

**Petition to List the Great Hammerhead Shark (*Sphyrna mokarran*) As
Endangered or Threatened Under the Endangered Species Act**



Great Hammerhead Shark. Photo: Martin Prochazkacz/Shutterstock.com

**Submitted to the U.S. Secretary of Commerce Acting through the National
Oceanic and Atmospheric Administration and the National Marine
Fisheries Service**

June 16, 2022

Submitted by:



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I. Notice of Petition

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Dear Secretary of Commerce,

Pursuant to the Endangered Species Act (“ESA”), 16 U.S.C. § 1533(b), the Center for Biological Diversity formally petitions the Secretary of Commerce to list the great hammerhead shark (*Sphyrna mokarran*) as an endangered or threatened species and to designate critical habitat concurrent with the listing.

The Secretary of Commerce and the National Marine Fisheries Service (“NMFS”), an agency within the National Oceanic and Atmospheric Administration (“NOAA”), have jurisdiction over this Petition. This Petition sets in motion a specific process, requiring NMFS to make an initial finding as to whether the Petition “presents substantial scientific or commercial information indicating that the petitioned action may be warranted.” 16 U.S.C. § 1533(b)(3)(A). NMFS must make this initial finding “[t]o the maximum extent practicable, within 90 days after receiving the petition.” *Id.*

The Center does not need to demonstrate that the listing is warranted, but rather that the information presented demonstrates that such action may be warranted. Because the Petition contains scientific information demonstrating that listing the great hammerhead shark as endangered or threatened may be warranted, NMFS must promptly make a positive finding on the Petition and commence a status review. 16 U.S.C. § 1533(b)(3)(B).

NMFS must acknowledge the receipt of this Petition within a reasonable timeframe. 50 C.F.R. § 424.14(f)(2).

If you have any questions, please feel free to contact us via the information contained in the signature block below.

Sincerely,

A handwritten signature in black ink, appearing to read "Emily Jeffers". The signature is fluid and cursive, with the first name "Emily" being more prominent than the last name "Jeffers".

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II. Executive Summary

The great hammerhead shark is one of the most imperiled sharks in the world. The largest of the hammerhead shark species, reaching up to 20 feet in length, great hammerheads are shy and solitary creatures that inhabit shallow coastal waters throughout the tropics worldwide. Prized for their fins, great hammerheads have been targeted in commercial and recreational fisheries, in addition to being caught as bycatch in longline, purse seine, and gillnet fisheries. Recent studies have shown the global population has declined by more than 80% in the last 70 years. Because they take years to mature, the great hammerhead is slow to recover from overexploitation.

In recognition of this dramatic population decline, in addition to threats from climate change and habitat degradation, the International Union for the Conservation of Nature (IUCN) in 2019 listed the great hammerhead shark as “critically endangered,” the step just below “extinct in the wild.” The IUCN recommended that all take of great hammerheads be prohibited.

The great hammerhead shark warrants listing under the Endangered Species Act because it is in danger of extinction throughout all or a significant portion of its range, or likely to become so in the foreseeable future. 16 U.S.C. § 1532(6), (20). In addition, its similarity of appearance to the scalloped hammerhead shark, a species already listed under the Act, merits listing for the great hammerhead. *Id.* § 1533(e).

As the U.S. Supreme Court has recognized, “[t]he plain intent of Congress enacting [the Endangered Species Act] was to halt and reverse the trend toward species extinction, whatever the cost.”¹ Here, listing the great hammerhead shark will protect the species within U.S. waters, prohibit the import or export of great hammerheads and their parts to or from the United States, and would aid international efforts to protect the great hammerhead by providing financial and technical assistance in developing conservation programs, as well as law enforcement assistance. The National Marine Fisheries Service must extend the full protections of the Act to safeguard this imperiled species.

III. Legal and Regulatory Framework

The Center for Biological Diversity formally petitions the Secretary of Commerce (Secretary), acting through the National Marine Fisheries Service (NMFS), an agency within the National Oceanic and Atmospheric Administration (NOAA), to list the great hammerhead shark (*Sphyrna mokarran*) as endangered under the U.S. Endangered Species Act (ESA) and to designate critical habitat for the species within U.S. waters. *See* 16 U.S.C. §§ 1531–1544.

This Petition is submitted pursuant to the ESA, 16 U.S.C. § 1533(b)(3)(A), the ESA’s implementing regulations, 50 C.F.R. § 424.14, and the Administrative Procedure Act, 5 U.S.C. § 553(e). In keeping with 50 C.F.R. § 424.14(f)(2), NMFS must acknowledge the receipt of this

¹ *Tenn. Valley Auth. v. Hill*, 437 U.S. 153, 184 (1978).

Petition within a reasonable timeframe. As fully set forth below, this Petition contains all the information requested in 50 C.F.R. § 424.14(c)–(e) and 16 U.S.C. § 1533(e). All cited documents are listed in the References section; electronic copies of these documents accompany this petition and pinpoint citations to these have been provided where appropriate. *See* 50 C.F.R. § 424.14(c)(5)–(6).

In reviewing the great hammerhead shark’s status, NMFS must analyze whether the species warrants listing throughout all or a significant portion of its range. 16 U.S.C. § 1532(6), (20). If NMFS finds that there are distinct population segments (DPSs) of great hammerhead shark, it must evaluate each of those DPSs for listing under the ESA.

If NMFS proposes to list the great hammerhead shark or any DPS thereof as threatened, the Center asks that the agency promulgate a final 4(d) rule to confer full take protections on the species concurrent with a final listing. *See* 16 U.S.C. § 1533(d). Those protections are necessary and advisable to provide for the conservation of the species. Further, if the great hammerhead shark or any DPS thereof is listed as endangered or threatened, the Center asks that NMFS promulgate a 4(e) rule for species similar in appearance to the great hammerhead shark. As set forth in 50 C.F.R. § 424.14(j), “[t]he Services will conduct a review of petitions to . . . adopt a rule under section 4(d) [or] 4(e) . . . of the [ESA] in accordance with the Administrative Procedure Act (5 U.S.C. § 553) and applicable Departmental regulations, and take appropriate action.”

The agency’s review and determination must be based on the best scientific and commercial data available. 16 U.S.C. § 1533(b)(1)(A). This requirement aims to “ensure that the ESA not be implemented haphazardly, on the basis of speculation or surmise.” *Bennett v. Spear*, 117 S.Ct. 1154, 1168 (1997).

Listing may be done at the initiative of the Secretary or in response to a petition. 16 U.S.C. § 1533(b)(3)(A). After receiving a petition to list a species, the Secretary is required to determine “whether the petition presents substantial scientific or commercial information indicating that the petitioned action may be warranted.” 16 U.S.C. § 1533(b)(3)(A). A “positive” 90-day finding leads to a status review and a determination of whether the species will be listed, to be completed within twelve months. 16 U.S.C. § 1533(b)(3)(B). A “negative” initial finding ends the listing process, and the ESA authorizes judicial review of such a finding. 16 U.S.C. § 1533(b)(3)(C)(ii).

