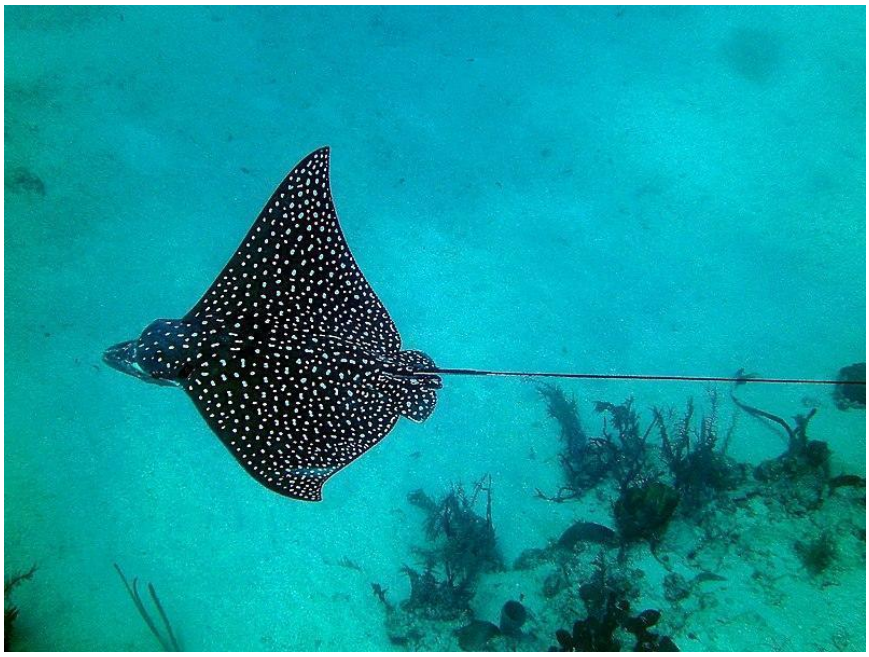
Petition to List the Whitespotted Eagle Ray (*Aetobatus narinari*)
As Endangered or Threatened
Under the Endangered Species Act



Whitespotted Eagle Ray. Photo: Nicholas Lindell Reynolds

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

April 6, 2023

Petitioners:

DEFEND THEM ALL FOUNDATION

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NOTICE OF PETITION

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Pursuant to the Endangered Species Act ("ESA"), 16 U.S.C. § 1533(b), the Defend Them All Foundation submits to the Secretary of Commerce and the National Marine Fisheries Service ("NMFS") a petition to list the whitespotted eagle ray (*Aetobatus narinari*) 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.* Petitioner does not need to demonstrate that the listing is warranted, but rather that the information presented demonstrates that such action *may* be warranted. Petitioners believe the best available scientific information demonstrates that listing the whitespotted eagle ray as endangered is warranted, and the available information clearly indicates that listing the species may be warranted. Therefore, NMFS must promptly make a positive finding on the Petition and commence a status review, as required by 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 blocks below.

Sincerely,

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Acknowledgements

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Hunter Collins, University of San Diego School of Law
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I. Legal and Regulatory Framework

The Defend Them All Foundation 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 whitespotted eagle ray (*Aetobatus narinari*) as endangered under the 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 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 Citations 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 whitespotted eagle ray'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 proposes to list the whitespotted eagle ray as threatened, Petitioners ask that the agency promulgate a final 4(d) rule to confer full take protections on the species concurrent with 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 whitespotted eagle ray is listed as endangered or threatened, Petitioners ask that NMFS promulgate a 4(e) rule for species similar in appearance to the whitespotted eagle ray. 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.

II. Background Summary

The whitespotted eagle ray (*Aetobatus narinari*), also known as the spotted eagle ray, is a large marine batoid found throughout the Atlantic Ocean in tropical to warm-temperate waters(Sellas et al. 2015, at 2). In the Western Central and Southwest Atlantic, it ranges from the Chesapeake Bay, USA, to Rio de Janeiro, Brazil, including the Gulf of Mexico, the Bahamas, and the Caribbean Islands; in the Eastern Central and Southeast Atlantic, this species is thought to range from Mauritania south to Angola, and possibly South Africa (Dulvy et al. 2021, at 2; Tagliafico et al. 2012, at 307; Smith & Merriner, at 18). The whitespotted eagle ray primarily inhabits shallow nearshore waters, in areas such as estuaries, lagoons, and bays, but is also found in coral reef ecosystems up to a 200-foot depth (Dulvy et al. 2021, at 1; Desgarnier et al. 2022, at 1). The whitespotted eagle rays are thought to have a lifespan of 15 to 20 years (Boyd 2017). The live-bearing species has a low regeneration rate, with litters ranging between 1-5 pups, with an average of 3, produced after a 12-month gestation period (Dulvy et al. 2021, at 7).

The whitespotted eagle ray is intrinsically sensitive to anthropogenic threats due to its low regeneration rate, slow growth, and late maturity (*See* Frisk et al. 2005, at 27). Whitespotted eagle rays were heavily fished in the past, and fishery pressure throughout the species' range has intensified (Dulvy et al. 2021, at 9). Population numbers continue to decline, with an

estimated 50-79% global population reduction over the last three generation lengths (30 years) (*Id.* at 2). Despite this persistent decline, whitespotted eagle rays still are caught in targeted traditional gillnet fisheries as well as in industrial shrimp trawl fisheries as bycatch (*Id.* at 2; *National Bycatch Report*, National Oceanic and Atmospheric Administration, at 185, 191, 199).

The whitespotted eagle rays' swimming patterns throughout the water column leave them vulnerable to varieties of fishing mechanisms (Dulvy et al. 2021, at 8). Rays have a high risk of extinction, and are "threatened primarily by overfishing, with benthic species being particularly susceptible to trawl and gill net fisheries and semi-pelagic species being vulnerable to longline and drift net fisheries" (Flowers et al. 2021, at 106). The whitespotted eagle ray continues to face fishing pressures, both within the United States territories and globally, leading to population declines most attributed to destructive fishing practices, coastal and ocean development, climate change, overutilization, inadequate existing regulatory processes, and noise and chemical pollution (Dulvy et al. 2021, at 8–9).

The IUCN categorizes the whitespotted eagle ray as Endangered[1] based on its estimated 50-79% global population reduction over the last three generation lengths (30 years) (*Id.* at 2). In the southern Gulf of Mexico alone, the species is estimated to have reduced by 38% over three generations (*Id.*). This species is highly threatened by extinction due to overfishing from industrial and traditional fisheries (*Id.*; *National Bycatch Report*, National Oceanic and Atmospheric Administration, at 185, 191, 199).

The whitespotted eagle ray is a key part of the intermediate trophic level and an important part of the food web as both predator and prey (See Barnett et al. 2010, at 189). "A diverse array of organisms feed on rays including other elasmobranchs, teleosts, mammals, birds, invertebrates and reptiles," as well as sharks. (Flowers et al. 2021, at 110). The diet of the whitespotted eagle ray is primarily bivalve and gastropod mollusks, "but it also consumes cephalopods, crustaceans, and teleost fishes," thereby keeping these species' populations near equilibrium (Tagliafico et al. 2012, at 307; see also Flowers et al. 2021, at 113; Ajemian et al. 2012, at 1).

As a bioturbator, the whitespotted eagle ray excavates and disturbs sediments up to a depth of 15 cm, which creates pits and contributes to a healthy marine ecosystem (Suchanek & Colin 1986, at 29; Flowers et al. 2021, at 114). More specifically, ray feeding activity creates "abiotic and biotic changes in the surrounding environment," displacing sediment, disturbing the benthos, and affecting infaunal community structure (Flowers et al. 2021, at 114, 116). The effects of ray disturbance lead to the "accumulation of organic matter and nutrient concentrations in feeding pits," the "recolonization of infauna into the pits," and enhanced "foraging opportunities for teleosts" (*Id.* at 115).

Whitespotted eagle rays exhibit a variety of interesting behaviors. For example, they form symbiotic relationships with numerous species, like octopus and pink whiprays (*Pateobatis fai*,

[1] IUCN classifies the *Aetobatus narinari* as "Endangered," or "when the best available evidence indicates that it … [is] considered to be facing a very high risk of extinction in the wild," on July 28, 2020 (*IUCN Red List Categories and Criteria Version 3.1*).

Dasyatidae), which use the backs of stingrays to “piggy-back” or “hitchhike” to “facilitate travel or reduce predation risk” (Flowers et al. 2021, at 116). The whitespotted eagle ray also exhibits unique swimming behavior patterns, using “deeper [waters] during the day and shallower portions during the night,” and moving faster while in “ocean and lagoonal habitats" than in “channels and inlets” (DeGroot et al. 2020, at 109, 121). Inlet and channel habitats used for clam aquaculture contain relatively greater concentrations of whitespotted eagle rays, leading to increased risk for the species in these waters (*Id.* at 109, 121).

