the species from the data dates back to 2002.

Squatina Squatina

The common angelshark is the most northerly distributed of the three angelshark species discussed in this finding. Its historical range extended along the eastern Atlantic, from Scandinavia to Mauritania, including the Canary Islands, and the Mediterranean and Black Seas. Throughout most of the northeastern Atlantic, *S. squatina* was historically frequently encountered. As Day (1880) reported, the species was common within the North Sea and English Channel, especially along the southern coasts of Kent, Sussex, and Hampshire. It was also regularly observed in the Firth of Clyde after gales (Day 1880). Hureau and Monod (1973) noted its occurrence from the western and southern North Sea, and in Scandinavian waters in the Skagerrak and Kattegat. The authors characterized the species as common over 40 years ago, except in the most northern and eastern parts of its range. Pethon (1979) also documented the presence of the species in waters off Norway (first record in 1929; second record in 1979), describing the species as rare in Scandinavian waters but regularly observed in the southern part of the North Sea and around the British Isles. However, comparisons of historical and current catch and survey data on *S. squatina* suggest significant declines in abundance of the species throughout its range in the northeastern Atlantic, with possible extirpations of the species from the western English Channel (near Plymouth), North Sea, and Baltic Sea (although adult *S. squatina* were always considered to be rare in these waters; HELCOM 2013) (Morey *et al.* 2006; OSPAR Commission 2010; McHugh *et al.* 2011; ICES 2014).

In Irish waters, historical records (dating back to 1772) suggest the species was regularly observed off the southern and western coasts of Ireland (Dr. Declan Quigley, Sea Fisheries Protection Authority, personal communication 2015). In fact, in the1960s, *S. squatina* were caught in large numbers off the west coast of Ireland, in Tralee Bay (County Kerry), by recreational anglers competing in fishing tournaments. Data from a marine sport fish tagging program in Ireland also suggests the species was rather common in these waters, with 320 angelsharks caught, tagged, and released in Tralee and Clew Bays (Ireland) from 1987–1991. However, by the late 1990s, data from angler catches and the tagging program indicate that abundance started to decline. Specifically, annual numbers of *S. squatina* (weighing >22.68 kg) caught by rod and line gear significantly decreased when compared to the previous 50 years, and from 1997–2001, only 16 angelsharks were caught by the tagging program, despite no change in tagging effort (Quigley 2006; ICES 2014). Since 2006, only one individual has been caught and tagged (ICES 2014). The species is now extremely rare off the west coast of Ireland, with no reported recaptures of tagged sharks since 2004. However, in October 2013, an angler reported catching (and releasing) an angelshark in Tralee Bay, confirming that the species still exists in these waters.

Similarly, in other areas of the northeastern Atlantic, survey data on *S. squatina* suggest very low present abundance. For example, Ellis *et al.* (1996) analyzed data from 550 bottom trawls conducted throughout the northeastern Atlantic (with survey focus in the Irish Sea) between 1981 and 1983 and found only 19 *S. squatina* sharks, comprising 0.6 percent of the total elasmobranch catch. Analysis of more extensive bottom-trawl survey datasets, covering the period of 1967–2002 and with sampling in the North Sea (1967–1990; 2001–2002), Celtic Sea (1982–2002), Eastern English Channel (1989–2002), Irish Sea (1988–2001), and Western English Channel (1990–2001), failed to record any *S. squatina* individuals (Ellis *et al.* 2004). However, in 2009, one *S. squatina* shark was captured in Cardigan Bay, four sharks were collected off Pembrokeshire (Wales) near the entrance to St. George's Channel (two in 2007 and two in 2010), and recent (2015) reports on social media networks of *S. squatina* catches provide some evidence of the contemporary presence of the species in the Irish Sea and nearby waters (ICES 2013; ICES 2014; J. Barker, pers. comm. 2015).

Similar to the trend in the northeastern Atlantic, *S. squatina* populations have declined throughout the Mediterranean Sea, with possible local extirpations in the Black Sea, Adriatic Sea, and northern Tyrrhenian Sea (Jukic-Peladic *et al.* 2001; Ferretti *et al.* 2005; Morey *et al.* 2006; OSPAR Commission 2010; Ferretti *et al.* 2013). In the central Mediterranean, *S. squatina* was commonly recorded in historical faunistic lists (Giusto and Ragonese 2014). The species was reported in the Gulf of Naples in historical records dating back to 1871 through at least 1956 (Tortonese 1956; Psomadakis *et al.* 2009) and in the Adriatic Sea (Tortonese 1956). However, Ferretti *et al.* (2005) noted the disappearance of the entire *Squatina* genus from the northern Tyrrhenian Sea in the early 1970s. In 2005, UNEP reported the species as being relatively common in Libyan waters; however, the data on which this statement was based are unknown. Bradai *et al.* (2006) also reported that the species was ''regularly observed'' in the Gulf of Gabès; however, the only available data from this region comes from surveys conducted off the southern coasts of Sicily and northern coasts of Tunisia and Libya. In contrast to the Bradai *et al.* (2006) characterization of the abundance of the species, trawl surveys conducted from 1995–1999 in the Strait of Sicily recorded *S. squatina* near Cape Bon, Tunisia with a biomass that comprised only 1 percent of the total elasmobranch catch (Scacco *et al.* 2002). Ragonese *et al.* (2013) confirmed the rarity of this species, reporting only one captured individual from their analysis of extensive survey data collected between the southern coasts of Sicily and northern coasts of Africa (Tunisia and Libya) from 1994 to 2009. The fish was caught at a depth of 128 m in 2005, close to the Maltese Islands. More recently, in 2011, an artisanal fishing vessel caught an *S. squatina* shark in a trammel net off the coast of Mazara del Vallo (southwestern Sicily), marking the first documented occurrence of *S. squatina* in over 30 years off the coast of southern Sicily (Giusto and Ragonese 2014).

In the eastern Mediterranean, *S. squatina* is rare but present. In 2008, three *S. squatina* individuals were recorded in Egypt from commercial landings in western Alexandrian waters (Moftah 2011). Within Turkish Seas, Kabasakal and Kabasakal (2014) report that *S. squatina* comprised 1.1 percent of the total number of elasmobranchs (n = 4632) caught between 1995 and 1999, and 0.46 percent of the total shark catches (n = 1068) between 1995 and 2004 in the northern Aegean Sea. In their updated checklist of marine fishes of Turkey, Bilecenoğlu *et al.* (2014) record *S. squatina* as occurring in the Black Sea (although the reference dates back to 1999), Sea of Marmara, Aegean Sea, and Levantine Sea. Kabasakal and Kabasakal (2014) also confirmed the presence of *S. squatina* in the Sea of Marmara but remarked on its rarity in these waters. In the Levantine Sea, Bulguroğlu *et al.* (2014) reported the capture of an *S. squatina* individual in 2013 by a commercial trawl vessel from a depth of 50 m in Antalya Bay (southern Turkey), Hadjichristophorou (2006) characterized the species as

occasionally occurring in Cyprus fishery records, and Saad *et al.* (2006) captured the species along the Syrian coast during surveys conducted from 2001–2004. Additionally, Soldo (2006) notes the presence of the species in the Adriatic Sea but the information used to support this assertion is unclear, as the species has not been reported in survey data from these waters since 1958 (Ferretti *et al.* 2013).

Presently, the only part of its range where *S. squatina* is confirmed as still relatively common is off the Canary Islands (Muñoz-Chapuli 1985; OSPAR Commission 2010). Much of the information on *S. squatina* presence and abundance from this area is derived from diver observational data. In 2013, the Zoological Society of London (ZSL), Universidad de Las Palmas de Gran Canaria (ULPGC) and Zoological Research Museum Alexander König (ZFMK) created the ''Angel Shark Project'' (ASP), which has gathered public sighting data of angelsharks through the creation of a citizen science sighting scheme called Poseidon (*www.programaposeidon.eu*) (Joanna Barker, UK & Europe Coordinator Conservation Programmes, ZSL, personal communication 2014). Since the launch of the Poseidon portal in April 2014, there have been 624 validated records (sightings of angelsharks), covering areas with no previous records such as El Hierro and La Palma (Meyers *et al.* 2014; Meyers, pers. comm. 2015; also see reported sightings on the ASP Web site, available at *http://angelsharkproject.com/*). Currently, 22 dive centers are actively reporting angelsharks (J. Barker, pers. comm. 2014); however, a few dive centers have been collecting observational data even prior to the creation of the Poseidon portal. For example, the ''Davy Jones Diving'' dive center, in Gran Canaria, has collected data on angelshark sightings in the ''El Cabron'' or Arinaga Marine Reserve since 2006. Narváez *et al.* (2008) analyzed these dive data for the period of May 2006 through August 2008 and found that 271 angelsharks were sighted over the course of 1,709 dives. Sightings included both females and males (with a sex ratio of 1:1.6) as well as juveniles (9 percent of the sightings) and adults.

The Davy Jones Diving dive center continues to log sightings of angelsharks and other species on its Web site. Analysis of the log data from January 1, 2011 through December 29, 2014 shows that angelsharks are still frequently observed in the Arinaga Marine Reserve, with sightings recorded on 35 percent of the dive trips off Gran Canaria over the past 3 years (n = 1,253 total trips) (Miller 2015).

Summary of Factors Affecting the Three Angelshark Species

Available information regarding historical, current, and potential threats to these three angelshark species was thoroughly reviewed (Miller 2015). We find that the main threat to these species is overutilization for commercial and recreational purposes. We consider the severity of this threat to be exacerbated by the species' natural biological vulnerability to overexploitation, which has led to declines in abundance and subsequent extirpations and range curtailment. We find current regulatory measures inadequate to protect these species from further overutilization. Hence, we identify these factors as additional threats contributing to the species' risk of extinction. We summarize information regarding these threats and their interactions below, with species-specific information where available, and according to the factors specified in section 4(a)(1) of the ESA. Available information does not indicate that disease, predation or other natural or manmade factors are operative threats on these species; therefore, we do not discuss these factors further in this finding. See Miller (2015) for a full discussion of all ESA Section 4(a)(1) threat categories.

The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

Based on the evidence of *S. squatina* extirpations in many parts of its range (see discussion in Historical and Current Distribution and Population Abundance), there has been a significant curtailment of the species' historical range, most notably in the northeastern Atlantic. In 2008, the International Council for the Exploration of the Sea (ICES) acknowledged that *S. squatina* was extirpated in the North Sea (although stated it may still occur in parts of the English Channel) and from parts of the Celtic Seas (ICES 2014), defining the term ''extirpated'' as ''loss of the species from part of the main geographical range or habitat, and therefore . . . distinguished from a contraction in the range of a species, where it has been lost from the fringes of its distribution or suboptimal habitat.'' The species is also believed to be extirpated from the Baltic Sea and western English Channel in the northeastern Atlantic, from the Adriatic, Ligurian and Tyrrhenian Seas in the Mediterranean, and from the Black Sea (Rogers and Ellis 2000; Jukic-Peladic *et al.* 2001; Dulvy *et al.* 2003; Ferretti *et al.* 2005; OSPAR Commission 2010; EVOMED 2011).