“Substantial information” is defined as the “amount of information that would lead a reasonable person to believe that the measure proposed in the petition may be warranted.” 50 C.F.R. § 424.14(b)(1). The four factors to guide the Service’s consideration on whether a particular listing petition provides “substantial” information include:

- a. Clearly indicates the administrative measure recommended and gives the scientific and any common name of the species involved;

- b. Contains detailed narrative justification for the recommended measure; describing, based on available information, past and present numbers and distribution of the species involved and any threats faced by the species;
- c. Provides information regarding the status of the species over all or significant portion of its range; and
- d. Is accompanied by appropriate supporting documentation in the form of bibliographic references, reprints of pertinent publications, copies of reports or letters from authorities, and maps.

50 C.F.R. § 424.14(b)(2)(i)-(iv).

The ESA does not require “conclusive evidence of a high probability of species extinction” in order to support a positive 90-day finding. *Ctr. for Biological Diversity v. Morgenweck*, 351 F.Supp.2d 1137, 1140 (D. Colo. 2004). Rather, the ESA contemplates a “lesser standard by which a petitioner must simply show that the substantial information in the Petition demonstrates that listing of the species may be warranted.” *Morgenweck*, 351 F.Supp.2d at 1141.

Even in the absence of the threats listed above, Section 4 of the ESA (16 U.S.C. § 1533(e)) additionally provides that the Secretary may “treat any species as an endangered species or threatened species even though it is not listed pursuant to this section,” when the following three conditions are satisfied:

1. “[S]uch species so closely resembles in appearance, at the point in question, a species which has been listed pursuant to such section that enforcement personnel would have substantial difficulty in attempting to differentiate between the listed and unlisted species;
2. “[T]he effect of this substantial difficulty is an additional threat to an endangered or threatened species;” and
3. “[S]uch treatment of an unlisted species will substantially facilitate the enforcement and further the policy of this chapter.”

16 U.S.C. § 1533(e)(A)-(C).

The great hammerhead’s similarity of appearance to the scalloped hammerhead shark, which NMFS listed under the ESA in September 2014, therefore provides an additional ground upon which to list the great hammerhead as “threatened” or “endangered.” 79 Fed. Reg. 38213 (July 3, 2014).

IV. Background Summary

The great hammerhead shark, *Sphyrna mokarran*, swims in coastal warm temperate and tropical waters around the world. It is caught globally as a target species and as bycatch in coastal and pelagic fisheries. Available information indicates the markets for sharks and shark fins, combined with an epidemic of illegal shark fishing, have caused a significant population decline (Rigby et al. 2019). And because the species is slow growing, late to mature, and has low productivity, it is innately prone to depletion and slow to recover.

In recognition of this information, WildEarth Guardians petitioned NMFS to list the great hammerhead shark under the U.S. Endangered Species Act on December 21, 2012, followed closely by a petition from the Natural Resources Defense Council on March 19, 2013. NMFS evaluated the petitions to determine whether they provided substantial information to list a species, and whether information contained in the petitions might support the identification of a distinct population segment (DPS) that may warrant listing as a species under the ESA. NMFS determined that the petitions presented substantial scientific and commercial information that the petitioned action may be warranted and initiated a status review of the great hammerhead shark. NMFS concluded in 2014 that the species did not warrant listing under the ESA.

In 2014, NMFS found that overutilization and inadequate regulatory mechanisms are likely increasing the species' extinction risk but only in combination with other threats or factors. The agency declined to list the great hammerhead because of the unknown effects of these other threats (habitat destruction, modification or curtailment, disease or predation, and other natural threats, such as the species' high at-vessel fishing mortality rates). NMFS noted that the available information indicated that most of the observed declines occurred in the 1980s, before the implementation of any significant management regulations. NMFS predicted that through the next 50 years, the species would be unlikely to be at risk of extinction due to demographic risks or threats to the point where the species would be influenced by stochastic or depensatory processes.

In the nearly 10 years since NMFS's negative 12-month finding, new data has emerged to support listing under the ESA. Given plummeting population trajectories in most areas of the world and ongoing fishing pressure and trade, the International Union for Conservation of Nature (IUCN)² recently designated the species (globally) as "critically endangered." (Rigby et al. 2019). "Critically endangered" is the designation just before "extinct in the wild." The hammerhead's designation as "critically endangered" is based on a >80% decline of the great hammerhead worldwide over the last three generations (*Id.*). NMFS must list the great hammerhead shark under the ESA because the species satisfies the listing criteria under ESA Section 4, and because without protection this species risks further decline and extinction.

² The IUCN Red List of Threatened Species is the global standard for quantifying extinction risk (Hoffmann et al., 2008; Mace et al., 2008).

V. Species Characteristics

a. Taxonomy and Morphological Description

The taxonomy of the petitioned species is *Sphyrna mokarran* (Rüppell, 1837). The full taxonomic classification is shown in Table 1.

Table 1. Taxonomy of *Sphyrna mokarran*

Kingdom	Animalia
Phylum	Chordata
Class	Chondrichthyes
Subclass	Elasmobranchii
Order	Carcharhiniformes
Family	Sphyrnidae
Genus	<i>Sphyrna</i>
Species	<i>mokarran</i>

Sphyrna mokarran is most frequently known by the common name “great hammerhead shark,” which is how it will be referenced throughout this petition.

Hammerhead sharks are recognized by their laterally expanded head that resembles a hammer, hence the common name “hammerhead.” The great hammerhead shark is the largest of hammerhead species and is distinguished from other hammerheads by a nearly straight anterior margin of the head and median indentation in the center in adults. The shark has strongly serrated teeth, a sickle shaped first dorsal and pelvic fins, and a high second dorsal fin with a concave rear margin (NMFS 2014). The body of the great hammerhead is fusiform, with the dorsal side colored dark brown to light grey or olive that shades to white on the ventral side (*Id.*). Fins of adult great hammerheads are uniform in color, whereas the tip of the second dorsal fin of juveniles may appear dusky (*Id.*).

b. Habitat, Distribution, and Migratory Patterns

The great hammerhead is a large coastal and semi-oceanic pelagic shark found in both coastal areas and deep offshore waters at depths of up to 300 meters. (Ebert *et al.* 2013, Weigmann 2016). They can often be found over continental shelves and in the lagoons and passes of coral reefs and atolls. (Compagno 1984; Denham *et al.* 2007; Guttridge *et al.* 2017). The great hammerhead ranges worldwide throughout tropic and warm temperate seas and into the Northwest Atlantic (Hammerschlag *et al.* 2011).