While fishing pressure is a major concern, habitat loss, water quality, climate change, and public perception of stingrays are also believed to be driving the species to extinction (Dulvy et al. 2014, at 2). Because this species routinely enters estuaries and occurs close to shore, the species is threatened by pollution, dredging, and habitat loss (*Id.*). The species is also captured for display in aquariums; however, limited information is available regarding the take rates (Dulvy et al. 2021, at 8-9). Despite a lack of information regarding the full extent of aquarium trade on the whitespotted eagle ray, the ray is held in many aquariums throughout the world (Swider et al. 2017, at 434). In fact, “[s]ince the opening of the first public aquarium in the mid-19th century, elasmobranchs have been popular exhibit animals” (*Id.*). Severe population fragmentation and the continued decline of mature whitespotted eagle rays threaten the species (Dulvy et al. 2021, at 7). With narrow depth ranges, low fecundity, heavy fishing, by-catch, and habitat degraded by anthropogenic and climate changes (such as coral bleaching), the whitespotted eagle ray is under severe threat.

The Petitioners request the listing of the whitespotted eagle ray as “endangered” under the U.S. Endangered Species Act (ESA) and the concurrent designation of critical habitat for the species within U.S. waters. An ESA listing would significantly improve the species’ survival prospects by curtailing present or threatened destruction of habitat, preventing overutilization for commercial and recreational purposes, strengthening inadequate existing regulatory mechanisms, and remedying natural and manmade factors, including noise and human disturbances, affecting the whitespotted eagle ray’s continued existence. In addition, ESA listing would increase global awareness of the species, assist research efforts, stimulate scientific funding, and provide financial, legal, and political assistance to local and international partnership conservation efforts concerning the whitespotted eagle ray.

III. Species Characteristics

Common Names

Whitespotted Eagle Ray, Bonnetray, White-spotted Eagle Ray (Dulvy et al. 2021, at 1).

Taxonomy

Kingdom	Animalia
Phylum	Chordata
Class	Chondrichthyes
Order	Myliobatiformes
Family	Aetobatidae
Genus	*Aetobatus*
Species	*narinari*

(Euphrasen, 1790)

Synonym

Raja narinari (Euphrasen, 1790).

Aetobatus narinari was previously identified as having a complex of cryptic lineages (Sales et al. 2019, at 170). Following a phylogenetic analysis using mitochondrial and nuclear markers and relation to previously analyzed specimens, Sales *et al.* (2019) suggested a modification of taxonomic status (*see generally id.*). Specifically, Sales *et al.* (2019) raised questions regarding the taxonomy of specimens previously identified as *A. narinari* off Africa and concluded that the species is restricted to the Western Atlantic. However, in their subsequent taxonomic analysis for the IUCN Red List, Dulvy *et al.* (2021) conclude that the species' range does in fact extend to the eastern Atlantic based on a review of Fricke *et al.* (2020). This petition adopts the taxonomy of Dulvy *et al.* (2021) in reliance on Fricke *et al.* (2020).

Morphological Description

The whitespotted eagle ray *(Aetobatus narinari)* is angular and thick, has a broad round flat snout, similar to a duck's bill, large spiracles located directly behind its eyes, and pointed tip pectoral fins (*Spotted Eagle Ray*, Georgia Aquarium). Inside the mouth is a "single row of broad, flat teeth in each jaw that combine to form upper and lower plates for crushing its shelled prey" (*Id.*). The whitespotted eagle ray is known for its unique pattern of white spots across its back, which is generally black, dark gray, or blue, while the underside is white (*Id.*). The skin is smooth and "lacks significant denticles or thorns" (*Id.*). Whitespotted eagle rays can weigh up to

507 pounds and reach a length of up to 8.2 feet (2.5 m) not including the tail, which can add up to 2.5-3x the width of the disc when undamaged (*Id.*).[2]

Habitat, Range, and Migratory Behavior

The whitespotted eagle ray's range is limited to the Atlantic Ocean (Dulvy et al. 2021, at 1). Along the Western Atlantic, the species can be found from "Cape Hatteras, North Carolina, USA to Rio de Janeiro, Brazil, including the Gulf of Mexico, the Bahamas, and the Caribbean Islands" (*Id.*). In the Eastern, Central, and Southeast Atlantic this species is believed to "range from Mauritania south to Angola, and possibly South Africa" (*Id.*).

Whitespotted eagle rays are primarily found in the neritic zone, starting at the edge of the low-tide mark and extending to the edge of the continental shelf, in tropical to warm-temperate waters (Dulvy et al. 2021, at 16; H. Asmus & R. Asmus 2011, at 3, 8). The species can be found in lagoons and estuaries, and is commonly associated with coral reef ecosystems. (Dulvy et al. 2021, at 1). They are "benthopelagic over the continental shelf[,] from the surface to 60 m depth" (*Id.*). The species' frequented habitat is often considered to be a "Hard Bottom" habitat, which includes "mixed communities of algae, sponges, octocorals[,] and stony corals," occurring in "subtidal, intertidal, and supratidal zones" (*Hard Bottom*, Florida Fish and Wildlife Conservation Commission, at 296). These "biological communities are structured by depth and latitude and inhabited by sessile, planktonic, epifaunal, and pelagic plants and animals," with "infaunal organisms … present in [the] interstitial soft bottom substrate" (*Id.*). Not only do whitespotted eagle rays feed in benthic environments, but the species has also been recorded resting for approximately 30 minutes, during which no animal movement occurred (Flowers and Kelley 2020, at 122). Whitespotted eagle rays provide a link between apex predators and lower trophic levels.

Whitespotted eagle ray populations may be resident or migratory/transient (Sellas et al. 2015, at 1; Brewster et al. 2020, at 2). For example, Gulf Coast whitespotted eagle rays exhibit increased migratory and transient behaviors when compared to Atlantic Coast rays, which remain primarily within the Indian River Lagoon (DeGroot et al. 2021, at 17). As a result, Atlantic Coast rays spend greater than five times the amount of time inshore, regardless of size, than Gulf coast rays (*Id.* at 10). "Immature [Atlantic Coast] rays spen[d] significantly more time," about 91.5 percent, "inside the [Indian River Lagoon] compared to [their] mature counterparts," about 60.2 percent (*Id.* at 1). The rays of the Gulf Coast "conduct repetitive annual migration patterns, heading south from Sarasota[, Florida,] starting in fall and returning to the area in early Spring" (*Id.* at 17). This trend provides the potential for mature whitespotted eagle rays to be caught outside of protected areas, thereby putting the species at increased risk of extinction.

[2] This Petition uses the maximum weight of 507 lbs in weight conversions.

Map (Dulvy et al. 2021, at 4).

United States Territory (Dulvy et al. 2021, at 4).

Biological Characteristics

Whitespotted eagle rays are benthivorous, hard-prey specialists that feed mostly on bivalves, gastropods, and large crustaceans by using their mandible and specialized jaws to crush their shells (Ajemian et al. 2012, at 13; Serrano-Flores et al. 2018). In foraging for food, whitespotted eagle rays use their long, bill-like snouts to stir up and restructure seabed sediment, eliminating particles through their gills: a process—known as bioturbation—providing smaller predators with access to otherwise buried invertebrates (Suchanek & Colin 1986, at 29). It is not uncommon for small fish to trail eagle rays for increased foraging opportunities (Flowers et al. 2021, at 116). Bioturbation results in the “nutrient release from the sediment into the water column,” providing “an important ecosystem function” by “fuelling planktonic primary production” (Biles et al. 2002,

at 999). For this reason, whitespotted eagle rays are considered a key component of a marine ecosystem.

Whitespotted eagle rays are believed to prefer foraging solitarily, but may swim in schools for social and migratory purposes (Ajemian et al. 2012, at 15; Aetobatus narinari - Spotted Eagle Ray, University of the West Indies).

Whitespotted eagle rays have a low reproductive capacity and late maturity (occurring at approximately four to six years) causing them to be highly vulnerable to overfishing (Cerutti et al. 2018, at 237; Dulvy et al. 2021, at 7; Swider et al. 2017, at 437; Bassos-Hull et al. 2014, at 1054; DeGroot et al. 2021, at 18). Reproduction is "matrotrophic viviparous and litters [are between] 1-5 pups, with an average of 3 produced annually after a 12-month gestation" (Dulvy et al. 2021, at 7). Male whitespotted eagle rays reach maturity at approximately 127-129 cm in disc width; females mature at 134.9 cm in disc width (Dulvy et al. 2021, at 7). In Brazil a recent study found 50% of the males were mature at 115.6 cm in disc width; for females it was 129.4 cm (Araújo et al. 2022).