In the northern parts of its range, *S. squatina* is thought to undertake seasonal migrations, sometimes of large distances, moving inshore for the summer and out to deeper water in the winter (Day 1880; OSPAR Commission 2010; ICES 2014). However, for the most part, results from tagging studies conducted in the northeastern Atlantic indicate these sharks remain in waters close to their initial tagging location (Quigley 2006). Similarly, in Mediterranean waters, *S. squatina* do not appear to stray far from a core area, with tagged fish recaptured 10–44 km from their release site (Quignard and Capapé 1971; Capapé *et al.* 1990). This available tagging information suggests that *S. squatina* exhibit potentially high site fidelity, which increases their susceptibility to local extirpations and has likely led to the observed loss of populations throughout large portions of its range. At this time, there is no genetic information available that could provide insight into natural rates of dispersal and genetic exchange among populations. However, based on information that *S. squatina* are ovoviviparous (lacking a dispersive larval phase) and likely exist as potentially isolated populations in a highly fragmented landscape, re-colonization of the extirpated areas mentioned above may not be possible. This curtailment of historical range ultimately translates to a significant loss of suitable habitat for the species and greatly increases the species' risk of extinction.

A curtailment of historical range is much less evident for the other two species, where data are severely limited. The IUCN Red List reviews of *S. aculeata* and *S. oculata* suggest these two species are now rare or even absent from most of the northern Mediterranean coastline (Morey *et al.* 2007a, b). Many historical records simply document the presence of these species in certain locations, with no corresponding information on abundance or distribution. Only a few references provide subjective descriptions of historical abundance, and only from select areas (*i.e.,* Balearic Islands, Gulf of Gabès, Libya, Israel, and Senegal; see Historical and Current Distribution and Population Abundance section). However, based on the absence of the species in relatively recent and repeated surveys in areas where they were once historically documented, it is possible that both species may have experienced a curtailment of their historical range. For *S. aculeata,* the available information suggests it may no

longer be found in the Adriatic Sea (Jukic-Peladic *et al.* 2001; Ferretti *et al.* 2013) or central Aegean Sea (where the species was likely historically rare; Damalas and Vassilopolou 2011), and is also missing from the Ligurian and Tyrrhenian Seas (where it was caught by local fishermen and also part of commercial landings in the 1970s; Ferretti *et al.* 2005; EVOMED 2011), and off the Balearic Islands (where angelsharks were historically common; Morey *et al.* 2007a). For *S. oculata,* the species may no longer be found in the Aegean Sea (Damalas and Vassilopolou 2011), Ligurian and Tyrrhenian Seas (Ferretti *et al.* 2005; EVOMED 2011), and off the Balearic Islands (Morey *et al.* 2007a), where its historical abundance in these areas mirrors that of *S. aculeata.* Similar to the case with *S. squatina,* these local extirpations and population declines have likely resulted in patchy distributions of both *S. aculeata* and *S. oculata* populations with low connectivity and loss of suitable habitat, increasing the species' risks of further extirpations and possibly leading to complete extinction.

We investigated additional habitat-specific threats to the three angelshark species, including the impacts of demersal trawling on habitat modification, deep-water oil exploration projects, and climate change; however, we found no information to indicate these are operative threats that are increasing the species' risks of extinction. Although significant demersal trawling occurred and continues to occur throughout the range of the *Squatina* species (Sacchi 2008; FAO 2013), and has likely altered seafloor morphology (Puig *et al.* 2012), there is no information that this habitat modification has had a direct effect on the abundance of these three species, or is specifically responsible for the curtailment of range of any of the *Squatina* species. The species' broad diets of benthic invertebrates and fishes from soft-sediment habitats means they are likely relatively resistant and resilient to changes in their habitats.

In 2012, there was concern regarding potential oil spill impacts on the *S. squatina* habitat around the Canary Islands because the Spanish government had approved a deep-water oil exploration project off the coasts of Fuerteventura and Lanzarote (Navío 2013). However, based on the 2014 exploratory drilling in the region, Repsol (the Spanish oil company in charge of the project) determined that the area ''lacked the necessary volume and quality [of methane and hexane gases] to consider future extraction'' and abandoned drilling off the Canary Islands in January 2015 (Bjork 2015).

Predicted impacts to angelshark habitats from climate change were also evaluated. The effects of climate change are a growing concern for fisheries management, as the distributions of many marine organisms are shifting in response to their changing environment. Factors having the most potential to affect marine species are changes in water temperature, salinity, ocean acidification, ocean circulation, and sea level rise. However, based on a study published by Jones *et al.* (2013), it appears that angelsharks, at least in United Kingdom (UK) waters, may not be especially vulnerable to these impacts. According to the authors' climate model projections, any negative impacts from a range shift due to climate change would likely be offset by an increase in availability of protected habitat areas for the common angelshark. In addition, the range shift would also shrink the angelshark's overlap with other commercially-targeted species, thus potentially decreasing their occurrence as bycatch during commercial fishery operations. We found no other information regarding the response of *Squatina* species to the impacts of climate change. Therefore, at this time, the best available information does not suggest that habitat modification or destruction by demersal trawling activities, deep-water oil exploration projects, or climate change contributes significantly to the extinction risk of these species.

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Based on catch records and anecdotal reports, the *Squatina* species were historically regularly observed and landed in many areas of their respective ranges. For example, *S. squatina* (which was historically called ''monkfish'' before anglerfish entered the market) was commonly recorded on the southern and eastern English coasts, western and southern coasts of Ireland, within the North Sea, on the Dogger Bank, in the Bristol Channel, in the Firth of Clyde, and in the Mediterranean Sea during the 19th and early 20th centuries (Day 1880; Ferretti *et al.* 2005; Morey *et al.* 2006; D. Quigley, pers. comm. 2015). In UK waters in the late 19th century, Day (1880) noted that the species was taken off the coasts of Kent, Sussex, Hampshire, and Swansea, frequent in Cornwall, and common ''at all times'' along the southern coast of Devon, documenting a personal observation of finding 26 common angelsharks that had been pulled in by seine net from Start Bay and left to die on shore. In Italy, historical fishing gear called ''squaenara'' or ''squadrara'' were purposely built to catch angelsharks (EVOMED 2011), suggesting a level of abundance that would warrant specialized gear and targeting of the species. Similarly, in French waters, angelsharks were so common that Arcachon fishermen would also use a special net designed specifically for catching them. These fishermen, who fished on the continental shelf in Arcachon Bay and the Bay of Biscay, would rope the tails of the species with a string attached to a type of wooden buoy and would bring the live shark back to shore. By the mid-19th century, annual catches of *S. squatina* totaled around 25,000 kg per year (Laporte 1853 cited by Quéro and Cendrero 1996 and Quéro 1998). The angelshark was historically marketed for its flesh (which was consumed or used for a variety of purposes, including: Medicine, bait, polish for wood and ivory, cover for hilts of swords, and sheaths for knives), liver for oil, and carcass for fishmeal (Day 1880; Edwards *et al.* 2001; Saad *et al.* 2006; Shark Trust 2010; ICES 2014; D. Quigley, pers. comm. 2015 citing Rutty (1772)). This exploitation continued for much of the 19th and early 20th centuries, during the time when demersal trawl fisheries saw significant expansion in the northeast Atlantic and Mediterranean. Because angelsharks are sedentary, bottom-dwelling species, they are highly susceptible to being caught in trawl fisheries. Consequently, as demersal trawling activities expanded with the use of steam-powered trawlers in the 1890s, angelshark populations began to experience significant declines.

For *S. squatina,* the comparison of historical and current catch and survey data provide evidence of this clear decline from overutilization. In Arcachon Bay and the Bay of Biscay, for example, where *S. squatina* was once commonly caught in the mid-19th century, annual landings have decreased by over 95 percent compared to historical landings data, with only 291 kg of the species recorded caught in 1996 (Quéro 1998). Similarly, in the western English Channel, where Day (1880) noted the species was frequently captured by trawls and taken in trammel and seine nets in the late 19th century, *S. squatina* has since seemingly disappeared. Based on data from multiple research trawl surveys, conducted from 1989–1997 and 2008–2009 and in waters where historical surveys previously recorded the species, *S. squatina* was notably absent (Rogers

and Ellis 2000; McHugh *et al.* 2011). Numerous other surveys provide similar evidence of declines and disappearances (see Historical and Current Distribution and Population Abundance section), indicating that *S. squatina* has essentially declined to the point where it is now extirpated in a number of areas of its historical range where it was previously common, and is rarely observed or caught throughout the rest of its range (Barrull *et al.* 1999; Ferretti *et al.* 2005; Morey *et al.* 2006; Psomadakis *et al.* 2009; McHugh *et al.* 2011; Dell'Apa *et al.* 2012).

It is likely that *S. aculeata* and *S. oculata* were also negatively impacted by these demersal trawlers, given their similar behavior and overlapping ranges; however, information regarding their relative historical abundance and/or frequency throughout their respective ranges, which could provide insight into population trends and impacts of this utilization, is less certain. Instead, much of the information, at least from Mediterranean waters, is primarily in the form of presence/absence on shark inventory lists for different countries or general characterizations of the species (with the most recent characterizations dated almost 10 years ago), with no corresponding data or information on abundance, the rationale behind the characterization, or recent updates on the status or presence of these species from those areas. However, with this information, we at least have evidence of the presence of these species in certain areas in the past and can rely on survey data for indications as to the present status of these species. Examining the extent of coverage of recent surveys and evaluating the potential impact of historical fishing effort can allow for reasonable conclusions to be drawn regarding utilization of these species. For example, Ferretti *et al.* (2005) concluded that the *Squatina* species have been extirpated from off the Tuscan coast since the early 1970s. This conclusion was based on the fact that the *Squatina* species (specifically *S. aculeata* and *S. squatina*) were formerly present in commercial landings data (although of unknown magnitude) and all three species were absent in recent trawl surveys. The trawl surveys were extensive, covering the continental shelf and upper slope of the Tuscan coast, from 0 to 800 meters depth, with 88 tows conducted from 1972–1974 and 1,614 tows between 1985 and 2004 (Ferretti *et al.* 2005). In terms of historical fishing effort, the Tuscan fishery had been active for many years prior to the 20th century; however, it was not until the beginning of the 20th century when fishermen began focusing on exploiting demersal resources (Ferretti *et al.* 2005). As technology advanced in the 1930s, the fishery improved, and by 1960, Ferretti *et al.* (2005) estimated that the fleet was exploiting approximately 90 percent of the Tuscan Archipelago (~ 13,000 km^2), with the majority of trawl effort concentrated in depths less than 400 m. Although the historical abundance of the *Squatina* species in this region is unknown (which could provide insight into the likelihood of the species in landings and survey data), given the history of the fishery, area of operation of the Tuscan fleets, and coverage of the recent trawl surveys, it is likely that historical overutilization of the angelshark species has occurred as a result of the expansion of the trawl fisheries. This overutilization has ultimately led to the observed extirpation of the *Squatina* species from the region. The decline and subsequent extirpation is further corroborated by interviews with fishermen who used to trawl in the Ligurian and Tyrrhenian Seas. According to their personal observations, the *Squatina spp.* were already reduced in numbers by the 1960s and 1970s (during the surge in fishing effort and capacity), with the last catches of the species from these seas remembered as occurring in the early 1980s (EVOMED 2011). Fishermen that trawled off the Sardinian coast also noted the progressive decline in abundance of the *Squatina spp.* during these years of fishery expansion, with the disappearance of the species from Sardinian waters occurring in the mid-1980s (EVOMED 2011).