Great hammerhead sharks are generally solitary and highly mobile (Compagno 1984; Cliff 1995; Denham *et al.* 2007; Hammerschlag *et al.* 2011 NMFS 2014). Migrations of great hammerhead

sharks can occur over periods of great distance and time; a review of shark tagging studies found maximum distance travelled to be 1180 km. (Kohler and Turner 2001). Another study tracked a great hammerhead shark migrating 1200 km in 62 days (NMFS 2014, *citing* Hammerschlag *et al.* 2011). “Some great hammerhead shark populations are thought to make poleward migrations following warm water currents, such as those found off Florida’s coast (Heithaus *et al.* 2007; Hammerschlag *et al.* 2011), while others are thought to be residential populations with only seasonal incursions into cooler waters due to range expansions (not true migrations) (Taniuchi 1974; Stevens and Lyle 1989; Cliff 1995).” (NMFS 2014).

Great hammerhead sharks prefer warmer water temperatures above 20° C. For example, in waters off South Africa, great hammerhead shark females were rarely caught in waters less than 22° C, and males, although apparently more tolerant of cooler waters, became scarce when temperatures dropped below 20° C (Cliff 1995). Similarly, based on catch data around the Tampa Bay area of Florida, great hammerhead sharks are found primarily in water temperatures > 20°C (Hueter and Manire 1994). In the East China Sea, Taniuchi (1974) noted that great hammerheads are only abundant in parts of the sea that are influenced by the warm Kuroshio and Tsushima currents and likely reside in the surface to mid-water range. Although Heithaus *et al.* (2007) reported higher probabilities of encountering great hammerheads in cooler, deeper waters of the Florida Keys (with highest probability in temperatures of 17-18°C), the authors note that this may be due to the great hammerhead sharks’ seasonal southward migration, as sampling was done primarily during the winter season.

c. Biological Characteristics

The great hammerhead shark can reach lengths of over six meters (total length, or TL), although individuals over four meters total length are rare (Compagno 1984, Stevens and Lyle 1989, NMFS 2014). “Piercy *et al.* (2010) attributes the rarity of these larger great hammerhead sharks to growth overfishing, and estimated the oldest female and male great hammerhead sharks to be 44 and 42 years, respectively, with corresponding lengths of 398 cm TL (female) and 379 cm TL (male).” (NMFS 2014.)

Great hammerheads give birth to live young, with a litter size of 6–42 pups, a gestation time of 11 months, a likely biennial reproductive cycle, and a size-at-birth of 50–70 cm total length (Stevens and Lyle 1989, Harry *et al.* 2011, Ebert *et al.* 2013, Clarke *et al.* 2015, Rigby *et al.* 2019). The expanded head of young great hammerhead sharks is rounder and develops into the distinct rectangular shape of an adult only as it matures. Females gain maturity at age 8.3 years and males at age 5.6 years; the males are consequently much smaller upon reaching maturity. NMFS 2014. Using the known maximum age of 44, generation length is estimated to be approximately 24 years. (Rigby *et al.* 2019) (*citing* Passerotti *et al.* 2010, Piercy *et al.* 2010, Harry *et al.* 2011).

Although there are very few age/growth studies for great hammerhead sharks, the available data indicate that great hammerhead sharks are a long-lived species and can be characterized as having low productivity (based on productivity parameters and categorizations in Musick (1999)), making them generally vulnerable to depletion and likely slow to recover from overexploitation.

The great hammerhead shark preys upon a range of marine organisms including bony fishes, cephalopods, and crustaceans, with a preference for stingrays and other batoids (NMFS 2014, Compagno 1984; Strong *et al.* 1990; Denham *et al.* 2007). The species appears immune to stingray and catfish venom, as they are sometimes found with barbs embedded in their mouths (Strong *et al.* 1990) and have been observed to use their uniquely shaped head to pin down and prey upon stingrays. (NMFS 2014.) Stomach analyses indicate that great hammerheads primarily feed at or near the seafloor (NMFS 2014) (*citing* Stevens and Lyle 1989; Cliff 1995).

The great hammerhead, like most sharks, is an apex predator at the top of the marine food chain. (Camhi *et al.* 1998.) As scientists have noted, these top predators have “the potential to impact marine communities through direct and indirect interactions.” (Heithaus *et al.* 2007). Accordingly, “[m]aintenance of biodiversity and ecosystem structure is another reason for controlling the indiscriminate destruction and fishing of chondrichthyans” because the loss of such a top predator could have wide-ranging and disastrous effects on ecosystem function. (Camhi *et al.* 1998.)

d. Population Status and Trends

Great hammerhead shark populations have suffered tremendous commercial fishing pressure as target and bycatch in commercial and small-scale pelagic longline, purse seine, and gillnet fisheries. Great hammerheads are also captured in coastal longlines, gillnets, trammel nets and sometimes trawls, particularly in areas with narrow continental shelves (White *et al.* 2006, Camhi *et al.* 2008, Lack and Meere 2009, Diop and Dossa 2011, Miller *et al.* 2014). Under-reporting of catches in pelagic and domestic fisheries is likely (Dent and Clarke 2015). Great hammerheads suffer extremely high bycatch mortality in incidental fisheries (Gulak *et al.* 2014). Many of those that survive capture likely are killed and stripped of their fins so that fishers can take advantage of the incidental profit (Fields *et al.* 2018).

Great hammerheads’ characteristic large fins are highly prized in Asian seafood markets, making the species a lucrative fishery target (Clarke *et al.* 2006, Dent and Clarke 2015, Fields *et al.* 2018). As mentioned above, the fact that this species has such high market value likely leads to high retention rates of sharks caught incidentally as bycatch. In addition, hammerheads are highly vulnerable to stress, and often die after capture, even if they are returned to the water alive (Gallagher *et al.* 2014). Finally, the species is taken in beach protection programs that target large sharks (Dudley and Simpfendorfer 2006, Simpfendorfer *et al.* 2010, Reid *et al.* 2011).

As a result of these pressures, and in response to significant population declines, in 2019 the IUCN recognized great hammerheads as “critically endangered” globally. Under IUCN criteria, a species is considered “critically endangered” when it is “considered to be facing an extremely high risk of extinction in the wild.” The IUCN uses five criteria to evaluate if a taxon belongs in a threatened category; for the great hammerhead, the IUCN found that because the great hammerhead population has declined more than 80% over the last three generations, the species merits classification in the “critical endangered” category. According to the IUCN, “[t]o allow recovery, it is recommended that all Great Hammerhead retention and landings be prohibited, at least as long as the global population is classified as Critically Endangered or Endangered. Initiatives to prevent capture, minimize bycatch mortality, promote safe release, and improve catch (including discard) reporting are also urgently needed, as is full implementation of additional commitments agreed through international treaties.”

Populations of all large hammerhead sharks “have registered significant declines in virtually all oceans.” (Camhi *et al.* 2009.) In its recent assessment of the great hammerhead population, the IUCN found a global population reduction of >80% over three generation lengths (71.1–74.4 years), with particularly steep declines in the Indian Ocean (median reduction of 99.3% over three generation lengths). (Rigby *et al.* 2019; Sherley *et al.* 2019; Dudley and Simpfendorfer 2006.) Steep declines of hammerheads have also occurred in the Mediterranean Sea with an estimated decline of 99.99% in abundance and biomass since the early 19th century (Ferretti *et al.* 2008). Walker *et al.* (2005) also report that hammerhead species have virtually disappeared from the central-southern Mediterranean Sea since 1986.