Population Status and Trends

The whitespotted eagle ray's global population is estimated to have undergone a dramatic reduction of 50–79% over the past three generation lengths (30 years) due to unsustainable levels of exploitation (Dulvy et al. 2021, at 7). While the rate of decline varies by location, a downward trend has been observed and is expected to continue if conservation measures are not established. Thus, the IUCN Red List categorizes the species as "endangered" globally (*Id.* at 1).

Western Central Atlantic:

Directed fisheries for whitespotted eagle rays are not well described throughout the species' range in the Western Central Atlantic, but are known to occur in Mexico, Cuba, and Venezuela (Dulvy et al. 2021, at 5). In these locations, there has been a continued decline of annual catch rates for some these fisheries (*Id.*). In the southern Gulf of Mexico, for example, fishers report 30-40 rays per night/trip from 1990-2000 but only 10-15 rays per night/trip in 2019 (*Id.*). This is reflected in data from Mexico, which suggests an annual rate of decline of 0.95% from 2000-2014 (*Id.*). Region-wide, the population appears to be growing, albeit slowly (1.32% annually) (*Id.*).

Despite the apparent localized and limited increase in whitespotted eagle ray within the Gulf region, the species continues to decline elsewhere (*Id.*). Venezuela and Guianas both have declining levels of whitespotted eagle rays due to the level of fishing pressure (*Id.*). Data in other countries where the whitespotted eagle ray is encountered, such as Colombia, is limited (*Id.*).

The IUCN states that whitespotted eagle ray "may be stable" in U.S. waters (Id. at 2). Concern over the species' trajectory in domestic waters remains a concern, however, because migrations

take U.S. eagle rays to countries where the species is declining (*Id.*). A study off the Florida coast, for example, indicated an "overall decrease in the numbers of spotted eagle rays observed on a yearly basis in both … aerial and boat-based surveys from 2008 to 2013" (Bassos-Hull et al. 2014, at 1051). Additionally, "small-scale, directed fisheries in the southern Gulf of Mexico and northeastern Venezuela that capture juvenile, mature, and pregnant individuals are a concern for the viability" of the whitespotted eagle ray population (Tagliafico et al. 2012, at 315). The international migrations of the Florida-based whitespotted eagle ray population exposes these individuals to substantial threats and contributes to the endangerment of the species.

Map (Dulvy et al. 2021, at 4).

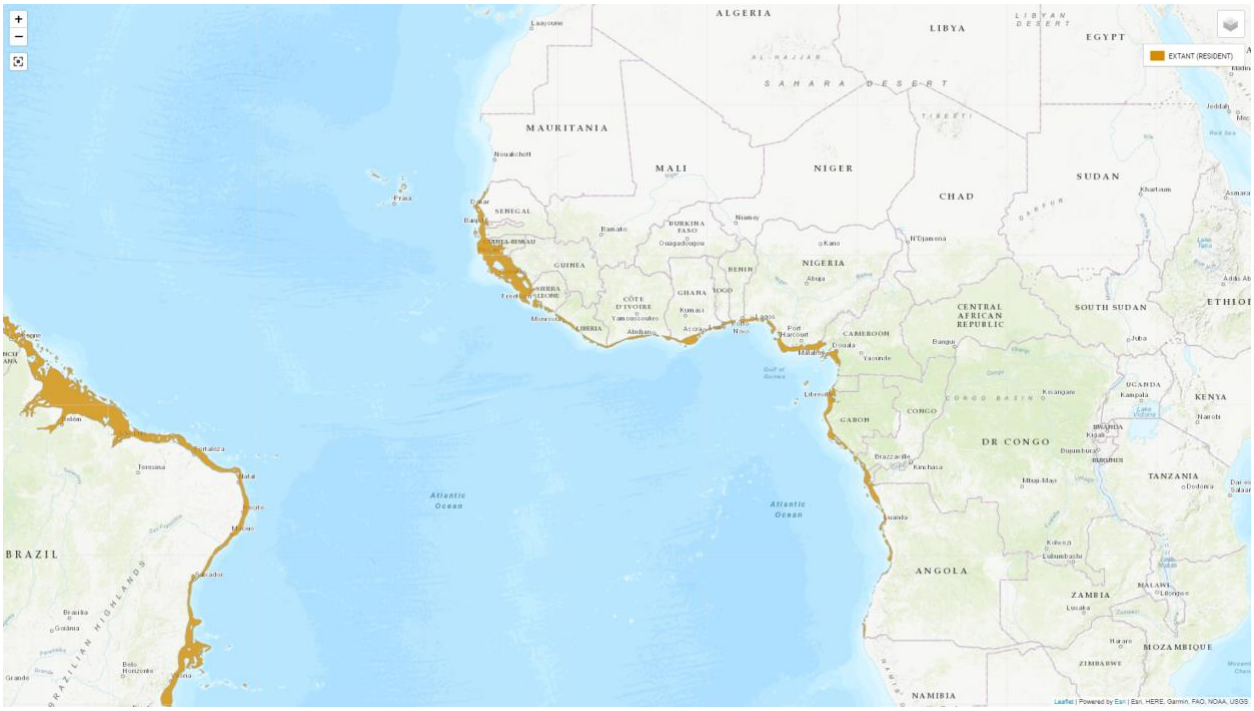
Southwest Atlantic:

"In the Southwest Atlantic, commercial and artisanal fisheries are intense, unmanaged," and have contributed to documented levels of decline in many fishery species (Dulvy et al. 2021, at 2). Available evidence suggests declines of whitespotted eagle ray populations (*Id.*). For example, the whitespotted eagle ray was "commonly caught in gillnets in 1995 in Pernambuco (Brazil), but landings have declined by about 80% since then" (*Id.*). Fishery monitoring that "occurred in São Paulo between 1996 and 2002 only recorded five individual[]" whitespotted eagle rays, and "fishers confirmed in interviews that the species has declined there" (*Id.*). It is suspected that this species has "undergone a population reduction of 50–79% over the past three generation lengths (30 years) in the Atlantic South American part of its range" (*Id.*).

Map (Dulvy et al. 2021, at 4).

Eastern Central and Southeast Atlantic:

In Eastern Central and Southeast Atlantic, “there have been very few records of this species over the past decade from the Republic of Congo and Gabon” (Dulvy et al. 2021, at 2). There are no relevant “records of this species in Mauritania, Senegal, Gambia, Guinea-Bissau, Sierra Leone, Côte d'Ivoire, Gabon, Nigeria, Cameroon[,] or Angola” (*Id.*). “The lack of recent sightings, despite numerous records of other rays with similar biology and catchability, suggest this species may have largely disappeared from West Africa” (*Id.*). Thus, scientists believe a “population reduction of more than 80% has occurred in the past three generation lengths (30 years)” (*Id.*).



Map (Dulvy et al. 2021, at 4).

Globally:

Catches of whitespotted eagle ray are believed to be “positively influenced by winter cold fronts, turbidity, low sea temperature, and the new moon phase,” but “negatively influenced by the presence of cownose rays *Rhinoptera bonasus*” (Cuevas-Zimbrón et al. 2011, at 723). Variation in the species’ groupings–by size, sex, and maturity–indicate that the species group together based on characteristics (*Id.*). These groupings make the whitespotted eagle ray particularly vulnerable to significant harm by fisheries, as a fishery has the potential to capture population members of similar size, sex, and/or maturity, thereby eliminating the reproductive members of the population.

Map (Dulvy et al. 2021, at 4).

The Whitespotted Eagle Ray satisfies the criteria for listing as an Endangered Species

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, the 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 species that occurs in coastal inshore waters where fishing pressure is substantial, the whitespotted eagle ray is vulnerable to human activity (Dulvy et al. 2021, at 8). Dramatic declines in the species' wild populations have been primarily attributed to the continued overexploitation of the species as target and bycatch in fisheries (*Id.*). Habitat degradation and a lack of comprehensive critical legal and regulatory protections are further exacerbating pressures driving the species to extinction (*Id.* at 9-10). The accumulation of past and present threats has resulted in an approximately 50-79% reduction in the global whitespotted eagle ray population over the last three generations (30 years) (*Id.* at 2).

A. Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

Chondrichthyes (sharks and rays) are considered highly susceptible to anthropogenic pressures near coastlines and in offshore environments (Leonetti et al. 2020, at 1). This is especially true for migratory species like the whitespotted eagle ray, which are susceptible to threats range wide (Dulvy et al. 2021, at 9-10; DeGroot et al. 2021, at 17). Destructive fishing practices, coastal development, and climate change are especially harmful to the whitespotted eagle ray due to its swimming and feeding behaviors, as well as to the benthic ecosystems upon which the rays rely (Dulvy et al. 2021, at 9; Branch et al. 2013, at 178).

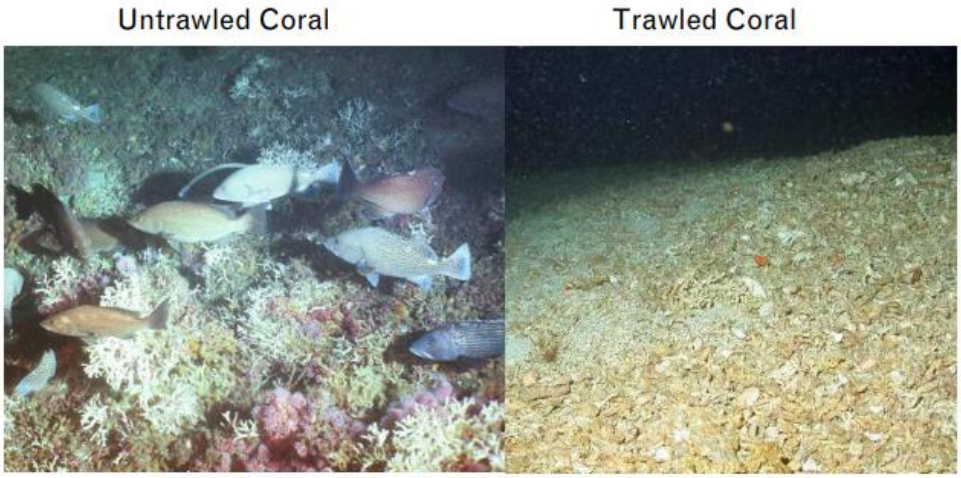
i. Destructive Fishing Practices

Bottom trawling, a fishing technique which uses "heavily weighted nets that are dragged across the ocean floor" and can be "as large as 40 feet tall and 200 feet wide," decimates coastal habitats (Stiles et al. 2010, at 1). This widespread fishing practice accounts for 26 percent of total marine fisheries catch and is most intense in territorial seas, which are within 12 nautical miles from shore (Steadman et al. 2021, at 5). When compared to other fishing gears, the environmental impacts of bottom trawling are uniquely challenging, as it is "linked to all three of the major impacts of fishing on marine biodiversity: overfishing, bycatch, and seabed contact" (*Id.*).

The seafloor is shaped by many factors: the "rocks, sand, or mud which make up the seabed"; the "living organisms that provide structure, such as seaweeds, sponges[,] and mollusks"; and "biological activities[,] such as digging and burrowing by clams, worms, and sea anemones, which create spaces within and oxygenate the seafloor sediment" (*Trawling Takes a Toll*, American Museum of Natural History). The organisms that contribute to this complex ecosystem are "scarce, slow-growing, long-lived, and do not quickly replace themselves if removed or killed" (*Id.*). The two biggest threats to this environment are: (i) the reduction of species through "permanently removing the fish, and other animal and plant species on which they feed, from the ocean bottom"; and (ii) the "killing [of the] species outright," through the use of gear, which "crushes, buries, or exposes organisms" (*Id.*).

“A single pass of a beam trawl, the heaviest gear routinely used in shelf sea fisheries, can kill 5-65% of the resident fauna and mix the top few [centimeters] of sediment” (Duplisea et al. 2001, at 1). Trawling “removes and reduces biogenic structures,” “reduces seabed formations … that provide shelter,” and “overturns and displaces” the environment (*Trawling Takes a Toll*, American Museum of Natural History).

Trawling also disturbs the bottom sediment and geochemical cycling, causing the water to become murky, thereby diminishing photosynthesis in shallow waters and making it more difficult for those species that use sight to hunt for food and cause filter-feeding animals to consume particles with no nutritional value, such as sand (*Id.).* Toxins can also become “exposed and circulated,” leading to their further dispersal throughout the ocean habitats (*Id.*). A field study in a Norweign fjord found that a 1.8 km long trawl pass created a “3-5 million m^3 sediment plume[,] containing around 9 t of contaminated sediment,” equivalent to “c. 10% of the annual gross sedimentation rate” and resulted in “[polychlorinated dibenzo-p-dioxins and -furans] from the sediments [to be] taken up by mussels which, during one month, accumulated them to levels above the EU maximum advised concentration for human consumption” (Bradshaw et al. 2012, at 232). Food availability or quality for bottom-feeders can also diminish through the redistribution of high-quality food particles and nutrients and the consequential shift in regional nutrient cycling as a result of trawling (*Trawling Takes a Toll*, American Museum of Natural History). Thus, trawling is “among the most serious” threats to the ocean (*Id.*). It degrades and destroys critical whitespotted eagle ray habitat and reduces foraging opportunities for the species.



Source: Stiles et al., *Impacts of Bottom Trawling*, OCEANA (2010)

In addition to trawling, local anthropogenic threats such as dredging, are especially harmful to the whitespotted eagle ray because of the species’ site affinity (DeGroot et al. 2021, at 18). Along with the possible direct mortality of marine fish caused by dredging, the suspended sediment causes increased physiological stress and sublethal responses, which creates behavioral changes and impacts foraging and predation (Wenger et al. 2016, at 973–76).

Additionally, dredging can release an array of contaminants into the marine environment including "[h]ydrophobic contaminants, such as legacy persistent organic pollutants (POPs; including PCBs, polybrominated diphenyl ethers [PBDEs], organochlorine pesticides OCPs, dioxins PCDDs, furans PCDFs) and high-molecular weight polyaromatic and aliphatic hydrocarbons (PAHs)," and metals (*Id.* at 977–78).

Noise impacts from dredging may also harm whitespotted eagle rays. Generally, dredging produces continuous sound frequencies below 1kHz, however this low level is likely to increase when the dredging includes the breaking and or removal of rocks, leading to higher levels of noise pollution (*Id.* at 979). This noise pollution is known to negatively impact whitespotted eagle rays (Berthe & Lecchini, at 100–102).

Source: *What is Dredging?*, NAT'L OCEANIC & ATMOSPHERIC ADMIN. (NOAA)

ii. Coastal and Ocean Development Threatens the Species with Extinction

A decline in the quality of neritic marine habitats occupied by the whitespotted eagle ray has been observed, and is expected to continue, as pollution and coastal development plague coastlines throughout the Atlantic region (Dulvy et al. 2021, at 9). The whitespotted eagle ray is especially vulnerable to habitat modification because they live, breed, and feed in shallow coastal habitats including lagoons, estuaries, and coral reefs (*Id.* at 7).

The whitespotted eagle ray is increasingly threatened by pollution, dredging, and habitat loss due to human interference (Dulvy et al. 2021, at 9). Habitat features, such as corals, seagrasses, and other seafloor features, are vulnerable to disturbances and are extremely slow to recover (*Id.* at 7). Habitat disturbances negatively impact the whitespotted eagle ray by reducing essential habitat features that the species relies on to hide and hunt as well as the environment their prey are found (Cerutti et al. 2018, at 238).

Coral reef ecosystems are of "major importance" to the Whitespotted eagle ray (Dulvy et al. 2021, at 7, 16). With "as much as 27 percent of monitored coral reef formations … lost," and "as much as 32 percent … at risk of being lost within the next 32 years," the whitespotted eagle ray is facing increasing threats due to habitat loss and population fragmentation (Weier, *Mapping*

the Decline of Coral Reefs; DeGroot et al. 2021, at 2). In some places, such as off the Florida Reef Tract, offshore coral reef cover is "≤ 5% since the 1997/98 El Niño on offshore reefs and has continued to decline" (Manzello *et al.* 2015).

Coral reefs support 25 percent of life in the ocean and the continued loss of coral reef formations is cause of serious concern (NMS, *Coral Reefs Support 25% of Life in the Ocean – But They Need Our Help*; Pörtner et al. 2019, at 61, 66). Anthropogenic climate change threatens corals through elevated temperatures, which lead to bleaching events and the spread of coral disease, as well as through ocean acidification, which reduces larval survival and impedes reef formation and maintenance (Pörtner et al. 2019, at 61). As the Intergovernmental Panel on Climate Change warns, "[c]oral reefs will face very high risk at temperatures 1.5ºC of global sea surface warming (*very high confidence*)" (Pörtner et al. 2019, at 65). Additionally, "[a]lmost all coral reefs will degrade from their current state, even if global warming remains below 2ºC (very high confidence), and the remaining shallow coral reef communities will differ in species composition and diversity from present reefs (very high confidence)" (*Id.*). Further reductions and fragmentation of suitable habitat are significant threats to the whitespotted eagle ray (DeGroot et al. 2020, at 109; DeGroot et al. 2021, at 2, 17).