Similar conclusions can be made regarding the present status of the *Squatina* species off the Balearic Islands by comparing historical characterizations of these species and fishing effort to recent fishery-independent survey data. Historically, Morey *et al.* (2007a) suggested that *Squatina* species (presumably *S. aculeata* or *S. oculata* based on fishing depths) were commonly caught in the Balearic Islands, pointing to evidence of a special type of fishing net that was used for catching angelsharks in this area. These species were frequently caught in the coastal artisanal fisheries and also by the trawl and bottom longline fisheries until the 1970s, after which captures became more sporadic (Morey *et al.* 2007a). Morey *et al.* (2007a) also reference records from a lobster gillnet fishery operating in the Balearic Islands that showed it was common to catch angelsharks on a daily basis until the mid-1980s. The timing of the observed depletion in the *Squatina* populations coincides with the fast growth in bottom trawling fishing effort in the Balearic Islands, where growth (estimated in terms of vessel engine power (HP)) exponentially increased from around 5,000 HP in the mid-1960s to over 20,000 HP by the early 1980s (Coll *et al.* 2014). The depths at which these trawlers fished also got progressively deeper over this time period due to increases in ship technology and gear. From 1940–1959, around 85 percent were trawling in shallow grounds of 40–150 m depths, and 15 percent in 40–800 m depths (EVOMED 2011). Between 1960–1979, more fishermen were exploiting deeper waters, with 44 percent strictly fishing in the shallow grounds, 30 percent fishing in depths of 40–800 m, and 17 percent in 200–800 m depths (EVOMED 2011). Although *S. aculeata* and *S. oculata* could have potentially used deeper waters as a refuge from fishing mortality during the 1940s and 1950s (as their depth distribution extends from 20–30 m to over 500 m), by the 1960s and 1970s, these deeper waters were no longer safe from exploitation. *Squatina squatina* likely experienced the highest level of fishing mortality as this species is found in much shallower depths, from 5—150 m, and therefore was accessible to the trawl fishermen during this entire time period. Since the mid-1990s, these species have not been recorded in fishery records (Morey *et al.* 2007a; EVOMED 2011). In addition, the *Squatina* species are notably absent in recent data from multiple fishery-independent studies that aimed to characterize the demersal elasmobranch assemblage off the Balearic Islands. These studies analyzed bottom trawl survey data collected from the continental shelf and slope of the Balearic Islands in depths of 41 m down to 1713 m, and covering the years of 1996, 1998, and 2001 (Massutí and Moranta 2003; Massutí and Reñones 2005). No *Squatina* species were recorded from the trawl hauls despite the overlap of the surveyed area with the observed depth range of the species. Therefore, given the historical fishing effort in this area, the timing of the observed declines in the angelshark populations, and the recent absence of the *Squatina* species from both fishery records and fishery-independent survey data, it seems reasonable to conclude that historical overutilization of these angelshark species has led to the observed extirpation of these species from this area.

Larger surveys, covering vast regions of the Mediterranean, have also provided valuable insight regarding the impacts of historical utilization on the *Squatina* species. For example, from 1985 to 1998, scientific trawl surveys (as part of the Italian Gruppo Nazionale Risorse Demersali (GRUND) project) were conducted in all Italian seas using typical Italian commercial trawl gear. However, *S. aculeata* and *S. oculata* were notably absent from the survey data (9,281 hauls over 22 surveys; Morey *et al.* (2007a,b) citing Relini *et al.* 2001). More expansive surveys, covering waters from Alboran to the Aegean, were conducted as part of the Mediterranean International Trawl Survey (MEDITS) program. This program aimed to provide information on the status of demersal resources within the Mediterranean region (Bertrand *et al.* 1997). Numerous surveys were conducted along the Mediterranean coastline, in 10 m to 800 m depths, but also failed to find *S. oculata* and had very few observances of the other *Squatina* species (Baino *et al.* 2001). Out of the 6,336 tows conducted from 1995–1999, *S. aculeata* appeared in only one tow (from the Aegean Sea) and *S. squatina* appeared in two (from western Mediterranean: Defined as coasts of Morocco, Spain and France) (Baino *et al.* 2001). Similarly, the Mediterranean Large Elasmobranchs Monitoring (MEDLAM) program, which was designed to monitor the captures and sightings of large cartilaginous fishes occurring in the Mediterranean Sea, also has very few records of the *Squatina* species in its database. Since its inception in 1985, the program has collected around 1,866 records of more than 2,000 specimens from 20 participating countries. Out of the 2,048 elasmobranchs documented in the database through 2012, there are records identifying only 6 individuals of *S. oculata,* 4 of *S. squatina,* and 1 of *S. aculeata.* Given that fishing effort by the Mediterranean trawl fleet is estimated to have peaked in the mid-1980s (based on trends data from areas in the Catalan, Ligurian, Tyrrhenian, western Adriatic, Ionian, and Aegean Seas; EVOMED 2011), the rarity and absence of the *Squatina* species in survey data following this period suggests that the historical level of fishing effort likely resulted in substantial declines and significant overutilization of the species.

Many of these surveyed areas have also seen a shift in species composition and richness since the expansion of the trawl fisheries. Historically abundant larger elasmobranch species, including angelsharks, have seemingly been replaced by smaller, more opportunistic species, a strong indicator of overutilization of these larger elasmobranchs by commercial fisheries (Rogers and Ellis 2000; Damalas and Vassilopoulou 2011; McHugh *et al.* 2011). For instance, in the central Aegean Sea, a major fishing ground for the Greek bottom trawl fishery fleet, Damalas and Vassilopoulou (2011) noted a significant decrease in chondrichthyan species richness along with a decline in their abundance from 1995 to 2006. Specifically, the authors analyzed data collected from 335 commercial bottom trawl hauls conducted in depths between 50 m and 339 m from 1995 to 2006 (2001–2002 was excluded). A total of 217 species (141 bony fishes, 24 mollusks, 22 crustaceans, and 30 chondrichthyan species, including *S. aculeata* (n = 3) and *S. oculata* (n = 1)) were recorded from these hauls. However, in the last 4 years of the study (2003–2006), *S. aculeata* and *S. oculata* were absent from trawl catches, along with 9 other chondrichthyan species (over a third of the total). The authors estimated that species richness declined by an average of 0.66 species per year during the study period (with a more rapid decline exhibited from 1995–2000 compared to 2003–2006). They attributed the decline in part to the intense fishing pressure by the Greek bottom trawl fishery and the vulnerability of certain species, such as angelsharks, to exploitation (Damalas and Vassilopoulou 2011).

In the Adriatic Sea, a number of fishery-independent trawl surveys covering the entire basin have been conducted since 1948, allowing for an examination of the impact of historical exploitation on the Adriatic Sea demersal fish assemblage (Ungaro *et al.* 1998; Jukic-Peladic *et al.* 2001; Feretti *et al.* 2013). Comparing trawl catch from surveys conducted in 1948 and 1998, Jukic-Peladic *et al.* (2001) found a decrease in overall elasmobranch diversity and occurrence. Larger shark and ray species that were present in 1948, including *S. squatina,* were rare or, in the case of *S. squatina,* completely absent in 1998 (Jukic-Peladic *et al.* 2001). The authors attribute the extirpation of many species, including *S. squatina,* and the displacement of the larger elasmobranchs by smaller sized species to the overutilization of the Adriatic Sea demersal resources (Jukic-Peladic *et al.* 2001). A comparison of more recent bottom trawl survey data to the 1948–1949 survey data indicate that the abundance of sharks in the Adriatic Sea has declined by 95.6 percent over the past 57 years (Ferretti *et al.* 2013). *Squatina squatina* was still notably absent, with the last survey record of the species from these waters dated to 1958 (Ferretti *et al.* 2013).

In addition to these fishery-independent survey data, analyses of commercial landings data also indicate that historical overutilization throughout the northeast Atlantic and Mediterranean has led to a general decline in the abundance of demersal shark and ray species. For example, in an analysis of Italian landings data, Dell'Apa *et al.* (2001) noted that elasmobranch landings were fairly steady until the 1970s, at which point they began to increase, reaching peaks in 1985 and 1994 and then sharply declining, which the authors attribute to overharvesting. Between 1983 and 1994, mean annual elasmobranch landings were 10,583 ± 2,599 t compared to 2,014 ± 1681 t between 1996 and 2004, a time period that also showed a consistent annual decrease in catch per unit effort. Similarly, in the English Channel, landings of elasmobranchs have declined steadily since the 1950s, with an overall decrease in high trophic level species (such as gadoid fishes and elasmobranchs) and an increase in low trophic level species (such as invertebrates), indicative of unsustainable fisheries that are ''fishing down marine food webs'' (Molfese *et al.* 2014). For areas where landings of *Squatina* species have been recorded (down to species level), the data show a similar trend. For example, in the Celtic Sea, French landings of *S. squatina* appear to have declined after peaking in the 1970s (when annual landings >25 t), falling to less than 1 t per year by the late 1990s (ICES 2013). Similarly, aggregated landings data of the genus *Squatina* from Portuguese fisheries statistics also show a decreasing trend over the last 20 years (personal communication from R. Coelho to Morey *et al.* (2006)); however, no information is known regarding the corresponding effort or other factors such as changes in retention/discarding practices (R. Coehlo, personal communication, 2014).

Off the west coast of Ireland, recreational fishermen observed a decline in rod-caught *S. squatina* beginning in the late 1990s. In fact, since 2006, only two individuals have been caught in these waters. The decline in this *S. squatina* population, to the point where the species is now extremely rare, has been attributed to both the historical recreational angling of the species as well as the operations of commercial trammel net fishermen in this area (D. Quigley, pers. comm. 2015). In the1960s, *S. squatina* were regularly

caught in Tralee Bay by recreational anglers competing in fishing tournaments. Pictures from some of these competitions, found online in the Kennelly Archive (*http://www.kennellyarchive.com/*), depict the extensive catch of *S. squatina* during these tournaments and highlight the especially large individuals that were caught (with all fish brought ashore). For example, pictures from a June 1964 sea angling competition show a ''record catch,'' when 37 *S. squatina* were caught in less than 3 hours off the coast of Fenit Pier (Ireland). Another record catch was documented in June 1965 during a boat-angling competition in Tralee Bay, where four trophy *S. squatina* individuals, weighing 60, 59, 50, and 30 lbs (27.2, 26.8, 22.7, 13.6 kgs), respectively, were caught in addition to numerous smaller individuals. Given the life history characteristics of the species, this level of essentially unregulated utilization and removal of larger and, hence, probably mature individuals, likely contributed to the observed decline in the *S. squatina* population from this area.