Population trend data for great hammerheads are lacking from the North Pacific and are limited from the Western Central Pacific, where hammerhead catches are tallied for the greater species-complex with no indication of the proportion of great hammerheads. Fishing pressure has significantly increased in recent decades across the distribution range of the great hammerhead in the tropical Indian Ocean and West Africa (Cooke 1997, Bruckner *et al.* 2011, Belhabib *et al.* 2012, Jabado *et al.* 2017), and has likely caused declines in these regions.

The Atlantic subpopulation has undergone a >50% reduction over three generation lengths (74.4 years). Signs of a possible recovery in the Northwest Atlantic are confounded by a high degree of uncertainty in the data and hampered by ongoing, high levels of exploitation.³ (Sherley *et al.* 2019; Rigby *et al.* 2019.)

³ The Northwest Atlantic stock was overfished from the mid- 1980s with overfishing occurring periodically from 1983–1997 and the risk of overfishing low after 2001 (Jiao *et al.* 2011). A previous stock assessment also found the stock overfished but experiencing overfishing after 2001 (Hayes 2008); however, both stock assessments report a high degree of uncertainty mostly due to poor catch data (Miller *et al.* 2014). Recent data indicates an increasing but variable trend. (Rigby *et al.* 2019.)

Table 1. From IUCN, Supplementary Information for *Sphyrna mokarran*.

Table 1. *Sphyrna mokarran* – Population change (%) and posterior probabilities for changes falling within the IUCN Red List categories Least Concern (LC), Near Threatened (NT), Vulnerable (VU), Endangered (EN), and Critically Endangered (CR); the “likely status” based on criteria A2–4 is assigned based on the category containing the highest posterior probability, with the exception that VU is also selected where LC obtained the highest probability, but it is < 50%. All probabilistic statements are based on the rate of change over three generation lengths (GL) from projections within JARA. The Global change is based on weighting the regional posterior probabilities by the proportional area (PA) weighting (see text for detail).

Region	GL (years)	Data length (years)	PA weighting	Median change	LC	NT	VU	EN	CR	Likely Status
N. Atlantic 1 ¹	24.8	25	0.27	-29.1	43.0	7.8	18.7	26.8	3.8	VU
N. Atlantic 2 ²	24.8	24	0.27	+366	100	0	0	0	0	LC
S. Atlantic	No trend data		0.05	-	-	-	-	-	-	-
N. Pacific	No trend data		0.24	-	-	-	-	-	-	-
S. Pacific	No trend data		0.16	-	-	-	-	-	-	-
Indian ³	23.7	26	0.28	-99.3	0	0	0	0	100	CR
Global 1	-	-	-	-62.4	20.5	6.6	14.0	20.8	38.1	CR
Global 2	-	-	-	-50.9	36.0	4.5	9.1	13.5	36.9	CR

Data sources:

1. Jiao *et al.* 2011: Figure 4M2, page 2702;
2. J. Carlson unpubl. data;
3. Dudley & Simpfendorfer 2006: Figure 2, page 231.

e. Similarity of Appearance to Scalloped Hammerhead Shark

The great hammerhead shark warrants listing under the Endangered Species Act because it is in danger of extinction throughout all or a significant portion of its range, or likely to become so in the foreseeable future. 16 U.S.C. §§ 1532(6), (20). Even if NMFS determines that the species does not warrant listing under the traditional criteria, however, the agency still should list the great hammerhead under the Act pursuant to Section 4(e).

Section 4(e) of the Endangered Species Act provides that the Secretary may treat any species as an endangered species or threatened species “even though it is not listed pursuant to this section,” when

A) such species so closely resembles in appearance, at the point in question, a species which has been listed pursuant to such section that enforcement personnel would have substantial difficulty in attempting to differentiate between the listed and unlisted species; B) the effect of this substantial difficulty is an additional threat to an endangered or threatened species; and C) such treatment of an unlisted species will substantially facilitate the enforcement and further the policy of this chapter.

16 U.S.C. § 1533(e). The great hammerhead shark meets all three criteria and thus should be listed due to its similarity of appearance to the scalloped hammerhead shark, a species protected by the ESA since 2014 (*see* 79 Fed. Reg. 38,213).

First, as seen in Figure 1, below, the great hammerhead resembles the scalloped hammerhead shark so closely “that enforcement personnel would have substantial difficulty in attempting to differentiate between the listed and unlisted species.” 16 U.S.C. § 1533(e)(A). This similarity of appearance was recognized in the CITES Appendix II listing of the scalloped hammerhead, where the great hammerhead was listed as a “look-alike” species to be included under Appendix II as well. CITES CoP 15 Prop. 15 2010. In discussing the endangered status of the scalloped hammerhead shark, the IUCN similarly noted that the inability to readily distinguish the great hammerhead from the scalloped hammerhead was “a large obstacle in the proper assessment of [the scalloped hammerhead] species.” IUCN Red List 2012b.

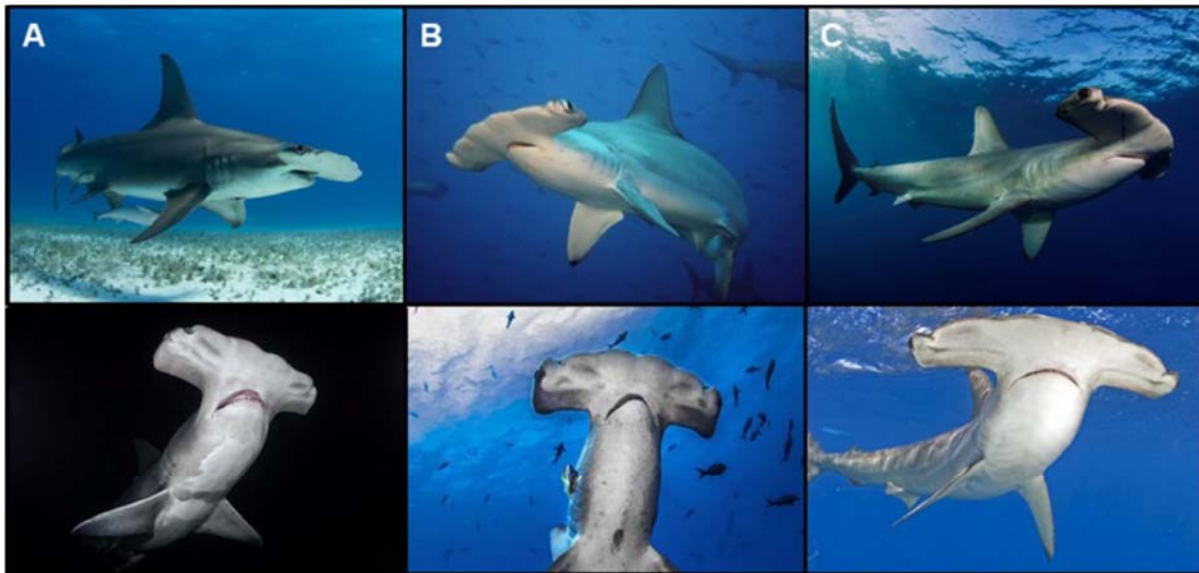


Fig. 1 Images of the three large hammerhead species: full body shots (above) and rostrum/cephalofoil (below): a great hammerhead [above: Austin Gallagher, below: Tanya Houppermans/Blue Elements Imaging], b scalloped hammerhead

[above: Tom Burns; below: Christopher Gillette], and c smooth hammerhead [above: Kyle McBumie; below: Chris Fallows]

Figure 1. Images demonstrating similarities between hammerhead species. From Gallagher & Kimley 2018.