The continued destruction of whitespotted eagle ray habitat is particularly dangerous to the species' persistence due to its site affinity, where the species returns to the same areas each year during its migration (Flowers et al. 2017, at 1). The available data thus indicate that local conservation efforts are necessary but insufficient to protect the species from substantial population loss and that nationalized and international conservation methods will be most beneficial to the species, especially as habitat destruction increases (*Id.* at 10).

iii. Climate Change Threatens the Species with Extinction

Habitat degradation and destruction associated with climate change threaten the whitespotted eagle ray with extinction in a variety of ways. "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, the effects of climate change will lead to significant changes in phytoplankton biomass and shifts in species dominance (Sommer et al. 2015, at 1; *Effects of Climate Change on Sharks*, NMFS). The increase in global temperature will reduce the turbulent mixing intensity in oceans, a leading factor in the decreasing total biomass of phytoplankton, which are responsible for nearly 50% of global net primary production, are the primary energy source for aquatic ecosystems, and are of global significance for climate regulation and biogeochemical cycling (Basu & Mackey 2018, at 1-2; Litchman et al. 2015, at 1). As the foundation of the marine food web, phytoplankton support "successive trophic levels such as zooplankton[], organisms that feed on zooplankton such as fish, and then predators that feed on the fish such as seals, sea lions, sharks, and marine mammals" (Alberro 2014). Declines in phytoplankton can result in "subsequent dwindling zooplankton populations, which in turn affect secondary and tertiary-level consumers such as fish and sharks" (*Id.*).

Rays are particularly vulnerable to climate change due to their natural tendency to "exploit the thermal heterogeneity in their environment by selecting different temperatures throughout the day, a behavior known as thermotaxis" (Vilmar & Di Santo 2022, at 770). By selecting "specific temperatures to enhance physiological processes, from swimming performance to digestion to reproduction," rays are dependent on their surroundings, which will fluctuate as a result of global warming (*Id.*).

Ocean acidification has led to lower aragonite saturation levels, making it "difficult for certain organisms to build and maintain their skeletons and shells" (*Climate Change Indicators in the United States: Ocean Acidity*, U.S. Environmental Protection Agency, at 1). "The largest decreases in aragonite saturation have occurred in tropical waters" (*Id.* at 2). Consequently, this decrease in aragonite will negatively affect the marine food web, making it more difficult for the whitespotted eagle ray, and other species, to find adequate food sources (Branch et al. 2013, at 178). By reducing the availability of key chemicals including aragonite and calcite, ocean acidification also will hinder the ability of corals to build skeletons, reducing white-spotted eagle ray habitat (Fabry et al. 2008, at 416; Kroeker et al. 2013, at 1884; Parker et al. 2013, at 652-53).

Additionally, high levels of CO2 can affect rays directly by causing "morphological, behavioral[,] and physiological anomalies" (Vilmar & Di Santo 2022, at 770). Bentho-pelagic species including whitespotted eagle ray have an advanced olfactory system that is used for communication, and the detection of prey, conspecifics, predators, and/or environmental cues (Schluessel et al. 2008, at 1367, 1376, 1383; Schluessel et al. 2009, at 452, 458). Researchers have found that near-future CO2 levels are threatening the survival of marine fishes by altering their responses to sensory cues, requiring fish to be "closer to an odor source for detection" and, thereby, "decreasing their chances of detecting food or predators" (Porteus et al. 2018, at 2). As a result, "both the olfactory system and central brain function are compromised by elevated CO2 in the oceans, with potentially major negative impacts on fish globally" (*Id.*; see Munday et al. 2008, at 1848).

Both "[o]cean warming and acidification exert … synergistic and antagonistic effects on elasmobranch locomotion efficiency by affecting skeletal mineralization, increasing metabolic rates during swimming, and prolonging the time it takes to recover from exercise, and to locate food" (Vilmar & Di Santo 2022, at 774). Together, these morphological and physiological impairments may further impair the whitespotted eagle rays' chances of survival (*Id.*).

Water temperature fluctuations significantly influence the behavior and migration patterns of the whitespotted eagle ray, suggesting that climate change-induced ocean warming will directly affect the species (Osgood et al. 2021, at 1). These temperature increases are expected to alter ray behavior by causing rays to move into deeper water (See Flowers et al. 2021, at 116-17). This will result in rays incurring "fitness costs through the inability to find food, increased predation risk …, and/or increased competition with other mesopredators" (*Id.* at 117). The increased temperatures are expected to affect the "rates of feeding, metabolism, growth, and even the life span of fish and other aquatic biota" (Havens 2015, at 3). Therefore, the frequency

and intensity of predator-prey interactions may be reshaped by climate change, leading to more predation of the whitespotted eagle ray (*Id.*; Ashton et al. 2022, at 1215).

The increasing frequency of "extreme weather events[,] such as hurricanes and fluctuations in environmental factors such as red tide and harmful algal blooms may impact ecologically important large-bodied mesopredators like the whitespotted eagle ray" (Galoustian, *Drifter or Homebody? Study Reveals Where Whitespotted Eagle Rays Roam*; see Weisberg et al. 2019; Havens 2015, at 4). Consequently, "the kinds of algae and bacteria that can produce toxins or cause disease proliferate greatly compared to other less harmful species when there is an increase in water temperature"(Havens 2015, at 3). Cyanobacteria, for example, is a harmful species of microorganisms that will grow at a faster rate with increased temperature (*Id.*). Real-life examples of the pending harm have already been witnessed. "In 2014, when water temperatures in the Gulf of Mexico were at record highs, the Florida Fish and Wildlife Conservation Commission (FWC) recorded one of the largest red tide blooms ever," killing more than 10,000 fish (*Id.* at 4). These blooms of harmful microorganisms occur mainly in estuaries and nearshore ocean waters, in habitat that the whitespotted eagle ray occupies (*Id.*).

In addition to harming eagle rays through direct catch and habitat destruction, bottom trawling releases greenhouse gas emissions due to its high fuel use and disturbance of sediments on the seafloor that contain carbon (Steadman et al. 2021, at 5). "Of the major gear types used in global fisheries, bottom trawling has the highest emissions from fuel use" (*Id.*). In addition to the gas emissions created by fuel consumption, bottom trawling disturbs marine sediments, the "largest pool of organic carbon on the planet and a crucial reservoir for long-term storage" (Sala et al. 2021, at 3). "If left undisturbed, organic carbon stores in marine sediments can remain for millennia"; however, disturbances of these "carbon stores can re-mineralize sedimentary carbon to CO2, which is likely to increase ocean acidification, reduce the buffering capacity of the ocean[,] and potentially add to the build-up of atmospheric CO2" (*Id.*). Research indicates that the disturbance of sediments caused by bottom trawling could contribute up to "1.47 Pg of aqueous CO2 emissions" in the first year after trawling (*Id.*). In another study, researchers "estimated that bottom trawling could release between 0.6 and 1.5 Gt CO2e a year, roughly equivalent to the entire global aviation industry" (Steadman et al. 2021, at 5). Therefore, bottom trawling exacerbates climate change and further threatens the whitespotted eagle ray.

Vulnerability to climate change will likely be exacerbated by other stressors, such as development and fishing (Flowers et al. 2021, at 116).

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

Directed fisheries and bycatch in coastal inshore and estuarine waters pose the greatest threat to the whitespotted eagle ray (Dulvy et al. 2021, at 8). The species is susceptible to a variety of fishery hazards, ranging from bottom trawling at the seafloor level to gillnets in the water column, resulting in persistent and sustained threats to the survival of the species.

Inshore gillnet fisheries are prominent throughout the species' range and are particularly problematic as the whitespotted eagle ray's swimming behavior increases its likelihood of entry and entrapment in gillnets (*Id.* at 1, 8-9). Globally, whitespotted eagle rays are commonly targeted by traditional gillnet and industrial shrimp trawl fisheries (*Id.* at 1). Once caught, the species is "retained and sold fresh and consumed locally" (*Id.* at 2). The species is also vulnerable to negative interactions with shellfish farming operations given the rays' molluscan diet (*Id.* at 1, 8-9).

Fishing pressure is substantial and often unregulated across a majority of the species' range, particularly in the Gulf of Mexico, the Caribbean Sea, and the Eastern Central and Southeast Atlantic Ocean along the coast of Africa (Dulvy et al. 2021, at 8).