Although catch-and-release became increasingly more common practice in Ireland over the years (Fahy and Carroll 2009), decreasing the threat of overutilization by recreational anglers, a new threat emerged in the 1970s in the form of trammel net usage by commercial fishermen. Trammel nets, which are a type of gill net consisting of three layers of netting tied together on a common floatline and leadline, were introduced off the coast of Kerry (Ireland) in the early 1970s (Quigley and MacGabhann 2014). They were primarily used to catch crawfish (*Palinurus elephas*), but given the non-specificity of the fishing gear, these nets also by-caught spider crab (*Maja brachydactyla*), another commercially important species in the area, as well as many other elasmobranchs and non-target species (Quigley and MacGabhann 2014). The prevalent use of these nets led to significant decreases in crawfish landings (from 300 t in 1971 to 34 t in 2006) as well as startling declines in the bycatch species, with Fahy and Carroll (2009) characterizing the angelsharks as having been fished ''almost to elimination'' by the use of these trammel nets.

Farther south, in waters off West Africa, *S. oculata* and *S. aculeata* were commonly observed in the 1970s and 1980s. However, it was also during this time period that shark fishing in the region really started to expand and intensify (Diop and Dossa 2011). In a review of shark fishing in the Sub Regional Fisheries Commission (SRFC) member countries: Cape-Verde, Gambia, Guinea, Guinea-Bissau, Mauritania, Senegal, and Sierra Leone, Diop and Dossa (2011) state that the shark fisheries and trade spread throughout this region in the 1980s and 1990s with the development of a market and increasing worldwide demand for shark fins. The number of boats and people entering the fishery, as well as improvements to fishing gear, steadily increased from 1994 to 2005, especially in the artisanal fishing sector where catches rose substantially. For example, before 1989, artisanal catch was less than 4,000 mt. However, from 1990 to 2005, fishing effort and catch increased dramatically, with catch estimates of over 26,000 mt by 2005 (Diop and Dossa 2011). Including bycatch estimates from the industrial fishing fleet increases this number to over 30,000 mt in 2005 (note that discards of shark carcasses at sea were not included in bycatch estimates, suggesting bycatch may be underestimated) (Diop and Dossa 2011). By 2008, shark landings had dropped by more than 50 percent to 12,000 mt (Diop and Dossa 2011). Although landings were not identified to the species level, it is likely that this intense and relatively unregulated fishing pressure on sharks significantly contributed to the observed decline of the *Squatina* species in this region, to the point where these sharks are now only rarely observed.

Overutilization of these angelshark species is still a threat, as the shark, trawl, and other demersal fisheries that historically contributed to the *Squatina* species' declines remain active throughout their respective ranges. In fact, in the Mediterranean Sea, trawling still provides one of the highest economic returns in the fishery sector operating in these waters (Sacchi 2008; STECF 2013). In 2008, Sacchi (2008) reported a Mediterranean fleet of approximately 84,000 fishing entities, with around 10 percent using trawl gear and contributing more than half of the catch. By 2012, the fleet size had decreased to around 76,023 vessels, but had a total fishing capacity of 1,578,015 gross tonnage and 5,807,827 kilowatt power (European Commission 2014). In April 2015, the General Fisheries Commission for the Mediterranean (GFCM) identified 9,171 large fishing vessels (*i.e.,* larger than 15 meters) as authorized to fish in the GFCM convention area (which includes Mediterranean waters and the Black Sea). Of these vessels, 46 percent identified as trawlers, although 28 percent did not report their class of fishing gear (GFCM 2015). These Mediterranean trawlers operate in depths of up to 800 m but normally conduct hauls in less than 300 m (Sacchi 2008), which overlaps with the depth range of the *Squatina* species. These trawlers also tend to participate in multi-species fisheries, meaning they are not just targeting one species but rather catching hundreds of different species during operations, posing a significant risk to non-targeted demersal species that are vulnerable to overexploitation, such as the *Squatina* species.

In addition to the demersal trawling, many of the artisanal fisheries, and even some commercial fisheries, throughout the range of these *Squatina* species employ the use of trammel and gillnets during fishing operations, which are also rather unselective types of gear. In a review of artisanal fisheries in the western-central Mediterranean (covering Morocco, Algeria, Tunisia, Libya, Italy, France, and Spain), Coppola (2001) found that the most important gear used in artisanal fisheries were gillnets and entangling nets (comprising 53 percent of the total gear utilized). In Turkey, the majority of fishermen work in the small-scale fishery (comprising around 83 percent of the total fleet; Turkish Statistical Institute 2014). The small-scale fishery operations consist of daily trips, generally in the Aegean and Black Seas, to target fish species using gillnets, trammel nets, entangling nets, and demersal and pelagic longlines (Tokac *et al.* 2012). Additionally, off the west coast of Ireland, there is evidence that commercial fishermen continue to use trammel nets in the inshore fisheries (Fahy and Carroll 2009). Despite the prohibition on these trammel nets in certain areas off the Kerry and Galway (Ireland) coasts (due to their associated level of elasmobranch bycatch, which historically contributed to the decline and present rarity of the *S. squatina* population in this area), these trammel nets are still widely used and deployed year-round (Fahy and Carroll 2009). And, as mentioned previously, artisanal fishing effort is also significant off the west coast of Africa, with fishermen employing a variety of nets to capture species, with some nets that are even specially designed for catching shark species (Diop and Dossa 2011).

Because of the low selectivity of the net and trawl gear and the intensity of fishing effort, a significant portion of the catch in these gears tends to be discarded at sea (Machias *et al.* 2001; Sacchi 2008; Damalas and Vassilopoulou 2010). Damalas and Vassilopoulou (2011) note that chondrichthyans, especially, tend to be

discarded due to their low commercial value. Based on their observations of 335 commercial bottom trawl hauls in the Aegean Sea between 1995 and 2006, they calculated that over 90 percent of chondrichthyans (by number) were discarded. However, data are limited on the discard rates of *Squatina* species. In the Damalas and Vassilopoulou (2011) study, only 4 *Squatina* sharks were observed caught (3 *S. aculeata* and 1 *S. oculata*), with two individuals discarded. Machias *et al.* (2001) observed that both *S. aculeata* and *S. oculata* were always discarded by the commercial trawlers operating in the Aegean and western Ionian Sea. Observer data from the French discard observer program from 2003–2013 recorded two discarded *S. squatina* individuals (both in 2012) (ICES 2014). In general, the available information suggests that *Squatina* species are generally bycaught (Edwards *et al.* 2001; Morey *et al.* 2007a, b; OSPAR Commission 2010; ICES 2014) and would more likely than not be discarded with the other chondrichthyan species. This is especially true for *S. squatina* which is currently prohibited from being retained in European Union (EU) waters (see *Inadequacy of Existing Regulatory Mechanisms* section). In fact, ICES (2014) reports that *S. squatina* is now only landed as a ''curio'' for fish stalls.

As such, the impact of the continued operation of these demersal trawl fleets as well as the net fisheries on the threat of overutilization really depends on the survival rate of these *Squatina* species upon capture and after discard. Unfortunately, at this time, the at-vessel mortality and discard survival rates of the *Squatina* species are unknown; however, based on mortality rates reported for two similar species, the African angelshark (*S. africana*) and the Australian angelshark (*S. australis*), discard survival may be low. For the African angelshark, Fennessy (1994) estimated an at-vessel mortality rate of 60 percent when caught by prawn trawlers and Shelmerdine and Cliff (2006) estimated a 67 percent mortality rate when the species was caught in protective shark gillnets. For the Australian angelshark, mortality rates of 25 and 34 percent have been estimated for capture in gillnets (Reid and Krogh 1992; Braccini *et al.* 2012), with a post-capture mortality rate (for those sharks discarded alive) of 40 percent (Braccini *et al.* 2012). Because these two angelsharks have similar life history traits to the *Squatina* species under review (see Miller (2015) for comparison of these species), we consider at-vessel mortality and discard survival rates for *S. aculeata, S. oculata,* and *S. squatina* to be comparable to those estimated for *S. africana* and *S. australis.*

Although current fishing mortality rates are unknown, even low levels of mortality would likely contribute to further population declines given the extremely depleted status of these species, to the point where all three species are rarely observed and extirpated in many areas. Yet, the discussion above provides evidence of high levels of fishing effort by commercial and artisanal fishermen using trawl and net gear throughout the range of these *Squatina* species. Therefore, given the inferred discard mortality estimates (with a 60 percent at-vessel mortality rate in trawls and 25–67 percent mortality rate in nets) and high likelihood of incidental capture, we find that the continued operation of the demersal trawl fleets and net fisheries is posing a threat of overutilization that is likely contributing to further population declines and significantly increasing the extinction risks of these species at this time.

In addition to the threat of overutilization from being bycaught, there is also evidence that these species are still being landed in certain parts of their ranges, contributing to the direct fishing mortality of the species. In Egypt, for example, which has the 2nd largest fishing fleet (of vessels >15 m) operating in the GFCM convention area, Moftah (2011) documented three *S. squatina* individuals for sale in a major fish market in western Alexandria. However, according to Bradai *et al.* (2012), the top elasmobranch fishing countries presently operating in the Mediterranean are Italy, Tunisia, and Turkey. From 1980 to 2008, these three countries were responsible for 76 percent of the total catch of elasmobranchs in the Mediterranean and Black Seas. Currently, Italy has the largest fishing fleet (of vessels >15 m) operating in the GFCM convention area, with 84 percent of its vessels (n = 1,421) identified as trawlers. Turkey has the third largest fishing fleet, with 54 percent identified as trawlers, and Tunisia has the fifth largest, with around 50 percent of its vessels considered to be trawlers. Although Italian vessels are currently prohibited from landing *S. squatina* in EU waters (see *Inadequacy of Existing Regulatory Mechanisms* section), Tunisia and Turkey do not have the same prohibitions for their respective waters. Additionally, there are no prohibitions from landing the other two species of angelsharks throughout their ranges.

In waters off Tunisia, the present level of fishing effort by trawlers as well as artisanal fishermen is a concern for any remaining populations of the three angelshark species. Tunisia is centrally located in the Mediterranean Sea. The Gulf of Gabès and Gulf of Tunis, which historically supported populations of the *Squatina* species (Capapé *et al.* 1990; Quignard and Ben Othman 1978), are two of the most important fishing grounds off the Tunisian coast (Echwikhi *et al.* 2013; Cherif *et al.* 2008). In 2011, the Tunisian fishing fleet consisted of 11,393 units, which included 10,500 coastal boats (artisanal fishermen), 430 trawlers, 400 sardine seiners, 38 tuna seiners, and 25 coral-fisher boats (Haddad 2011). Elasmobranchs, in particular, constitute an important catch component in Tunisian fisheries, especially artisanal fisheries (Echwikihi *et al.* 2013), and since 1970, annual catches of elasmobranchs have steadily increased with recent catches (2005–2012) of elasmobranchs averaging around 2,000 mt per year. Similarly, *S. squatina* catches in Tunisian waters also appear to show an increase in recent years, with a peak of 86 mt in 2010 and 60 mt in 2012. In 1990, Capapé *et al.* (1990) observed that *S. squatina* was fished throughout the year in Tunisian waters and sold in the Tunis fish market. Based on the recent catch data, it appears that *S. squatina* is still being exploited by Tunisian fisheries. It is unknown if this exploitation is sustainable; however, based on the species' life history traits as well as the observed decline of the species and potential extirpations in areas where reported catches and landings have been of lesser magnitude (*e.g.,* Bay of Biscay; Celtic Seas), this present level of exploitation is likely to cause declines in the *S. squatina* population from this area through the foreseeable future.