This difficulty in differentiating between hammerhead shark species has been playing out in catch reporting for years. The similar appearance and cephalofoil head shape among the species of hammerhead sharks has often led to confusion as to which hammerhead species has been caught. As a result, catch numbers are typically reported at the genus level, e.g. *Sphyrna*, rather than determining which specific species of hammerhead has been killed. (Camhi *et al.* 2009, Abercrombie *et al.* 2004).

Furthermore, processing hammerhead sharks typically involves removing the fins and discarding the rest of the body.⁴ Thus many primary identification characteristics, such as fin placement and cephalofoil shape, are unavailable to enforcement personnel. The inability of enforcement personnel to discern between great and scalloped hammerheads from capture through processing jeopardizes efforts to protect the listed scalloped hammerhead shark from extinction.

Second, the difficulty in distinguishing between great hammerhead and scalloped hammerhead sharks presents “an additional threat to [the] endangered or threatened species.” 16 U.S.C. § 1533(e)(B). A failure to list the great hammerhead shark under the ESA would allow fishers to continue targeting the species—placing the scalloped hammerhead at increased risk of extinction. The morphological similarity of the two species and the resulting difficulty in differentiating between them means scalloped hammerheads inevitably will be captured in great hammerhead fisheries. Captured scalloped hammerheads may be finned and their carcasses disposed of; fishers could profit off of exploiting this endangered species since there is little risk of being caught (as described above). Failure to protect the great hammerhead under the ESA thus presents “an additional threat to” the listed scalloped hammerhead, 16 U.S.C. § 1533(e)(B).

Finally, protecting the great hammerhead under the ESA “will substantially facilitate the enforcement” of protections for the scalloped hammerhead. 16 U.S.C. § 1533(e)(C). First, there will be less incidental catch of scalloped hammerhead because fisheries will no longer be able to target the great hammerhead. Second, enforcement personnel will be able to more readily identify and prevent the catch of scalloped hammerheads because they will not have to distinguish between parts and products obtained from scalloped hammerhead and great hammerheads.

ESA listing of the great hammerhead would make enforcement of scalloped hammerhead protections more effective and efficient, furthering the goals of the ESA. Should NMFS determine that the great hammerhead does not deserve ESA protections on the merits (which it

⁴ While fins are the most profitable hammerhead products, these identification difficulties also exist for a multitude of other items derived from these sharks such as jaws, teeth, fishmeal, and liver oil.

does), the agency still should protect the species under the ESA pursuant to the Act's 4(e) similarity provision.

VI. The Great Hammerhead Shark Satisfies the Criteria for Listing Under the ESA

The Endangered Species Act (ESA), 16 U.S.C. §§ 1531 *et seq.*, was intended “to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, [and] to provide a program for the conservation of such endangered species and threatened species.” 16 U.S.C. § 1531(b). The protections only apply to species listed as endangered (“in danger of extinction throughout all or a significant portion of its range.” 16 U.S.C. § 1532(6); *see also* 16 U.S.C. § 533(a)(1)) or threatened (“is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” 16 U.S.C. § 1532(20). Under the Endangered Species Act, the term “species” includes “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.” 16 U.S.C. § 1532(16).

Under the ESA, NMFS “shall . . . determine whether any species is an endangered species or threatened species on the basis of any of the following factors:”

- a. Present or threatened destruction, modification, or curtailment of its habitat or range;
- b. Overutilization for commercial, recreational, scientific, or educational purposes;
- c. Disease or predation;
- d. Inadequacy of existing regulatory mechanisms; or
- e. Other natural or manmade factors affecting its continued existence.

16 U.S.C. § 1533(a). A species must only meet one of these factors to qualify for federal listing. 50 C.F.R. § 424.11.

As a benthopelagic species, the great hammerhead shark occupies most of the water column and is vulnerable to human activities from the surface to the seafloor (Thornburn et al. 2019). Dramatic declines in the species' wild populations have been primarily attributed to relentless overexploitation for human consumption and bycatch (Ribgy et al. 2019). Habitat degradation and a lack of critical legal and regulatory protections are exacerbating fishing pressures, driving the species toward extinction. The accumulation of past and present threats has resulted in an approximately 80% reduction in the great hammerhead shark population over the last three generations (approximately 71 years) (*Id.*). The factors threatening the great hammerhead are described in more detail below.

a. *Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range*

Habitat degradation and destruction pose an existential threat to great hammerhead sharks. Chondrichthyes (sharks and rays) like the great hammerhead are considered highly susceptible to anthropogenic pressures near coastlines and in offshore environments (Leonetti et al. 2020, at 1). Climate change and coastal development are especially harmful to the great hammerhead given the species' dependence on tropical and sub-tropical coral reefs.

i. *Climate Change Threatens the Great Hammerhead Shark with Extinction*

Habitat degradation and destruction associated with climate change threaten the great hammerhead shark with extinction. "Climate changes affect the physics and chemistry of the world's oceans and have the potential to alter every functional relationship in the marine food web either directly or indirectly" (Tester 1996, at 191).

For example, climate change is leading to significant alterations in phytoplankton biomass⁵ and shifts in species dominance (*Id.*). The importance of phytoplankton is immeasurable, as they are responsible for nearly 50% of global net primary production and are the primary energy source for aquatic ecosystems (Moisan *et al.* 2013). As the ecological foundation of the marine food web, phytoplankton support successive trophic levels such from zooplankton to zooplanktivorous fish to apex predators including sharks (Alberro 2014). Climate change-induced declines in phytoplankton thus reverberate up the food chain, impacting tertiary-level consumers such as great hammerhead sharks (*Id.*).