Total demersal biomass of inshore stocks in the Gulf of Guinea has declined by an estimated 75% since 1982, attributed to overharvest "within both the industrial and [artisanal] fisheries and destructive fishing practices" (*Id.* at 9). Between 1950 and 2010, the total traditional fishing boats increased from 32,000 to 252,000 traditional vessels "and 3,300 industrial vessels (mostly distant water fleets from Europe and East Asia operating under 'access agreements' that take sharks and rays as bycatch) operating in [the Gulf of Guinea] by 2010" (*Id.*).

In the United States, whitespotted eagle rays are primarily caught as incidental bycatch and are among the top bycatch species by abundance in the observed catches (Trent et al. 1997, at 23). In Georgia, the whitespotted eagle ray was the fourth most abundant species observed as bycatch and in North Florida the species was the second most abundant, in terms of the number of individuals (*Id.*). The species is especially vulnerable to capture as bycatch due to their natural molluscan diet, leading to "negative interactions with shellfish farming" (Dulvy et al. 2021, at 9). Interactions between the species and shellfish farmers generally stem from "molluscan culture operations in the Indo-Pacific" (*Id.*).

In the Southern Gulf of Mexico, the whitespotted eagle ray remains a "target species for fisheries" and is the "second most captured batoid in the region" at about 40 tons/year [approximately 157 individual whitespotted eagle rays weighing the maximum weight of 507 pounds] (Amparo et al. 2017, at 16). Because of their variable swimming behavior, the species is "susceptible to a range of fishing gear throughout the water column, especially inshore gillnet fisheries, which are intensive throughout most of [the whitespotted eagle rays'] range" (Dulvy et al. 2021, at 8). However, the species is "commonly taken in industrial and [traditional] fisheries using demersal trawl, shrimp trawl, demersal set gillnets, and beach seine nets" (*Id.* at 1). Thus, the species is susceptible to various fishing pressures, from bottom trawling at the seafloor level to gillnets in the water column (*Id.*). Once caught, the species is "retained and sold fresh and consumed locally" (*Id.* at 2).

In the Western Central Atlantic, directed fisheries for whitespotted eagle rays "are not well described," but are known to exist in "Mexico …, Cuba …, and Venezuela" (Dulvy et al. 2021, at 8). In Caribbean Colombia, traditional fisheries are "widespread and lack management," and the

“ray is taken there using gillnet, longline, and trawl gears” (*Id.*). In Venezuela, commercial and traditional fisheries are intense and lack management; there have been “peaks in catches[,] followed by declines, [which indicate] sequential overfishing” (*Id.*). Declining annual catch rates, demonstrated in Mexico and Venezuela, indicate the substantial decline of a species due to overfishing (*Id.*).

Commercial trawl and longline fisheries are widespread and largely unmanaged in the Southwest Atlantic where the whitespotted eagle ray is considered overfished (Dulvy et al. 2021, at 8). Traditional fisheries are also common along the South American Atlantic Coast in Eastern, Northeastern, and Northwestern Brazil, where “44% of target stocks were likely to be overfished by the end of the 2000s” (*Id.*). In Southern Brazil, commercial trawl fishing “began in the 1960s and entered a period of rapid expansion in the 1990s and 2000s, resulting in over 650 vessels fishing at depths of 20–1,000 m” (*Id.*). Unsustainable fishing practices–both traditional and commercial–have driven sharp declines in the abundance of several elasmobranch species in the region, including Largetooth Sawfish (Pristis pristis), Smalltooth Sawfish (Pristis pectinata), Daggernose Shark (Isogomphodon oxyrhynchus), and Smalltail Shark (Carcharhinus porosus). Scientists estimate that the whitespotted eagle ray has “undergone a population reduction of 50–79% over the past three generation lengths (30 years) in the Atlantic South American part of its range” (*Id.* at 2).

In the Eastern Central Atlantic, whitespotted eagle rays were “being exploited by semi-industrial fisheries in the 1950s” (Dulvy et al. 2021, at 8). Although the fisheries gradually collapsed, the demand for marine products has continued (*Id.*). Targeted fisheries have increased, “likely increasing fishing pressure on this species” and leading to “population reductions of many species of sharks and rays” (*Id.* at 9). Rays continue to be targeted in a “number of countries with artisanal fishers using drift gillnets and demersal set gillnets with large mesh sizes” (*Id.*).

The fishery pressures against whitespotted eagle rays may result in “smaller species [being] released from interspecies competition and tak[ing] over the niche of larger species” (Flowers et al. 2021, at 117). As such, fishery behavior, including trawling, threatens rays not only through bycatch, but also indirectly through the “depletion of prey sources like shrimp or changes in demersal prey species assemblages” (*Id.*). This, consequently, leads to “increased intra- and interspecific competition” (*Id.*). Therefore, the “contribution of fisheries to ray ecology cannot be overlooked” (*Id.*).

The whitespotted eagle ray is also captured for use in public aquarium displays and the marine aquarium trade (Dulvy et al. 2021, at 9). However, little data regarding the take of rays for this purpose are available.

Even if caught and released as bycatch, ray species face harm due to stress from capture. In a study examining the physiological responses of captured manta rays, “researchers found a gradual increase in lactate,” a stress response hormone, as the animal was handled, leading to “elevated levels [that] continued for as long as the animal was held in confinement” (NMFS 2022, at 50-51). The study confirms that rays should be released promptly, between “10 to 20

minutes and less than 30 minutes," to protect the species' health (*Id.*). When handled, the whitespotted eagle ray has lactate concentrations that range from 33.2 ± 24.64 (mg dL-1), a "considerable increase" from its resting concentration (Rangel et al. 2021, at 192-193). At a value of greater than 180 mg dL-1, the individual risks "moribund and death" (*Id.*). "When not associated with research, immediate release is recommended" and "more stringent handling protocols for research should be required to reduce the physiological stress" (*Id.*). Therefore, whitespotted eagle rays are negatively impacted by handling so the conduct and procedures of the fisheries' handling of the species is of major concern. Consequently, to best preserve species, the focus must be on avoiding the species' capture in the first place.

In sum, the threats caused by overutilization push the whitespotted eagle way towards extinction.

C. Disease or Predation

Disease and predation are not considered primary threats to the whitespotted eagle ray (*Aetobatus narinari*). However, other stressors including climate change, habitat degradation and destruction, and mishandling during fisheries interactions may increase rays' susceptibility to disease and parasites. A number of parasitic relationships are known to occur, with trematodes (*Thaumatocotylepse udodasybatis*), which infects the skin, being most common (Aetobatus narinari - Discover Fishes, Florida Museum; see Castro 1996; *Trematoda (Flukes)*, Encyclopedia). *Clemacotyle australis* and *Decacotyle octona* n. comb. have also been observed in the bronchial cavity and gills of the species (Aetobatus narinari - Discover Fishes, Florida Museum). Marine leeches *Branchellion torpedinis* have also been found on pelvic fins (Id.).

Parasitological studies with whitespotted eagle rays located in the Gulf of Mexico found that "six species of parasitic copepods (*Alebion sp.*, *Caligus dasyaticus*, *C. haemulonis*, *Euryphorus suarezi*, *Lepeophtheirus acutus*, and *L. marginatus*)" were living on this species. (Amparo et al. 2017, at 15). Parasitic copepods, also known as sea lice, are known to "cause serious cutaneous lesions" as they graze on the skin of their hosts (*Id.* at 16). This often induces secondary infection and can cause "destruction of gill tissue, emaciation, and sometimes death" (*Id.*). *Decacotyle floridana*, a genus-specific monocotylid monegene, was also found on whitespotted eagle rays in Mexico (Pulido-Flores & Monks, at 69). These monogenean parasites have also infested this species in "managed environments," like aquariums, and have caused "secondary consequences" and "breakthrough infections" even when treated (Mylniczenko et al. 2015, at 1; Janse & Borgsteede, at 152).

Rays infected with parasites exhibit "stressful behavior," displayed by: "tips of the pectoral fins [to be] kept high above the median line during swimming; spinning movements where the body was held in a vertical position; tail and pelvic fins … angled upwards during swimming; jumping out of the water …; swimming against the current …; upside down swimming …; regular resting on the bottom; [and] … the ventral side" scratching against surfaces (Janse & Borgsteede, at 153). "This behavior caused haemorrhages on the tips and sides of the pectoral fins and on the skin under the pectoral girdle" (*Id.* at 154).