The absence of data for the other two *Squatina* species is also telling, especially since in 1978, *S. aculeata* was noted as abundant, and as recently as 2006, both species were ''regularly observed'' in the Gulf of Gabès (Quignard and Ben Othman 1978; Bradai *et al.* 2006). Additionally, in 1990, the Gulf of Tunis was posited as a nursery ground for *S. oculata* based on young-of-the-year individuals captured during trawling operations (Capapé *et al.* 1990). However, in a recent analysis of extensive trawl survey data collected off the southern coasts of Sicily from 1994 to 2009, Ragonese *et al.* (2013) found only one report of a captured *S. aculeata* individual. This shark was caught during a shelf haul in 86 m

depth close to the Gulf of Gabès in 2000. The fact that observations of these species are now rare, with the last record of the species in survey data from 15 years ago (Ragonese *et al.* 2013), and the most recent anecdotal characterizations of the species from almost a decade ago (Bradai *et al.* 2006), suggests that the remaining populations of *S. aculeata* and *S. oculata* are likely small and potentially isolated, placing them at risk from stochastic and demographic fluctuations. These risks will only increase in the future as more individuals are removed from the populations as a result of the continued fishing pressure by trawlers and artisanal fishermen within this region.

In Turkey, at least one angelshark species, *S. aculeata,* was a recent target of recreational fishermen. Based on field survey data collected between January and September 2007, boat-based recreational fishermen operating in Çanakkale Strait caught an estimated 23,820 kg of *S. aculeata* (Ünal *et al.* 2010). The number of surveyed fishermen represented only 2.7 percent of the estimated recreational fishery population. In addition, the results from the surveys indicated that the marine recreational fishery in Turkey is essentially unmonitored and hence potentially unsustainable (Ünal *et al.* 2010). In fact, almost half of the recreational activity can be considered commercial activity as many of the recreational fishermen are selling their catches (even though marine recreationally caught fish are not legally allowed to be traded; Ünal *et al.* 2010). Given the high level of marine recreational harvest (around 30 percent of the commercial fishing harvest; Ünal *et al.* 2010), evidence of *S. aculeata* as a potentially targeted and traded species, and lack of monitoring or controls regarding fishing practices, this marine recreational fishery is considered a threat contributing to the direct overutilization of the species in this area. In 2015, one of the co-authors of the above study noted that the species is presently rare in Turkish waters, but mentioned the recent capture of an *S. aculeata* shark from Gökova Bay by a fisherman using a trammel net (V. Ünal, personal communication 2015). This individual (a female *S. aculeata*) is the largest specimen ever recorded from Turkish waters (V. Ünal, pers. comm. 2015).

In addition to the marine recreational fisheries, the commercial fisheries of Turkey are also harvesting angelsharks; however, the information on catch is not species-specific. According to Turkey's ''Fisheries Statistics'' publication, catches of angelsharks have declined over the past 8 years after a peak of 51 tonnes was reported in 2006. In 2013, 17 tonnes of angelsharks were harvested, with 68 percent of the catch coming from the Aegean region, 26 percent from the Mediterranean region, and 6 percent from the Marmara region. Although there is no accompanying information on fishing effort, the bottom trawl fishery is highly active in Turkish waters. In 2015, the GFCM identified 554 Turkish trawl vessels (over 15 meters) as authorized to fish in the GFCM convention area, and according to Tokaç *et al.* (2012), the bottom trawl fishery is responsible for around 90 percent of the total demersal fish catch from the Aegean Sea. As such, the decline in angelshark catch may likely be a result of decreasing abundance of these sharks in the region as a result of the exploitation of the species by the demersal trawl fishery.

In the northeastern Atlantic, Spanish and French fleets have reported landings of *S. squatina* to ICES since the species' retention prohibition by the EU in 2009 (see *Inadequacy of Existing Regulatory Mechanisms* section). In 2010, Spanish-reported landings amounted to 9 tonnes (live weight), increased to 10 tonnes in 2011, and significantly increased to 63 tonnes in 2012. All of these landings occurred off the coasts of Portugal and Spain (ICES 2014). The ICES (2014) notes that there are also nominal records of *S. squatina* in French national landings for 2012 and 2013 but does not report the figures due to the unreliability of the data. There was no corresponding information on fishing effort and it is also unclear why this EU-prohibited species is still being landed by EU vessels.

Similarly, in the Canary Islands, where *S. squatina* retains its EU prohibited designation, there is evidence that individuals continue to be captured by local and sport fishermen. Although *S. squatina* is not a targeted species in the Canary Islands, nor is there large demand for the species, fishermen in the area do like to eat angelsharks and may illegally land the species (E. Meyers, pers. comm. 2014). This illegal fishing of the species by artisanal fishermen for personal consumption is a concern for the *S. squatina* population in these waters (E. Meyers, pers. comm. 2014). Artisanal Canarian fishermen tend to concentrate their fishing efforts on the narrow continental shelf around the islands (Popescu and Ortega-Gras 2013), which increases the likelihood of capture of *S. squatina* sharks. Although the artisanal fishery has experienced a significant reduction in the number of fishing vessels since 2004, there has also been an associated increase in engine power per small vessel (Popescu and Ortega-Gras 2013). In fact, between 1990 and 2003, these small vessels constituted only 12–18 percent of the total power of the Canarian fleet, but by 2013, this contribution had risen to 30.6 percent (Popescu and Ortega-Gras 2013). Additionally, despite the decrease in number of vessels, the artisanal sector remains the most important segment of the Canarian fishing fleet (both on a social and economic level), with small boats (less than 12 m) representing 86.7 percent of the total number of vessels in the Canarian fishing fleet (Popescu and Ortega-Gras 2013).

Recreational fishing in the Canary Islands is also identified as a potential threat to the species, as many Canarian sport fishing Web sites display photos of hooked angelsharks despite their prohibited status. There is evidence that angelsharks caught by sportfishermen are returned to the water after a photo has been taken; however, the post-release survival rates are unknown (J. Barker, pers. comm. 2015). This has become a concern in recent years due to the increasing number of sport fishermen in the area. According to Barker *et al.* (2014), from 2005 to 2010 there has been a nearly 3-fold increase in the number of recreational angler licenses (from 40,000 to 116,000), with over 830 registered charter fishing boats in operation. As the number of recreational anglers increases, so does the risk of hooking (and potentially killing) one of these prohibited sharks. Although *S. squatina* are regularly observed around the Canary Islands, very little is known about this population or the associated risks of this level of utilization (by artisanal and sport fishermen) on the local population.

In waters off West Africa, artisanal fishing pressure on sharks remains high and relatively unregulated. In 2010, the number of artisanal fishing vessels that landed elasmobranchs in the SRFC zone was estimated to be around 2,500 vessels, with 1,300 of those specializing in catching sharks (Diop and Dossa 2011). Morey *et al.* (2007a, b) note that although there are no directed fisheries for *Squatina* species, it is taken as bycatch in the international industrial demersal trawl fisheries and artisanal fisheries. In a personal communication to Morey *et al.* (2007b), M. Ducrocq states that *S. oculata* were common and frequently caught by artisanal Senegalese fishermen in line and gillnet gear around 30 years ago, and Capapé *et al.* (2005) noted that *S. aculeata* was relatively abundant off the coast of

Senegal and landed throughout the year. However, since 2005, fishermen have reported fewer observations of all squatinid species (C. Capapé, pers. comm. 2015), with no observed landings in recent years in the artisanal fishery (Mathieu Ducrocq, Programme Arc d'Emeraude, Agence Nationale des Parcs Nationaux, personal communication 2014). Although not as common anymore, this information suggests that *S. oculata* and *S. aculeata* were and potentially still are susceptible to being caught in artisanal fishing gear. Taking into account this susceptibility, as well as the fact that fishing for sharks occurs year-round in this region, and fishery management plans are still in the early implementation phase for this region (Diop and Dossa 2011), the continued operations of the artisanal fisheries may prevent any potential re-establishment of these *Squatina* species to this area (if already extirpated) or lead to further declines in existing local populations in the foreseeable future.

Illegal fishing in waters off West Africa is also a threat likely contributing to the observed declines of these species and contributing to their risk of extinction. Illegal fishing activities off West Africa are thought to account for around 37 percent of the region's catch, the highest regional estimate of illegal fishing worldwide (Agnew *et al.* 2009, EJF 2012). From January 2010 to July 2012, the UK-based non-governmental organization Environmental Justice Foundation (EJF) conducted a surveillance project in southern Sierra Leone to determine the extent of illegal fishing in waters off West Africa (EJF, 2012). The EJF staff received 252 reports of illegal fishing by industrial vessels in inshore areas, 90 percent of which were bottom trawlers (EJF 2012). The EJF (2012) surveillance also found these pirate industrial fishing vessels operating inside exclusion zones, using prohibited fishing gear, refusing to stop for patrols, attacking local fishers and destroying their gear, and fleeing to neighboring countries to avoid sanctions. Due to a lack of resources, many West African countries are unable to provide effective or, for that matter, any enforcement, with some countries even lacking basic monitoring systems. In waters off Senegal, which may have historically supported larger populations of *S. aculeata* and *S. oculata* (see Historical and Current Distribution and Population Abundance section), fishery resources have been severely depleted due to both foreign and illegal fishing activities. In 2006, after Senegal cancelled its licensing agreement with the subsidized EU fleet, dozens of large (10,000-tonne factory ships) foreign trawling vessels were granted new licenses by the government and were reportedly catching hundreds of tonnes of fish a day (and up to 300,000 tonnes a year; Vidal 2012b) in Senegalese waters (Vidal 2012a). Although these trawlers are prohibited from trawling within 12-miles of the coast, due to the lack of monitoring and policing capabilities, many move closer inshore at night to fish (Vidal 2012b). Quoting the manager of the largest fishing port in Senegal, Vidal (2012b) reports that fish catches have decreased 75 percent compared to 10 years ago. Based on the level of fishing activity, reported landings and trends, fishing gear, and area of operation, it is likely that these foreign and illegal trawling activities have significantly contributed to the observed decline of the *Squatina* species within these areas. Although many of the foreign vessel licenses were cancelled in 2012 (see *Inadequacy of Existing Regulatory Mechanisms* section), due to the lack of enforcement resources, illegal trawling is still considered to be a threat contributing to the overutilization of the demersal resources, including the *Squatina* species.

Overall, the available information on the past and present status of these species, including historical and present observations of the species from anecdotal, commercial, and fishery-independent survey data, in combination with trends in fishing effort and catch, suggests that the threat of overutilization alone is likely contributing significantly to the risk of extinction for all three *Squatina* species.