Ocean warming caused by greenhouse gas pollution also is wreaking havoc on reef ecosystems worldwide, including those that provide important habitat for great hammerhead sharks. The world's oceans have absorbed more than 90 percent of the excess heat caused by climate change, resulting in average sea surface warming of 0.7°C (1.3°F) per century since 1900. (USGCRP 2017). Scientific research definitively links anthropogenic ocean warming to the catastrophic, mass coral bleaching events that have been documented since 1980 and are increasing in frequency alongside increasing atmospheric CO₂ concentrations. (Hoegh-Guldberg *et al.* 2007; Donner *et al.* 2009; Eakin *et al.* 2010; NMFS 2015; Hughes *et al.* 2017; Hughes *et al.* 2018; Manzello *et al.* 2019; Cheng *et al.* 2019; Leggatt *et al.* 2019). Most reefs worldwide will suffer annual bleaching scenarios by 2050, and such events may occur sooner—perhaps in the next decade—in the Florida Keys. (van Hooijdonk *et al.* 2013; Hughes *et al.* 2018; Manzello *et al.* 2019).

⁵ An increase in global temperature reduces the turbulent mixing intensity in oceans, which is the leading factor in decreasing the total biomass of phytoplankton (Károlyi et al. 2020, at 612).

Exacerbating the harms from rising temperatures is ocean acidification. The global ocean has absorbed more than a quarter of the CO₂ emitted to the atmosphere by human activities, which has increased its surface acidity by more than 30 percent (Gruber *et al.* 2019, at 27; Dixson *et al.* 2014, at 1). This increase has occurred at a rate likely faster than anything experienced in the past 300 million years. (USGCRP 2017; Hönisch *et al.* 2012). Ocean acidity could increase 150 percent by the end of the century if CO₂ emissions continue unabated. (Orr *et al.* 2005; Feely *et al.* 2009). By reducing the availability of key chemicals (namely, aragonite and calcite), ocean acidification negatively affects corals by hindering their ability to build skeletons and by disrupting metabolism and critical biological functions. (Fabry *et al.* 2008; Kroeker *et al.* 2013). The synergistic impacts of warming and acidification accelerate coral reef decline (Pitts 2018; Dove *et al.* 2020).

In addition to threatening coral reef habitats, ocean acidification caused by climate change also threatens the great hammerhead shark directly. Acidified waters affect shark physiology and survivability in several ways, including by impacting “body condition, growth, aerobic potential and [behavior] (e.g. lateralization, hunting and prey detection)” (Dixson *et al.* 2014, at 6-7, Rosa *et al.* 2017). For example, one study showed that small-spotted catsharks (*Scyliorhinus canicula*) exposed to current carbon dioxide levels exhibited a “shift in their nocturnal swimming pattern from a pattern of many starts and stops to more continuous swimming” (Green & Jutfelt 2014).

Ocean acidification in conjunction with ocean warming harms sharks by increasing energetic demands while decreasing metabolic efficiency and reducing sharks’ ability to locate food through olfaction (Pistevos *et al.* 2015). The ramifications of increasing ocean acidification thus could result in reduced growth as well as reduced pup survival rates through a decreased ability to smell and, therefore, hunt (*Id.*). Additionally, acidic oceans may corrode the teeth of certain shark species, which would lead to higher mortality rates (Dziergwa *et al.* 2019).

Global climate change also increases the frequency and severity of environmental challenges in great hammerhead shark habitats. For example, sharks including great hammerheads utilize estuaries as nursery areas (*see* Macdonald *et al.* 2021). Estuarine areas offer resources needed for growth and development as well as protection from predators (Morash *et al.* 2016). At the same time, estuaries experience large decreases in salinity with big storm events—events that are on the rise as the global climate warms (*id.*). Large salinity changes serve as stressors for sharks because they are osmoconformers (meaning that maintain salinity levels similar to those of their ambient environment) (*id.*). Thus rapid changes in external salinity directly impact both shark physiology and behavior (*id.*).

ii. Coastal and Ocean Development Threatens the Great Hammerhead Shark with Extinction

Habitat degradation and destruction associated with coastal and ocean development threaten the great hammerhead with extinction. The placement of high voltage subsea cables represents one such development-related threat to the species. High voltage direct current subsea cables are believed to negatively impact the great hammerhead and other sharks across their migration lanes, especially when the sharks are feeding and navigating (Walker *et al.* 2020, at 9). The electric fields created by subsea cables affect predator/prey interactions; induce avoidance/attraction and other behavioral effects; alter species navigation/orientation capabilities; and affect species physiology and development (Taormina *et al.* 2018; Carter *et al.* 2009). Therefore, both the placement and utilization of subsea cables across migration lanes could harm great hammerhead sharks (Walker *et al.* 2020; Taormina *et al.* 2018).

As described above, coral reefs are exhibiting significant levels of deterioration due to climate change. Scientists believe this threat, in concert with other anthropogenic impacts, will lead to the loss of 70% of tropical and semi-tropical coral reefs--an important great hammerhead habitat--within the next 40 years (Eyre *et al.* 2018). The Caribbean already lost four-fifths of its coral reefs by 2003 with no signs of improvement since then. (*See Id.*).

Human-caused impacts to important coral reef habitats already are having profound impacts on shark populations. Such impacts include pollution, habitat degradation, prey depletion, and fishing (targeted, incidental, recreational, illegal) (Nadon *et al.* 2012). A recent University of Miami study found that reef shark numbers around populated islands, those where anthropogenic effects would be strongest, had dropped by more than 90% compared to those at the most pristine reefs. (*Id.*). The researchers found that “[t]he pattern – of very low reef shark numbers near inhabited islands – was remarkably consistent, irrespective of ocean conditions or region.” (*Id.* at 2). In short, as human population, especially human population located near coasts and coral reefs, continues to increase, sharks, especially those that depend on fragile coastal ecosystems like the great hammerhead, will continue to lose habitat. This loss of habitat puts great hammerheads at greater risk of extinction.

b. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Overexploitation is the overwhelming driver of marine biodiversity loss (McClenachan *et al.* 2012). Overfishing drives over one-third of all sharks and rays toward a global extinction crisis, and the great hammerhead is no exception (Dulvey *et al.* 2021). Range-wide overutilization is the primary factor driving the great hammerhead shark’s dramatic decline and fisheries pose the primary short-term threat to the species’ continued existence (Camhi *et al.* 2009; Rigby *et al.* 2019).

Great hammerhead sharks suffer substantial fishing-related mortality both as a targeted fishery species and as bycatch (Camhi *et al.* 2009). Commercial fishing operations target great hammerheads for their large and highly valuable fins (*Id.*). Both the size of their fins and the high needle count make great hammerhead fins highly prized in the shark fin trade. Hammerhead fins are a significant component of the fin trade and one of the preferred species for shark fin soup (Clarke *et al.* 2006a, Dent and Clarke 2015, Fields *et al.* 2018). In addition, the great hammerhead's meat, liver oil, skin, cartilage, and jaws may also be used (White *et al.* 2006, Lack and Meere 2009, Miller *et al.* 2014, Glaus *et al.* 2015, Rigby *et al.* 2019).