Predators, such as the tiger shark, lemon shark, bull shark, silver tip shark, and great hammerhead shark, feed on the whitespotted eagle ray (*Aetobatus narinari - Spotted Eagle Ray*, University of the West Indies; Aetobatus narinari - Discover Fishes, Florida Museum). "Sharks have also been reported to follow [white]spotted eagle rays during the birthing season, feeding on newborn pups" (*Aetobatus narinari - Discover Fishes*, Florida Museum).

D. Inadequacy of Existing Regulatory Mechanisms

Current regulatory mechanisms to preserve the whitespotted eagle ray population are inadequate (Dulvy et al. 2021, at 8-10). There is no in-place research and monitoring plan, no in-place water protection, no in-place species management, and no in-place education, which contribute to the species' continued decline (*Id.* at 17). Additionally, extant regulations remain inadequate to protect the whitespotted eagle ray from the myriad threats associated with climate change.

Fishery Regulations

In light of concerns over the conservation of whitespotted eagle rays and the important role the species plays in maintaining a balanced marine ecosystem, Florida has prohibited the utilization of this species through different methods, which include harvest, possession, landing, purchase, sale, or exchange (Florida Administrative Code: 68B-44.004; Dulvy et al. 2021, at 10). Targeted fishing for elasmobranchs continues elsewhere, however, using passive gear like gillnets and longlines that will catch whitespotted eagle rays (Roskar et al. 2020). Thus, enhanced legal and regulatory protections at the national and international levels are urgently needed to protect wild populations of whitespotted eagle rays from further decline due to habitat loss, overutilization, and other threats (Dulvy et al. 2021, at 9-10).

Despite classification as a state-protected species in Florida for more than two decades under the Florida Administrative Code, the population of whitespotted eagle rays has not increased substantially (*Id.* at 10). These prohibitions do not apply to lawful harvest in nearby state and federal waters. Therefore, the current state-level protection is inadequate because the protection only applies to whitespotted eagle rays that are captured in Florida state waters, which are "from shore to 3 nautical miles on the Atlantic and from shore to 9 nautical miles on the Gulf" (*Boundary Maps and Management Zones*, Florida Fish and Wildlife Conservation Commission).

Whitespotted eagle rays may still be caught in neighboring Gulf states, negatively impacting the species (Dulvy et al. 2021, at 10). Other US states, such as Texas, Louisiana, Georgia, South Carolina, North Carolina, and Virginia all have whitespotted eagle rays that frequent their coasts. However, these states do not afford adequate protection to the species. Texas, for example, allows for the catch and possession of whitespotted eagle rays (*Fishing Regulations*, Texas Parks & Wildlife; Boyd 2017). Alabama prohibited recreational and commercial harvest of *Aetobatus narinari* (Ala. Admin. Code r. 220-3.30, Legal Information Institute). Meanwhile,

Louisiana, Georgia, South Carolina, North Carolina, and Virginia do not regulate fishing of the whitespotted eagle ray (Louisiana 2020 Fishing Regulations, Louisiana Wildlife & Fisheries; Georgia Fishing, eRegulations; Hunting & Fishing, South Carolina Department of Natural Resources; North Carolina Fishing, eRegulations; Virginia's Recreational Fishing Regulations for Marine Waters, Virginia Marine Resources Commission). Therefore, federal protection is necessary because this species is harmed by numerous fisheries and a unified conservation effort "could contribute to conservation of the species" (Dulvy et al. 2021, at 10).

Internationally, "only 13 of the top 20 shark-fishing nations [have] completed and implemented [National Plans of Action] for elasmobranchs," leaving the whitespotted eagle ray vulnerable on a global scale (Dulvy et al. 2021, at 9-10). Much of the "progress towards the implementation of these actions have stalled since 2011 due to a lack of funding and support" (*Id.* at 10).

To conserve the whitespotted eagle ray population and allow recovery, "species protection, spatial management, bycatch mitigation, and harvest and trade management measures (including international trade measures)" are required (Dulvy et al. 2021, at 10). Furthermore, enforcement of the measures will require "ongoing training," "capacity-building (including in the area of species identification)," and "[c]atch monitoring" (*Id.*).

Climate change regulations

Regulatory mechanisms are woefully insufficient to address climate change-related threats to the whitespotted eagle ray. Existing national and international regulatory climate change mechanisms are non-binding and, even if adhered to by all parties, fail to mandate greenhouse gas emission reductions sufficient to protect rays from climate change-related effects including ocean warming and ocean acidification. These failings are compounded by the recently enacted Inflation Reduction Act, which mandates massive oil and gas leasing in the United States (Inflation Reduction Act, Pub. L. No. 117-169 (2022)).

In a past analysis, NMFS concluded that existing regularly mechanisms aimed at reducing greenhouse gas emissions were "inadequate" to avert climate-related threats to species (Endangered and Threatened Wildlife and Plants: Final Listing Determination on Proposal to List 66 Reef-Building Coral Species and to Reclassify Elkhorn and Staghorn Corals). With respect to international agreements, the agency found it "unlikely that Parties would be able to collectively achieve, in the near term, climate change avoidance goals outlined via international agreements" (*Id.*). In addition, "none of the major global initiatives appeared to be ambitious enough, even if all terms were met, to reduce GHG emissions to the level necessary to" avoid impacts to imperiled species (*Id.*). Circumstances on the international front have not changed materially since the agency's review.

The primary international agreement on climate action is the United Nations Framework Convention on Climate Change (UNFCCC). Adopted at the Rio Earth Summit in 1992, it has to date been ratified by 190 countries. The most recent agreement covering UNFCCC countries, the Paris Agreement, was ratified in 2016 and took effect in 2020. According to the UNFCCC,

"[t]he Paris Agreement builds upon the Convention and for the first time brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects" (*Paris Agreement to the United Nations Framework Convention on Climate Change*). The "central aim" of the Agreement "is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius" (*Id.*).

Scientists predict increases of 2°C or more would result in "'dangerous' [to] 'extremely dangerous' climate change" (Anderson & Bows 2011, at 20). Projected impacts include the disappearance of Arctic summer sea ice, irreversible melting of the Greenland ice sheet, an increased risk of extinction for 20-30% of species on Earth, and "rapid and terminal" declines of coral reefs worldwide (Veron et al. 2009, at 1428; Jones et al. 2009, at 484; *Climate Issues Update*, The Economics of Ecosystems and Biodiversity (TEEB); Hare et al. 2011, at S1; Warren et al. 2011, at 1-2; Frieler et al. 2013, at 165). The Paris Agreement seeks to avoid such dangerous harms by aiming to limit warming to 1.5°C. Humans already have warmed the planet 1.0°C over the pre-industrial level, and at the current rate we likely will reach 1.5°C of warming between 2030 and 2052 (Masson-Delmotte et al. 2018, at 6).

This warming occurs largely due to rising atmospheric CO_2 levels. In 2019, the global annual atmospheric concentration of CO_2 exceeded 415 parts per million (ppm) for the first time (Harvey 2019). This carbon dioxide level—a dramatic increase over the preindustrial level of 280 ppm—has not been seen for 3 million years (*Id.*). Atmospheric CO_2 has been rising at a rate of nearly 3 ppm per year, and this rate is accelerating (*Id.*; Raupach et al. 2007, at 10288; Friedlingstein et al. 2010, at 1; *Global Carbon Dioxide Growth in 2018 Reached 4th Highest on Record*, NOAA). In 2021, global average atmospheric carbon dioxide was 414.72 ppm—a record average high (Lindsey 2022, at 1). But as climate scientists have warned: "[i]f humanity wishes to preserve a planet similar to that on which civilization developed and to which life on Earth is adapted, paleoclimate evidence and ongoing climate change suggest that CO_2 will need to be reduced … to at most 350 ppm [equivalent to ~1.5°C], but likely less than that" (Hansen et al. 2008, at 1). This 350 ppm target must be achieved within decades to prevent dangerous tipping points and "the possibility of seeding irreversible catastrophic effects" (*Id.*).

Despite its adoption of the 1.5°C threshold, the Paris Agreement does not do enough to shield the marine species including rays from the harmful effects of climate change, including ocean warming and ocean acidification (Olhoff et al. 2019, at XIII). Additionally, signatories have not yet effected the changes necessary to achieve the Agreement's goals (*Id.*). According to a recent analysis by the United Nations, current commitments will result in warming of approximately 2.5-2.9°C by 2100 (*Nationally Determined Contributions under the Paris Agreement*, United Nations Framework Convention on Climate Change (UNFCCC)). According to Simon Stiell, Executive Secretary of the United Nations Framework Convention on Climate Change, "[w]e are still nowhere near the scale and pace of emission reductions required to put us on track toward a 1.5 degrees Celsius world" (Schonhardt 2022).