Inadequacy of Existing Regulatory Mechanisms

In the EU, there are some regulatory mechanisms in place to protect these three *Squatina* species. All three *Squatina* species are listed on Annex II of the Barcelona Convention, ''which requires Mediterranean countries to undertake maximum, cooperative efforts for their protection and recovery, including controlling or prohibiting their capture and sale, prohibiting damage to their habitat, and adopting measures for their conservation and recovery.'' In 2012, Spain published Order AAA/75/2012 which announced the inclusion of the Mediterranean populations of these three angelshark species (*S. squatina, S. oculata,* and *S. acuelata*) on Spain's List of Wild Species under Special Protection. Species on the list are protected from capture, injury, trade, import and export, and require periodic evaluations of their conservation status.

Elsewhere in the EU, however, specific regulations prohibiting the capture or trade of these angelshark species, or other efforts to protect and recover these species, are missing or only apply to *S. squatina* and not the other two species. For example, in 2008, *S. squatina* was listed under Schedule 5, Section 9(1) of the UK Wildlife and Countryside Act (1981), which protects the species from being killed, injured or taken on land and up to 6 nautical miles from English coastal baselines. In 2011, these protections were extended out to 12 nautical miles and the species was also added under section 9(2) and 9(5), protecting it from being possessed or traded. In 2010 and 2012, ICES advised that *S. squatina* remain on its list of Prohibited Species and that any incidental bycatch be returned to the sea (ICES 2014). In 2009, *S. squatina* received full protection in EU waters from the European Council (Council Regulation (EC) 43/2009). European Union vessels are currently prohibited from fishing for, retaining on board, transhipping, or landing *S. squatina* in all EU waters (including EU waters within the Mediterranean Sea) (EC 23/2010, 57/2011, 43/2012, 39/2013, 43/2014). These retention prohibitions may decrease, to some extent, fisheries-related mortality of the species, especially in those parts of its range where the species was previously landed. However, even prior to these prohibitions, it appears that the species was normally discarded due to its low commercial value. Given the assumed low survival rate of the species when bycaught and discarded by the trawl and demersal line fisheries (see *Overutilization for Commercial, Recreational, Scientific, or Educational Purposes* section), these existing regulatory mechanisms may only have a minor impact on decreasing current fisheries-related mortality and, ultimately, *S. squatina's* risk of extinction.

In Ireland, in 2006, the Irish Specimen Fish Committee, which verifies and publicizes the capture of specimen (trophy) fish caught by anglers using rod and reel methods, removed *S. squatina* from its list of eligible ''specimen status'' species due to concern over its status. The committee reviewed the data on angler catches of angelsharks in 2009 and again in 2013, and after finding a decline in the number being caught and released, decided to keep the exclusion in place until the next review period in 2015. As long as this exclusion from the specimen status list is in place, it should provide some benefit to the local

populations, as it will decrease potential fisheries-related mortality of the larger (and likely mature individuals) that may occur during handling and processing of the fish to meet the claim requirements. However, these benefits may be offset by the fact that claims for a new record (which is different from a specimen fish) are still considered, with the requirement that the fish be weighed on shore, photographed and returned alive. Therefore, there is some risk that especially large angelsharks (as the current angling record is a 33 kg *S. squatina*) may still be brought ashore with the potential for mortality during the processing of angling records. Removal of these larger and mature individuals from an already declining population will greatly decrease its productivity, making it more susceptible to overexploitation that may lead to potential extirpations.

With respect to overutilization of the species by commercial fisheries in Ireland, a major threat identified for the angelsharks in Irish waters was the unsustainable level of bycatch of the species in trammel nets deployed by commercial fishermen. In 2002, a regulation (SI—Statutory Instrument) was implemented prohibiting the use of trammel nets to catch crawfish in specific areas off the coasts of Kerry and Galway (SI No. 179). This regulation was renewed in 2006 (SI No. 233); however the use of trammel nets to catch other species is still allowed (Fahy and Carroll 2009), decreasing the level of protection that this prohibition affords angelsharks. In addition, enforcement of inshore fishery regulations is lacking, and, as a consequence, Fahy and Carroll (2009) note that trammel nets are set year-round in Brandon and Tralee Bays (south-west Ireland—areas once known for large *S. squatina* populations) with the majority of landed crawfish caught by this method. Due to the deficiencies in the legislation (Bord Iascaigh Mhara (BIM) 2012) and enforcement of the SI, commercial trammel net fishing in the inshore areas off western Ireland still poses a significant risk to any remaining *S. squatina* individuals, and, as such, this regulatory measure is inadequate in decreasing the threat of overutilization by commercial fisheries in this area.

With respect to controlling general EU fishing effort in the Mediterranean, the Common Fisheries Policy (CFP; the fisheries policy of the EU) requires Member States to achieve a sustainable balance between fishing capacity and fishing opportunities. However, due to criticisms that the CFP has failed to control the problem of fleet overcapacity (European Commission 2009; 2010) and consequently prevent further declines in fish stocks (Khalilian et al. 2010), it was reformed in 2014. It is too soon to know if the new policies identified in the CFP, such as a complete ''discard ban'' and managing stocks according to maximum sustainable yield, will be adequate in controlling fishing effort by the European fishing fleet to the point where they no longer pose a threat to the remaining *Squatina* species populations.

In non-EU countries, regulations to protect any of these *Squatina* species from overutilization are lacking. There are no species-specific management measures and current regulations are likely inadequate to prevent further declines in the three *Squatina* species. In Turkey, for example, there are very few landing quotas for species due to a lack of stock assessments, even though evidence suggests that many of the species found in Turkish seas are presently overexploited (OECD 2003; Tokaç *et al.* 2012; Ulman *et al.* 2013). The number of registered fishing boats continues to increase, with previous attempts to control the fishing effort deemed unsuccessful. Based on an analysis of catch data, Ulman *et al.* (2013) note that the optimal fleet capacity has been exceeded by over 350 percent for all of Turkey's seas, suggesting that fishing effort and stocks will continue to decline through the foreseeable future. Although there are some seasonal prohibitions to protect spawning stocks in certain areas, minimum size regulations, and gear restrictions, including a bottom trawl ban in the Sea of Marmara, there is little enforcement of existing regulations, with current management measures and prohibitions likely insufficient to protect fish resources from further declines (OECD 2003; Ulman *et al.* 2013).

Off the coast of West Africa, fishing occurs year-round, including during shark breeding season (Diop and Dossa 2011). Many of the state-level management measures in this region lack standardization at the regional level (Diop and Dossa 2011), which weakens some of their effectiveness. For example, Sierra Leone and Guinea both require shark fishing licenses; however, these licenses are much cheaper in Sierra Leone, and, as a result, fishers from Guinea fish for sharks in Sierra Leone (Diop and Dossa 2011). Also, although many of these countries have recently adopted FAO recommended National Plans of Action—Sharks, their shark fishery management plans are still in the early implementation phase, and with few resources for monitoring and managing shark fisheries, the benefits to sharks, including *Squatina* species, from these regulatory mechanisms have yet to be realized (Diop and Dossa 2011). Additionally, many of these countries also lack the resources and capabilities to effectively enforce presently implemented fishing regulations, making this region a hotbed for illegal fishing activities (Agnew *et al.* 2009, EJF 2012). For example, although the Senegalese government took a significant step in controlling the exploitation of its fisheries when it cancelled the licenses of 29 foreign fishing trawlers in 2012, Senegal's director of Ministry of Fisheries and Maritime Affairs, Mr. Cheikh Sarr, recognizes that the country still lacks the enforcement resources and capabilities to combat illegal fishing activities. Mr. Sarr, quoted in Lazuta (2013), remarks: ''Revoking these licenses has been helpful in the general sense . . . But the reality is, whether or not a boat is authorized to enter our waters, if they decide to engage in IUU [illegal, unreported, and unregulated fishing], they will come . . . And often, we have very little power to stop them.'' These licenses were cancelled in response to the growing anger of artisanal fishermen at the level of overfishing by these trawlers and the alleged corruption of the previous government's licensing system (Vidal 2012a). It is unclear if these licenses will remain cancelled in the future under different government regimes. As such, the present regulatory mechanisms in this region, as well as means to enforce these mechanisms, appear inadequate to control the exploitation by illegal fishing vessels and thus pose a threat to the *Squatina* populations that may still be found in these waters.

Within the Canary Islands, the EU prohibited bottom trawling throughout the EEZ in 2005 ((EC) No 1568/2005) in an effort to protect deep-water coral reefs from fishing activities. As demersal trawling is identified as a significant threat to *S. squatina,* contributing to its past decline, this prohibition will provide needed protection to *S. squatina* in an area where the species is still commonly observed. In addition, there are also three designated marine reserves in the Canary Islands, which provide protection from fishing activities, but they are relatively small, covering only 0.15 percent of the Canarian EEZ. Given the uncertainty regarding the population distribution of *S. squatina* within the Canary Islands, it is unclear if these reserves are even effective in protecting *S. squatina* from fishery-related

mortality. In fact, based on the present threats to the species in the Canary Islands, which include sport fishing practices and illegal fishing by artisanal fishermen for personal consumption, it does not appear that the current regulatory mechanisms in place are adequate to address these threats. For example, in August 2014, due to the concern over the sport fishing of prohibited shark species, the Canarian Government required anyone obtaining a sport fishing license to prominently display a poster of prohibited shark species (including *S. squatina*) on board their boat. Although this new requirement may help deter sport fishermen from keeping the sharks, it does not address the stress of capture and lethal handling techniques used by these fishermen (*e.g.,* gaffing and long periods out of water; ZSL 2014). Additionally, those boats that had a sport fishing license prior to August 2014 are not required to have or display this poster (E. Meyers, pers. comm. 2015). Thus, the species may continue to suffer mortality in the sport fishery. Similarly, there is no information available to suggest that the current regulatory mechanisms will be adequate to curb the illegal fishing of the species by artisanal fishermen in the area. Although the species is protected in EU waters, the local Canarian government does not enforce this law, nor is there legal prosecution of violators (E. Meyers, pers. comm. 2015).

Overall, existing regulatory mechanisms appear inadequate in decreasing the main threat of overutilization of these species. This is especially true for *S. aculeata* and *S. oculata,* which are still allowed to be legally exploited, with this exploitation essentially unregulated, throughout their respective ranges. Although *S. squatina* is afforded a higher level of protection through the EU prohibition of landing of the species, its range extends to areas where this prohibition does not apply. In addition, given the level of fishing effort by the Mediterranean trawl and demersal line fisheries and Canarian artisanal and sport fishermen, and associated discard mortality of the species, the existing regulatory measures may only have a minor impact on decreasing current fisheries-related mortality of *S. squatina.* As such, we conclude that the threat of the inadequacy of existing regulatory mechanisms is likely contributing significantly to the risk of extinction for all three *Squatina* species.

Extinction Risk

Although accurate and precise data for many demographic characteristics of the *Squatina* shark species are lacking, the best available data provide multiple lines of evidence indicating that these species currently face a high risk of extinction. As defined by the status review (Miller 2015), a species is considered to be at a high risk of extinction when it is at or near a level of abundance, spatial structure and connectivity, and/or diversity that place its persistence in question. The demographics of the species may be strongly influenced by stochastic or depensatory processes. Similarly, a species may be at high risk of extinction if it faces clear and present threats (*e.g.,* confinement to a small geographic area; imminent destruction, modification, or curtailment of its habitat; or disease epidemic) that are likely to create such imminent demographic risks. Below, the analysis of extinction risk is given for each species.