Great hammerheads frequently are taken as bycatch in longlines, bottom nets, hook-and-line and trawls. Bycatch threatens great hammerhead populations because the species has one of the highest bycatch mortality rates (> 90%) (Renshaw *et al.* 2012, Rigby *et al.* 2019). These “on-line mortalities” led the IUCN Shark Specialist Group on the Conservation Status of Pelagic Sharks and Rays to determine that “mandates for live release are not likely to be sufficient to offset fisheries mortality. Changes in fishing gear and methods, as well as the establishment of protected areas, are also needed to rebuild and conserve hammerhead populations.” (Camhi *et al.* 2009). Furthermore, due to their high-value fins, teeth, and jaws, it is likely that many great hammerheads that would have otherwise survive incidental capture are killed by fishers who profit by removing and selling their fins and other parts. These threats, coupled with the species' low reproductive rates, make great hammerheads particularly “susceptible to depletion.” (Rigby *et al.* 2019).

As a result of this overharvest, the IUCN recently found a global population reduction of great hammerhead sharks of >80% over three generation lengths (71.1–74.4 years) (Rigby *et al.* 2019). Great hammerhead populations have undergone steep declines in the Indian Ocean (median reduction of 99.3% over three generation lengths), Mediterranean Sea (an estimated decline of 99.99% in abundance and biomass since the early 19th century), and in the Atlantic prior to management measures⁶. There is a lack of data from the Pacific, limited regional representation of some time-series, intensive fisheries in data-poor regions that are suspected to have driven significant declines, and uncertainty about levels of exploitation that are potentially similar to those of the Scalloped Hammerhead (*S. lewini*) (which has also been assessed as globally Critically Endangered by the IUCN, and is listed under the ESA). The dramatic declines of great hammerhead populations around the world evidence the existential threat posed to this species by overexploitation.

c. Disease or Predation

⁶ Slow recovery may now be occurring in the Northwest Atlantic although there is a high degree of uncertainty in the data.

Neither disease nor predation pose known threats to the great hammerhead shark's continued survival and persistence. Hammerhead sharks may accumulate brevetoxins, heavy metals, and polychlorinated biphenyls in their liver, gill, and muscle tissues, as discussed below, but disease independent of toxic pollutants is likely not a factor in great hammerhead shark abundance. Predation is also not likely to influence great hammerhead abundance numbers.

d. Inadequacy of Existing Regulatory Mechanisms

Current conservation regulations are ineffective to ensure the survival of the great hammerhead shark.

International

International regulatory mechanisms have proven insufficient to conserve the great hammerhead shark. In 2019, in recognition of the dramatic population declines of the last half-century, the IUCN listed the great hammerhead as "critically endangered" throughout the globe. In its listing, the IUCN recommended that "all Great Hammerhead retention and landings be prohibited, at least as long as the global population is classified as Critically Endangered or Endangered. Initiatives to prevent capture, minimize bycatch mortality, promote safe release, and improve catch (including discard) reporting are also urgently needed, as is full implementation of additional commitments agreed through international treaties." (Rigby *et al.* 2019). While the IUCN's recognition of the great hammerhead's plight has brought attention to the species, the listing does not impose any enforceable restrictions on exploitation or otherwise ameliorate threats to the species' continued existence.

Other international guidelines also have proven insufficient to protect the great hammerhead. Several proposals to ban hammerhead landings and/or set regional hammerhead fishing limits through the Inter-American Tropical Tuna Commission (IATTC) have been defeated. In 2010, the International Commission for the Conservation of Atlantic Tunas (ICCAT) adopted recommendations prohibiting retention, transshipment, landing, and sale of great hammerheads (and other hammerhead species) for ICCAT fisheries operating in the Convention Area. There are exceptions for local consumption in developing countries, provided they cap catches, meet catch data reporting requirements, and ensure fins are not traded internationally. These recommendations were implemented by the United States. Despite implementation of these prohibitions, great hammerhead sharks have continued to decline in the Convention Area.

Also in 2010, the Western and Central Pacific Fisheries Commission (WCPFC) designated the great hammerhead as a 'key shark species.' This designation means that the species is a priority for conservation and management (WCPFC 2014). Designation is based on the threat to a species by fishing, how readily a species is identified, and how frequently it appears in logbooks

(*Id.*). The WCPFC has yet to adopt hammerhead catch limits in accordance with the designation, so it does not constitute a mechanism sufficiently protective for great hammerhead sharks (Rigby *et al.* 2019).

In 2012, the General Fisheries Commission for the Mediterranean (GFCM) banned retention and mandated careful release for the great hammerhead and 23 other elasmobranch species listed on the Barcelona Convention Annex II. Implementation by GFCM Parties, however, has been very slow, rendering these protections less effective than needed to halt the great hammerhead's decline.

In 2014, the great hammerhead was added to Appendix II of the Convention on International Trade in Endangered Species (CITES) based on its similarity to the scalloped hammerhead. The listing requires CITES Parties to ensure that exports be accompanied by permits declaring that parts are sourced from legal and sustainable fisheries.

In 2014, the great hammerhead was listed on Appendix II of the Convention on Migratory Species (CMS), which reflects Parties' commitments to work regionally toward conservation. The species is also covered by the CMS Memorandum of Understanding for Migratory Sharks, which is aimed at facilitating conservation. While helpful, these commitments are non-binding and thus insufficient to protect the great hammerhead shark from extinction.

National

National regulations likewise are inadequate to protect the great hammerhead shark from extinction. These regulations largely are limited to shark finning bans, which have been adopted in at least 19 countries, including the United States under the 2010 Shark Conservation Act. *See* Dulvy *et al.* 2008; 16 U.S.C. § 1857(P). However, such bans by themselves do not fully address the depletion of great hammerhead populations as they do not prohibit all targeted capture nor directly address the issue of bycatch. Enforcement of the bans also remains challenging.⁷ As NMFS recognized for scalloped hammerheads, "even with the increase and strengthening of finning bans, the lack of internationally enforced catch limits or trade regulations allows for the continued and unregulated fishing of scalloped hammerheads in international waters." NOAA 2014. This premise applies with equal force to great hammerheads.

Finning bans alone only address issues of cruelty and waste and do little to reduce the number of sharks caught and killed. This is particularly so in the case of great hammerhead sharks, which

⁷ One shortcoming of these finning bans is that they are typically enforced by monitoring the fin-to-carcass weight ratio. However, many ratios are too high to be effective and contain loopholes to allow the continued removal of fins from sharks at sea. Dulvy *et al.* 2008.

suffer extremely high bycatch mortality even when not finned. (Renshaw *et al.* 2012, Gallagher *et al.* 2014). Enforced catch limits are needed to truly reduce hammerhead population depletion (Dulvy *et al.* 2008). Indeed, NMFS emphasized that even though the United States recently strengthened its original finning ban with the 2010 Shark Conservation Act (requiring that all sharks be landed with fins naturally attached, *including* any fins purchased on the high seas), the need for “internationally enforced catch limits [and] trade regulations” remains. NOAA 2011b.