The United States took a significant step backwards on its climate change commitments when it passed the Inflation Reduction Act, which will require a massive amount of oil and gas drilling. Inflation Reduction Act, Pub. L. No. 117-169 (2022). Further, in the United States, federal agencies have failed to fully capitalize on existing authority under domestic law to reduce greenhouse gas emissions to levels that would be protective of species. The U.S. government repeatedly has acknowledged that its rules do not go far enough to notably reduce the nation's greenhouse gas emissions (*Final Environmental Impact Statement: Medium- and Heavy-Duty Fuel Efficiency Improvement Program*, Nat'l Highway Traffic Safety Administration (NHTSA), at 3-95; *Standards of Performance for Greenhouse Gas Emissions for New Stationary Sources: Electric Utility Generating Units*, U.S. Envt'l Protection Agency (EPA), at 22,401). The government's refusal to utilize existing laws such as the Clean Air Act and Energy Policy and Conservation Act to force needed greenhouse gas reductions renders them inadequate mechanisms to protect the whitespotted eagle ray from the effects of climate change.

Throughout the whitespotted eagle ray's range, regulatory mechanisms fail to protect the species from climate change, fishing, and other threats to its continued existence. Additional protections including those afforded by the Endangered Species Act will be required for the species' conservation.

E. Other Natural or Manmade Factors Affecting Continued Existence

Whitespotted eagle rays are negatively impacted by other anthropogenic threats including noise, chemical pollution, plastic pollution, and human disturbances including dredging (See Taylor, *Biotelemetry Reveals Behaviour of Rare Eagle Ray*). Interactions with humans, increased pollution, and disturbances will result in changes to the species' movement patterns and health. The reduced productivity of estuarine areas will further "exacerbate pressures already facing populations" of the species (*Id.*).

i. Noise

Anthropogenic (human-made) noise pollution of natural soundscapes causes "physiological, neurological and endocrinological problems, increased risk of coronary disease, cognitive impairment and sleep disruption of many mammals, reptiles, fishes and invertebrate[s] taxa" (Berthe & Lecchini, at 100).

Whitespotted eagle rays are disturbed by noise pollution, which impacts their natural behavior (*Id.* at 99). A 2016 study found that "playbacks of boat motor sound significantly disturbed rays during foraging activity (60% exhibited an escape behaviour)" (*Id.*). When the boat motor sound was played, "60% of rays swam at least 50 m away from the foraging site" and the rays fled within the first ten seconds (*Id.* at 101). Additionally, boat motor sounds triggered significantly more escape behavior while foraging but no "significant relationship was highlighted between the sound intensities of boat" and "the time for the eagle rays to escape (i.e. 66% of rays

exhibited an escape behaviour during the 10 first seconds, corresponding to the lowest sound intensities of boat noise – 90 and 98 dB re 1 mPa RMS …)" (*Id.*). Overall, the study "highlighted the negative effect of boat noises on the foraging activity of eagle rays" and that "boat noise is detrimental to the eagle rays" (*Id.* at 99, 102). The whitespotted eagle rays' use of coastal areas increases their susceptibility to noise disturbance from vessels.

ii. Chemical Pollution

Persistent organic pollutants (POPs), including polychlorinated biphenyls (PCBs) dichlorodiphenyltrichloroethane (DDT) and hexachlorobenzene (HCB) pose a threat to the whitespotted eagle ray. These chemicals are resistant to biodegradation, leading to an accumulation in marine environments (See *Persistent Organic Pollutants: A Global Issue, A Global Response*, United States Environmental Protection Agency). POPs are a global issue, as they "persist for long periods of time," "accumulate and pass from one species to the next through the food chain," and can "affect people and wildlife far from where they are used and released" (*Id.*). The low water solubility of these materials leads to "reservoirs or 'sinks' for POPs" along aquatic sediment, causing the most harm to benthopelagic species, such as the whitespotted eagle ray (*Id.*).

Whitespotted eagle rays caught off New South Wales, Australia, tested positive for polychlorinated biphenyls, DDTs and HCB (Cagnazzi et al. 2019, at 263,266). Some concentrations were high enough to have "deleterious sub-lethal effects," leading to possible "negative impacts on longer-term health" (*Id.*).

iii. Plastic Pollution

Plastic litter in the marine environment has become an "extremely serious threat," with more than 80% of the waste found in the marine environment being plastics (Pinho et al. 2022, at 1). The fragmentation of larger plastics into microplastics, through "physical, biological, and chemical processes, increase its availability to a wider range of organisms, including organisms at the lowest trophic level, which can result in a cascading effect in marine food webs" (*Id.*). Consequences of microplastic ingestion can include "[g]astric obstruction," "intestinal tract alterations," "compromised intestinal functions," "reduced predatory performance, abnormal swimming behavior, … lethargy," "oxidative stress, inflammation, … disrupted energy metabolism," "reduced feeding and activity," as well as "behavioral and metabolic effects" (*Id.* at 2).

"Due to their hydrophobicity and relatively large total surface area, [microplastics] can efficiently absorb endocrine disruptive chemicals, pesticides, fertilizers, aqueous metals persistent organic pollutants (POPs), carcinogens, and mutagens, becoming vectors of contaminants by their ingestion" (*Id.*). Once adsorbed, the "toxic compounds have great stability and do not degrade" (*Id.*). Thus, "microplastic particles have been shown to hold concentrations of PCBs more than 1 million times higher than those in the surrounding water" (*Id.*).

Batoids are “highly susceptible to accumulation of environmental pollution due to their intrinsic ecological and biological traits (i.e., low reproductive output, late maturation, slow growth),” and are negatively impacted by the increasing presence of microplastics in the marine environment (*Id.*). One study, focused on the ingestion of plastic debris by the Haller’s round ray (*Urobatis halleri*) in the eastern Gulf of California, showed a “high ingestion of [plastic debris] both in terms of quantities and frequency of occurrence” (*Id.* at 7). Therefore, “[m]icroplastic ingestion … can be added to the threats batoids face, besides bycatch and overfishing, as well as by other pollutants such as persistent organic pollutants, PAHs, and heavy metals” (*Id.*).

iv. Human Disturbances

As coastal populations and developments increase, whitespotted eagle rays are increasingly likely to interact with humans. Whitespotted eagle rays that move into coastal areas to feed “become susceptible to boat strikes and entanglement in fishing gear” (Bassos-Hull et al. 2014, at 1052). Dredging, construction, and pollution have been linked to habitat alteration, which may change the abundance and distribution of the whitespotted eagle ray (Galoustian, *Drifter or Homebody? Study Reveals Where Whitespotted Eagle Rays Roam*; Dulvy et al. 2021, at 9).

In conclusion, the whitespotted eagle ray satisfies the Endangered Species Act’s five-factor analysis because: (a) the present or threatened destruction, modification, or curtailment of its habitat or range (which includes destructive fishing practices, coastal and ocean development that threatens the species with extinction, and climate change that threatens the species with extinction); (b) overutilization for commercial, recreational, scientific, or educational purposes; (c) disease or predation; (d) the inadequacy of existing regulatory mechanisms (which includes inadequate fishery regulations and climate change regulations); and (e) other natural or manmade factors affecting its continued existence (which includes noise, chemical pollution, plastic pollution, and human disturbances) threaten the species’ existence. Protection of the whitespotted eagle ray through the Endangered Species Act is needed to conserve the species.

IV. Critical Habitat Designation

The ESA mandates that, when NMFS lists a species as endangered or threatened, the agency must 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).

Petitioners expect that NMFS will comply with this unambiguous mandate and designate critical habitat concurrently with the listing of the whitespotted eagle ray. Critical habitat must include, but should not be limited to, the breeding habitat off the East Coast (Dulvy et al. 2021, at 10).

V. 4(d) Rule

Should NMFS determine after conducting a status review that listing the whitespotted eagle ray as "threatened" is warranted, Petitioners request 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 eagle ray by trade, Petitioners urge NMFS to extend to the eagle ray 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 whitespotted eagle ray.

VI. Conclusion

The whitespotted eagle ray (*Aetobatus narinari*), a species identified as Endangered by the IUCN, continues to face pressures from habitat loss, overutilization, and inadequate protections. Overfishing, habitat degradation and destruction, climate change, dredging, and other threats continue to drive the species towards extinction. As such, the whitespotted eagle ray meets the criteria for listing under the ESA. Listing is essential to ensure the whitespotted eagle ray's survival and persistence.

Petitioners request the whitespotted eagle ray be listed as endangered under the ESA and request 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. Petitioners urge NMFS to grant the actions requested herein without delay.

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