Squatina aculeata

The sawback angelshark presently faces demographic risks that significantly increase its risk of extinction. Although there are no quantitative historical or current abundance estimates, the best available information (including anecdotal accounts as well as survey data) suggest the species has likely undergone substantial declines throughout its range, with no evidence to suggest a reversal of these trends. Recent and spatially expansive trawl data indicate the species is currently rare, including in areas where it once was common (*e.g.,* Tunisia, Balearic Islands), as well as notably absent throughout most of its historical Mediterranean range. The best available data indicate a decline in abundance that has subsequently led to possible extirpations of the species from the Adriatic Sea, central Aegean Sea, Ligurian and Tyrrhenian Seas, and off the Balearic Islands. In the northeast Atlantic, the species was characterized as common in waters off West Africa, from Mauritania to Sierra Leone, in the 1970s; however, it has since undergone declines to the point where individuals of the species are rarely observed or caught, with the last record of the species from survey records dating back to 1998. The rare occurrence and absence of the species in recent survey data, despite sampling effort in areas and depths where *S. aculeata* would potentially or previously be found, suggest current populations are likely small and fragmented, making them particularly susceptible to local extirpations from environmental and anthropogenic perturbations or catastrophic events. Additionally, the reproductive characteristics of the species: Late maturity, long gestation, and low fecundity (which may be further reduced as gravid *Squatina spp.* females easily abort embryos during capture and handling) suggest the species has relatively low productivity, similar to other elasmobranch species. These reproductive characteristics have likely hindered the species' ability to quickly rebound from threats that decrease its abundance (such as overutilization) and render it vulnerable to extinction. Although there is no genetic, morphological or behavioral information available that could provide insight into natural rates of dispersal and genetic exchange among populations, *S. aculeata* are ovoviviparous (lacking a dispersive larval phase) and the best available information suggests that they likely have a patchy distribution due to local extirpations, population declines, and limited migratory behavior. As such, connectivity of *S. aculeata* populations is likely low, and this limited inter-population exchange may increase the risk of local extirpations, possibly leading to complete extinction. The small, fragmented, and possibly isolated remaining populations suggest the species may be at an increased risk of random genetic drift and could experience the fixing of recessive detrimental alleles, reducing the overall fitness of the species.

In conclusion, although there is significant uncertainty regarding the current abundance of the species, the best available information indicates that the species has suffered substantial declines in portions of its range where it once was common, and is considered to be rare throughout its entire range. The species likely consists of small, fragmented, isolated, and declining populations that are likely to be strongly influenced by stochastic or depensatory processes and have little rebound potential or resilience. This vulnerability is further exacerbated by the present threats of overutilization and inadequacy of existing regulatory measures that continue to contribute to the decline of the existing populations, compromising the species' long-term viability. The demersal fisheries that historically contributed to the decline in *S. aculeata* are still active throughout the species' range and primarily operate in depths where *S. aculeata* would occur. The available information suggests heavy exploitation of demersal resources by these fisheries, including high levels of chondrichthyan discards and associated mortality due to the low gear selectivity and intensity of fishing effort throughout the Mediterranean and

eastern Atlantic. Given the depleted state of the *S. aculeata* populations and present demographic risks of the species, even low levels of mortality would pose a risk of extinction to the species. However, current regulatory measures appear inadequate to protect *S. aculeata* from further fishery-related mortality, especially in areas where recent fisheries data indicate the species may still be present. As such, the additional fishing mortality sustained by the species as a result of continued commercial, artisanal, recreational and illegal fishing activities is a threat that is significantly contributing to the species' risk of extinction throughout its range. In summary, based on the best available information and the above analysis, we conclude that *S. aculeata* is presently at a high risk of extinction throughout its range.

Squatina oculata

The smoothback angelshark presently faces demographic risks that significantly increase its risk of extinction. Although there are no quantitative historical or current abundance estimates, the best available information (including anecdotal accounts as well as survey data) suggest the species has likely undergone substantial declines throughout its range, with no evidence to suggest a reversal of these trends. Recent and spatially expansive trawl data indicate the species is currently rare, including in areas where it once was common (*e.g.,* Iberian coast, Tunisia, Balearic Islands), and notably absent throughout most of its historical Mediterranean range. The best available data indicate a decline in abundance that has subsequently led to possible extirpations of the species from the central Aegean Sea, Ligurian and Tyrrhenian Seas, and off the Balearic Islands. Although some qualitative descriptions of the abundance of the species from the literature suggest the species may be more common in portions of the central Mediterranean (*i.e.,* Libya) and the Levantine Sea (*i.e.,* Israel, Syria), these characterizations are almost a decade old. The absence of updated or recent data or information on the species within these areas is worrisome, and, based on the present threats to the species and its demographic risks, it is likely that these populations are also in decline. In the northeast Atlantic, the species was characterized as common in waters off West Africa, from Mauritania to Liberia, in the 1970s and 1980s; however, it has since decreased in abundance to the point where individuals of the species are rarely observed or caught, with the last record of the species from the survey records dating back to 2002. Based on the best available information, remaining populations of *S. oculata* are likely small and fragmented, making them particularly susceptible to local extirpations from environmental and anthropogenic perturbations or catastrophic events. Additionally, the reproductive characteristics of the species: Late maturity, long gestation, and low fecundity (which may be further reduced as gravid *Squatina spp.* females easily abort embryos during capture and handling) suggest the species has relatively low productivity, similar to other elasmobranch species. These reproductive characteristics have likely hindered the species' ability to quickly rebound from threats that decrease its abundance (such as overutilization) and render it vulnerable to extinction. Although there is no genetic, morphological or behavioral information available that could provide insight into natural rates of dispersal and genetic exchange among populations, *S. oculata* are ovoviviparous (lacking a dispersive larval phase) and the best available information suggests that they likely have a patchy distribution due to local extirpations, population declines, and limited migratory behavior. As such, connectivity of *S. oculata* populations is likely low, and this limited inter-population exchange may increase the risk of local extirpations, possibly leading to complete extinction. The small, fragmented, and possibly isolated remaining populations suggest the species may be at an increased risk of random genetic drift and could experience the fixing of recessive detrimental alleles, reducing the overall fitness of the species.

In conclusion, although there is significant uncertainty regarding the current abundance of the species, the best available information indicates that the species is presently rare throughout most of its range, likely consisting of small, fragmented, isolated, and declining populations that are likely to be strongly influenced by stochastic or depensatory processes and have little rebound potential or resilience. This vulnerability is further exacerbated by the present threats of overutilization and inadequacy of existing regulatory measures that continue to contribute to the decline of the existing populations, compromising the species' long-term viability. The demersal fisheries that historically contributed to the decline in *S. oculata* are still active throughout the species' range and primarily operate in depths where *S. oculata* would occur. The available information suggests heavy exploitation of demersal resources by these fisheries, including high levels of chondrichthyan discards and associated mortality due to the low gear selectivity and intensity of fishing effort throughout the Mediterranean and eastern Atlantic. Given the depleted state of the *S. oculata* populations and present demographic risks of the species, even low levels of mortality would pose a risk of extinction to the species. However, current regulatory measures appear inadequate to protect *S. oculata* from further fishery-related mortality. As such, the additional fishing mortality sustained by the species as a result of continued commercial, artisanal, and illegal fishing activities is a threat that is significantly contributing to the species' risk of extinction throughout its range. In summary, based on the best available information and the above analysis, we conclude that *S. oculata* is presently at a high risk of extinction throughout its range.

Squatina squatina

The common angelshark presently faces demographic risks that significantly increase its risk of extinction. Based on historical and current catches and survey data, *S. squatina* has undergone significant declines in abundance throughout most of its historical range, with no evidence to suggest a reversal of these trends. Once characterized as fairly common, the species is now considered to be extirpated from the western English Channel, North Sea, Baltic Sea, parts of the Celtic Seas, Adriatic Sea, Ligurian and Tyrrhenian Seas, and Black Sea, and rare throughout the rest of its range in the northeast Atlantic and Mediterranean, with one exception. The *S. squatina* population off the Canary Islands may be fairly stable (although there is no trend data to confirm this); however, this area only constitutes an extremely small portion of the species' range and its present abundance in this portion remains uncertain. Overall, the best available information suggests that *S. squatina* has undergone significant declines and is still in decline throughout most of its range. Current populations are likely small and fragmented, making them particularly susceptible to local extirpations from environmental and anthropogenic perturbations or catastrophic events. Additionally, the reproductive characteristics of the species: Late maturity, long gestation, and low fecundity (which may be further reduced as gravid *Squatina spp.* females easily abort embryos during capture and

handling) suggest the species has relatively low productivity, similar to other elasmobranch species. These reproductive characteristics have likely hindered the species' ability to quickly rebound from threats that decrease its abundance (such as overutilization) and render it vulnerable to extinction. Although there is no genetic, morphological or behavioral information available that could provide insight into natural rates of dispersal and genetic exchange among populations, *S. squatina* are ovoviviparous (lacking a dispersive larval phase) and the best available information suggests that they likely have a patchy distribution due to local extirpations, population declines, and limited migratory behavior with evidence of possible high site fidelity. As such, connectivity of *S. squatina* populations is likely low, and this limited inter-population exchange may increase the risk of local extirpations, possibly leading to complete extinction. The small, fragmented, and possibly isolated remaining populations suggest the species may be at an increased risk of random genetic drift and could experience the fixing of recessive detrimental alleles, reducing the overall fitness of the species.

In conclusion, although there is significant uncertainty regarding the current abundance of the species, the best available information indicates that the species has undergone a substantial decline in abundance. Once noted as common in historical records, the species is presently rare throughout most of its range (and considered extirpated in certain portions), with evidence suggesting it currently consists of small, fragmented, isolated, and declining populations that are likely to be strongly influenced by stochastic or depensatory processes. Based on tagging data, the Canary Island population, whose present abundance and population structure remains unknown, may be confined to this small geographic area. With limited inter-population exchange, its susceptibility to natural environmental and demographic fluctuations increases its risk of extirpation. The vulnerabilities of this species (small population sizes, declining trends, potential isolation) are further exacerbated by the present threats of curtailment of range, overutilization, and inadequacy of existing regulatory measures that will either contribute or continue to contribute to the decline of the existing populations, compromising the species' long-term viability. The demersal fisheries that historically contributed to the decline in *S. squatina* are still active throughout the species' range and primarily operate in depths where *S. squatina* would occur. Although the species is protected in EU waters, the available information suggests heavy exploitation of demersal resources by fisheries operating throughout the Mediterranean and eastern Atlantic, resulting in high levels of chondrichthyan discards and associated mortality. The species is still being landed, both legally and illegally, and, in some parts of its range, such as Tunisia, at levels that have historically led to population declines. In the Canary Islands, which are thought to be the last stronghold for the species, *S. squatina* is presently at risk of mortality at the hands of artisanal fishermen as well as a growing number of sport fishermen, despite the prohibition on capturing the species. Although trawling is banned within the Canary Islands, and a number of marine reserves have been established there, it is unclear to what extent these regulations will be effective in protecting important *S. squatina* habitat or decreasing fishing mortality rates. In summary, based on the best available information and the above analysis, we conclude that *S. squatina* is presently at a high risk of extinction throughout its range.