The great hammerhead shark also is part of the Large Coastal Shark complex management unit (one of three groups defined on the basis of ecology and fishery dynamics for assessment and regulatory purposes) in the NMFS Federal Fisheries Management Plan for Atlantic Tuna, Swordfish and Sharks. However, this plan has no specific provisions for fishing of great hammerheads and thus does not constitute a regulatory mechanism sufficiently protective of this species.

In sum, existing regulatory mechanisms for managing great hammerhead sharks are woefully inadequate. As the IUCN stated, “[t]o allow recovery, it is recommended that all Great Hammerhead retention and landings be prohibited.” (Rigby *et al.* 2019). In addition, “Initiatives to prevent capture, minimize bycatch mortality, promote safe release, and improve catch (including discard) reporting are also urgently needed, as is full implementation of additional commitments agreed through international treaties.” *Id.* Current national and international regulatory mechanisms fall far short of these goals.

Protection under the Endangered Species Act would go a long way toward filling this regulatory vacuum. First, listing the great hammerhead as “threatened” or “endangered” would directly protect the populations in the Northwest and Western Central Atlantic region and in territorial waters in the Pacific, where the great hammerhead would be under U.S. jurisdiction. 16 U.S.C. § 1538(a)(1). Second, listing would prohibit the import or export of great hammerheads and their parts to or from the United States. *Id.* § 1538(a)(1)(A). Finally, listing would encourage international efforts to protect the great hammerhead by providing financial and technical assistance in developing conservation programs, as well as law enforcement assistance. *Id.* § 1537.

e. Other Natural or Manmade Factors Affecting Continued Existence

The effects of pollution on Chondrichthyes species are understudied (Consales & Marsili, *Assessment of the Conservation Status of Chondrichthyans: Underestimation of the Pollution Threat*, at 165). However, as top predators, sharks are prone to the accumulation of high levels of toxic pollutants (Kibria & Haroon 2015, at 1).

Sharks’ position as an apex predator increases their exposure to contaminants that bioaccumulate and biomagnify up the food chain. In sharks, compounds like DDT are stored in the liver and

passed from mother to her pups, leaving the pups plagued with DDT poisoning (Kibria & Haroon 2015, at 5, 7). Indeed, a “significant positive relationship [has been] found between [young of the year (YOY)] contaminant loads and maternal trophic position, suggesting that trophic ecology is one factor that plays an important role in maternal offloading” (Lyons *et al.* 2013, at 27). Since these toxic contaminants are already present in the oceans and persist for extended periods of time, DDT, PCBs, and PFAS represent both present and future threats to the great hammerhead shark (*See generally* Kivenson *et al.* 2019, at 2971).

In light of research on similar species, exposure to and bioaccumulation of DDT and other pollutants likely have played a role in the great hammerhead shark’s decline. Studies have revealed elevated levels of both inorganic and organic micropollutants in sharks’ muscle and liver, including heavy metals (e.g., mercury, cadmium, arsenic, lead) and various persistent organic pollutants (e.g., polychlorinated biphenyls (PCBs), polychlorinated dibenzo furans (PCDFs), polychlorinated dibenzo-p-dioxins (PCDDs), and pesticides, including DDT and hexachlorobenzene) (Kibria & Haroon 2015, at 1; Torres 2017). Adverse health effects in high trophic level species including sharks are associated with the exposure of persistent organic pollutants and dioxin-like compounds in particular (Ross & Birnbaum 2003, at 305).

Accumulation of these toxins may make shark species susceptible to long-term effects such as interference with secretions from the rectal gland, changes in heart function, changes in blood parameters, inhibition of DNA synthesis, disruption of sperm production, and death (*Id.*, at 10). Increased pollutant exposure leads to diminished appetite, lowered swimming activity, starvation, and even mortality (*Id.*). Exposure of marine animals including sharks to persistent organic pollutants (PCBs, DDT) may cause negative effects including birth defects, high infertility rates, endocrine disruption, and other reproductive problems (*Id.*). In addition to hindering reproductive success, sharks harboring high contaminant loads may be at risk of immune system dysfunction. Otherwise non-threatening diseases may pose an acute or chronic health risk due to sharks’ immune systems operating at suboptimal levels. Warmer sea temperatures associated with climate change could trigger aggressive proliferation of bacteria, further exacerbating the threat of immunosuppression (Sawyna *et al.* 2017, at 49). In sum, contaminants appear to pose a risk to great hammerhead sharks, increasing their risk of extinction.

VII. Critical Habitat Designation

The ESA mandates that, when NMFS lists a species as endangered or threatened, the agency also concurrently designate critical habitat for that species. 16 U.S.C. § 1533(a)(3)(A)(i); *see also id.* at § 1533(b)(6)(C); *see also Weyerhaeuser Co. v. United States Fish & Wildlife Serv.*, 139 S. Ct. 361 (2018) (stating that the ESA “directs the Secretary of the Interior, upon listing a species as endangered, to also designate the ‘critical habitat’ of the species.”).

The ESA defines “critical habitat” as:

- a. [T]he specific areas within the geographical area occupied by the species . . . on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and
- b. [S]pecific areas outside the geographical area occupied by the species . . . upon a determination by the Secretary that such areas are essential for the conservation of the species.”

Id. at § 1532(5)(A).

The Center expects that NMFS will comply with this unambiguous mandate and designate critical habitat concurrently with the listing of the great hammerhead shark. That habitat must include, but should not be limited to, the potential nursery grounds of Biscayne Bay, Florida, identified by Macdonald *et al.* (2021).

VIII. 4(d) Rule

Should NMFS determine after conducting a status review that listing the great hammerhead shark as “threatened” is warranted, the Center requests that the agency simultaneously issue a 4(d) rule outlining necessary and advisable regulations for the species’ conservation. As part of this 4(d) rule and in light of the threat posed to the great hammerhead shark by trade, Petitioners urge NMFS to extend to the great hammerhead shark all prohibitions of ESA Section 9, including bans on taking, imports, exports, sale in interstate or foreign commerce, and transport (applying the existing limited exceptions to promote science and restoration as provided in ESA Section 10) and to promulgate additional protective regulations needed for survival and recovery of the great hammerhead shark.

IX. Conclusion

Overexploitation for fins, meat, and liver oil, bycatch, habitat degradation, inadequate regulatory mechanisms and other manmade factors, including contaminants, pose existential threats to the great hammerhead shark’s continued existence. As such, the great hammerhead meets the criteria for listing under the ESA. The great hammerhead’s similarity of appearance to the scalloped shark also justifies listing under the Act. Listing is essential to ensure the shark’s survival and persistence.

The Center requests the great hammerhead shark be listed as endangered under the ESA and requests that NMFS designate critical habitat for the species within U.S. waters. Listing will significantly improve the species' conservation prospects by reducing key threats and by increasing global awareness, catalyzing additional research, and forging national and international conservation partnerships to conserve this imperiled species. The Center urges NMFS to grant the actions requested herein without delay.

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