Protective Efforts

In response to the significant decline of *S. squatina* over the years, a number of conservation efforts are planned or in development with the goal of learning more about these sharks in order to understand how better to protect them. These efforts include projects to reduce sportfishing-related mortality and/or diver disturbance of the angelshark in the Canary Islands, data collection to inform conservation (including genetic and tagging research), and awareness-raising campaigns to promote the importance of the Canary Islands for angelshark conservation (ASP 2014; E. Meyers, pers. comm. 2015; J. Barker, pers. comm. 2015). While funding has been secured for some of these activities, including for a pilot angelshark tagging program, many of the other efforts described above are dependent on additional future funding (J. Barker, pers. comm. 2015). As such, the likelihood of implementation of these projects remains uncertain. There is also a collaborative effort sponsored by Deep Sea World (Scotland's National Aquarium) and Hastings Blue Reef Aquarium to breed angelsharks in captivity, and in 2011, they were successful. A female *S. squatina* successfully delivered 19 pups in captivity, marking the first time that an angelshark has successfully bred in captivity (Deep Sea World 2015), which may be an important first step in the conservation of the species.

Although these efforts will help increase the scientific knowledge about *S. squatina* and promote public awareness of declines in the species, there is no indication that these efforts are currently effective in reducing the threats to the species, particularly those related to overutilization and the inadequacy of existing regulatory mechanisms. Therefore, we cannot conclude that these existing conservation efforts have significantly altered the extinction risk for the common angelshark. We are not aware of any other planned or not-yet-implemented conservation measures that would protect this species or the other two *Squatina* species (*S. aculeata* and *S. oculata*). We seek additional information on other conservation efforts in our public comment process (see below).

Proposed Determination

Based on the best available scientific and commercial information, as summarized here and in Miller (2015), we find that all three *Squatina* species are in danger of extinction throughout their respective ranges. We assessed the ESA section 4(a)(1) factors and conclude that *S. aculeata, S. oculata,* and *S. squatina* all face ongoing threats of overutilization by fisheries and inadequate existing regulatory mechanisms throughout their ranges. *Squatina squatina* has also suffered a significant curtailment of its range. These species' natural biological vulnerability to overexploitation and present demographic risks (*e.g.,* low and declining abundance, small and isolated populations, patchy distribution, and low productivity) are currently exacerbating the negative effects of these threats and placing these species in danger of extinction. We therefore propose to list all three species as endangered.

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 the proposed endangered listings are prohibitions on take, including export and import.

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 the listing of these species under the ESA will increase the number of section 7 consultations, because these species occur outside of the United States and are unlikely to be affected by Federal actions.

Critical Habitat

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

The best available scientific and commercial data as discussed above identify the geographical areas occupied by *Squatina aculeata, S. oculata,* and *S. squatina* as being entirely outside U.S. jurisdiction, so we cannot designate critical habitat for these species.

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 on these species does not indicate that U.S. waters provide any specific essential biological function for any of the *Squatina* species proposed for listing. Therefore, based on the available information, we do not intend to designate critical habitat for *S. aculeata, S. oculata,* or *S. squatina*.

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 all three *Squatina* species as endangered, all of the prohibitions of section 9(a)(1) of the ESA will apply to these 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 these species include, but are not limited to, the following:

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

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

(3) Importing or exporting these angelshark species or any part of these species.

We emphasize that whether a violation results from a particular activity is entirely dependent upon the facts and circumstances of each incident. Further, an activity not listed may in fact result in a violation.

Public Comments Solicited

To ensure that any final action resulting from this proposed rule 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 any of the *Squatina* species proposed for listing;

(2) Taxonomic information on any of these species;

(3) Biological information (life history, genetics, population connectivity, etc.) on any of these species;

(4) Efforts being made to protect any of these species throughout their current ranges;

(5) Information on the commercial trade of any of these species;

(6) Historical and current distribution and abundance and trends for any of these species; and

(7) Current or planned activities within the range of these species and their possible impact on 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 peer review comments on the status review report (Miller 2015) from four scientists familiar with the three angelshark species. We received and reviewed comments from these scientists, and their comments are incorporated into the draft status review report for the three *Squatina* species and this proposed rule. Their comments on the status review are summarized in the peer review report and available at *http://www.cio.noaa.gov/services_programs/prplans/PRsummaries.html*.

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), we have 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 the species occurs, 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 all three species. As the process continues, we intend to continue engaging in informal and formal contacts with the U.S. State Department, giving careful consideration to all written and oral comments received.

List of Subjects in 50 CFR Part 224

Endangered and threatened species, Exports, Imports, Transportation.

Dated: July 8, 2015.

Samuel D. Rauch, III.

Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.

For the reasons set out in the preamble, 50 CFR part 224 is proposed to be amended as follows:

PART 224—ENDANGERED MARINE AND ANADROMOUS SPECIES

■ 1. 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.*

■ 2. In § 224.101, amend the table in paragraph (h) by adding new entries for three species in alphabetical order under the ''Fishes'' table subheading to read as follows:

§ 224.101 Enumeration of endangered marine and anadromous species.

* * * * *

(h) The endangered species under the jurisdiction of the Secretary of Commerce are:

Species [1]			Citation(s) for listing determination(s)	Critical habitat	ESA rules
Common name	Scientific name	Description of listed entity			
*	*	*	*	*	*
Fishes					
*	*	*	*	*	*
Shark, common angel-	*Squatina squatina*	Entire species	[*Insert* ***Federal Register*** *citation and date when published as a final rule*].	NA	NA.
Shark, sawback angel-	*Squatina aculeata*	Entire species	[*Insert* ***Federal Register*** *citation and date when published as a final rule*].	NA	NA.
Shark, smoothback angel- ..	*Squatina oculata*	Entire species	[*Insert* ***Federal Register*** *citation and date when published as a final rule*].	NA	NA.
*	*	*	*	*	*

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 679

RIN 0648–XD649

Fisheries of the Exclusive Economic Zone Off Alaska; Groundfish Fisheries in the Gulf of Alaska

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

ACTION: Notice; intent to prepare an environmental impact statement; request for written comments.

SUMMARY: NMFS, in consultation with the North Pacific Fishery Management Council (Council), announces its intent to prepare an Environmental Impact Statement (EIS) on a new management program for trawl groundfish fisheries in the Gulf of Alaska (GOA), in accordance with the National Environmental Policy Act of 1969 (NEPA). The proposed action would create a new management program that would allocate allowable harvest to individuals, cooperatives, and other entities that participate in GOA trawl groundfish fisheries. The proposed action is intended to improve stock conservation by imposing accountability measures for utilizing target, incidental, and prohibited species catch, creating incentives to eliminate wasteful fishing practices, providing mechanisms for participants to control and reduce bycatch in the trawl groundfish fisheries, and to improve safety of life at sea and operational efficiencies. The EIS will analyze the impacts to the human environment resulting from the proposed trawl bycatch management program. NMFS will accept written comments from the public to identify the issues of concern and assist the Council in determining the appropriate range of management alternatives for the EIS.

DATES: Written comments will be accepted through August 28, 2015.

ADDRESSES: You may submit comments on this document, identified by NOAA–NMFS–2014–0150, by any of the following methods:

- *Electronic Submission:* Submit all electronic public comments via the Federal e-Rulemaking Portal. Go to *www.regulations.gov/#!docketDetail;D=NOAA-NMFS-2014-0150*, click the ''Comment Now!'' icon, complete the required fields, and enter or attach your comments.
- *Mail:* Submit written comments to Glenn Merrill, Assistant Regional Administrator, Sustainable Fisheries Division, Alaska Region NMFS, Attn: Ellen Sebastian. Mail comments to P.O. Box 21668, Juneau, AK 99802–1668.

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 by NMFS. All comments received are a part of the public record and will generally be posted for public viewing on *www.regulations.gov* without change. All personal identifying information (*e.g.,* name, address), confidential business information, or otherwise sensitive information submitted voluntarily by the sender will be publicly accessible. NMFS will accept anonymous comments (enter ''N/A'' in the required fields if you wish to remain anonymous).

FOR FURTHER INFORMATION CONTACT: Rachel Baker, (907) 586–7228 or email *rachel.baker@noaa.gov*.

SUPPLEMENTARY INFORMATION: Under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), the United States has exclusive fishery management authority over all living marine resources found within the exclusive economic zone (EEZ). The management of these marine resources, with the exception of marine mammals and birds, is vested in the Secretary of Commerce (Secretary). The Council has the responsibility to prepare fishery management plans for the fishery resources that require conservation and management in the EEZ off Alaska. Management of the Federal groundfish fisheries in the GOA is carried out under the Fishery Management Plan for Groundfish of the Gulf of Alaska (FMP). The FMP, its amendments, and implementing regulations (found at 50 CFR part 679) are developed in accordance with the requirements of the Magnuson-Stevens Act and other applicable Federal laws and executive orders, notably the National Environmental Policy Act (NEPA) and the Endangered Species Act (ESA).

The Council is considering the establishment of a new management program for the GOA trawl groundfish fisheries. The proposed action would allocate allowable harvest of selected target and bycatch species to individuals, cooperatives, and other entities. The purpose of the program is to improve management of all species caught in the GOA trawl groundfish fisheries by creating vessel-level and/or cooperative-level incentives to avoid and reduce bycatch, and to create accountability measures for participants when utilizing target and bycatch species. The Council also intends for the program to improve operational efficiencies, reduce incentives to fish during unsafe conditions, and support the continued participation of coastal communities that are dependent on the fisheries. NMFS and the Council have determined the preparation of an EIS may be required for this action because some important aspects of the bycatch management program on target and bycatch species and their users may be uncertain or unknown and may result in significant impacts on the human environment not previously analyzed. Thus, NMFS and the Council are initiating scoping for an EIS in the event an EIS is needed.

NMFS and the Council are seeking information from the public through the EIS scoping process on the range of alternatives to be analyzed, and on the environmental, social, and economic issues to be considered in the analysis. Written comments generated during this scoping process will be provided to the Council and incorporated into the EIS for the proposed action.

Management of the GOA Trawl Groundfish Fisheries

The Council and NMFS annually establish biological thresholds and annual total allowable catch limits for groundfish species to sustainably manage the groundfish fisheries in the GOA. To achieve these objectives, NMFS requires vessel operators participating in GOA groundfish fisheries to comply with various restrictions, such as fishery closures, to maintain catch within specified total allowable catch limits. The GOA groundfish fishery restrictions also include measures that are intended to minimize catch of certain species, called prohibited species, which may not be retained for sale by the vessel harvesting groundfish. For example, current GOA groundfish fishery regulations require Pacific halibut prohibited species catch (PSC) to be discarded immediately after it is recorded, and Chinook salmon must be retained by the harvest vessel only until sampled by an observer. The GOA groundfish fishery restrictions also include PSC limits for Pacific halibut and Chinook salmon to constrain the amount of bycatch of these species in the groundfish fisheries. When harvest of prohibited species in a groundfish fishery reaches the specified PSC limit for that fishery, NMFS closes directed fishing for the target groundfish species,